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and **SPACE DIGEST**

The Magazine of Aerospace Power

Published by the Air Force Association



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MIRAGE F2 STRIKE, POWERED BY TF306



F-111 FIGHTER, POWERED BY TF30-P-1

TF30

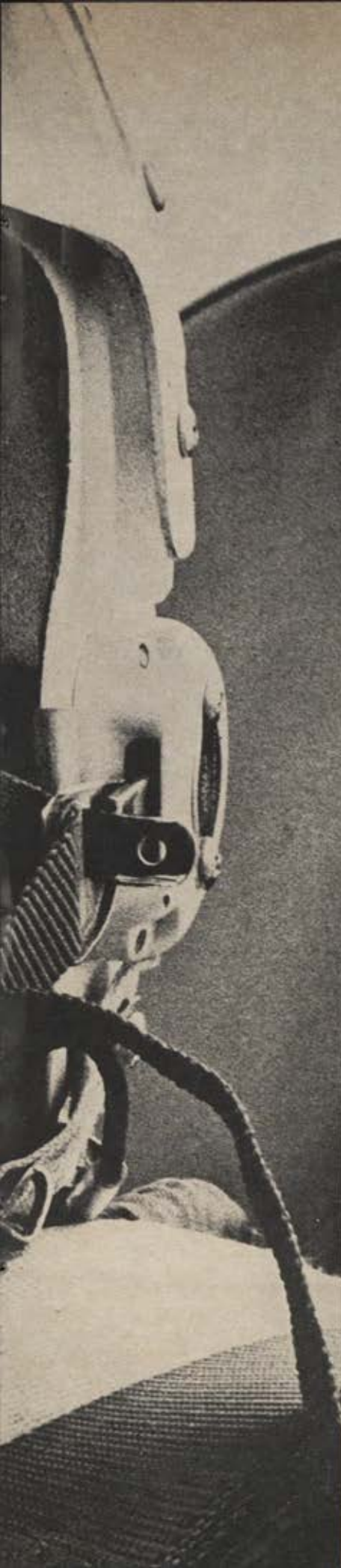
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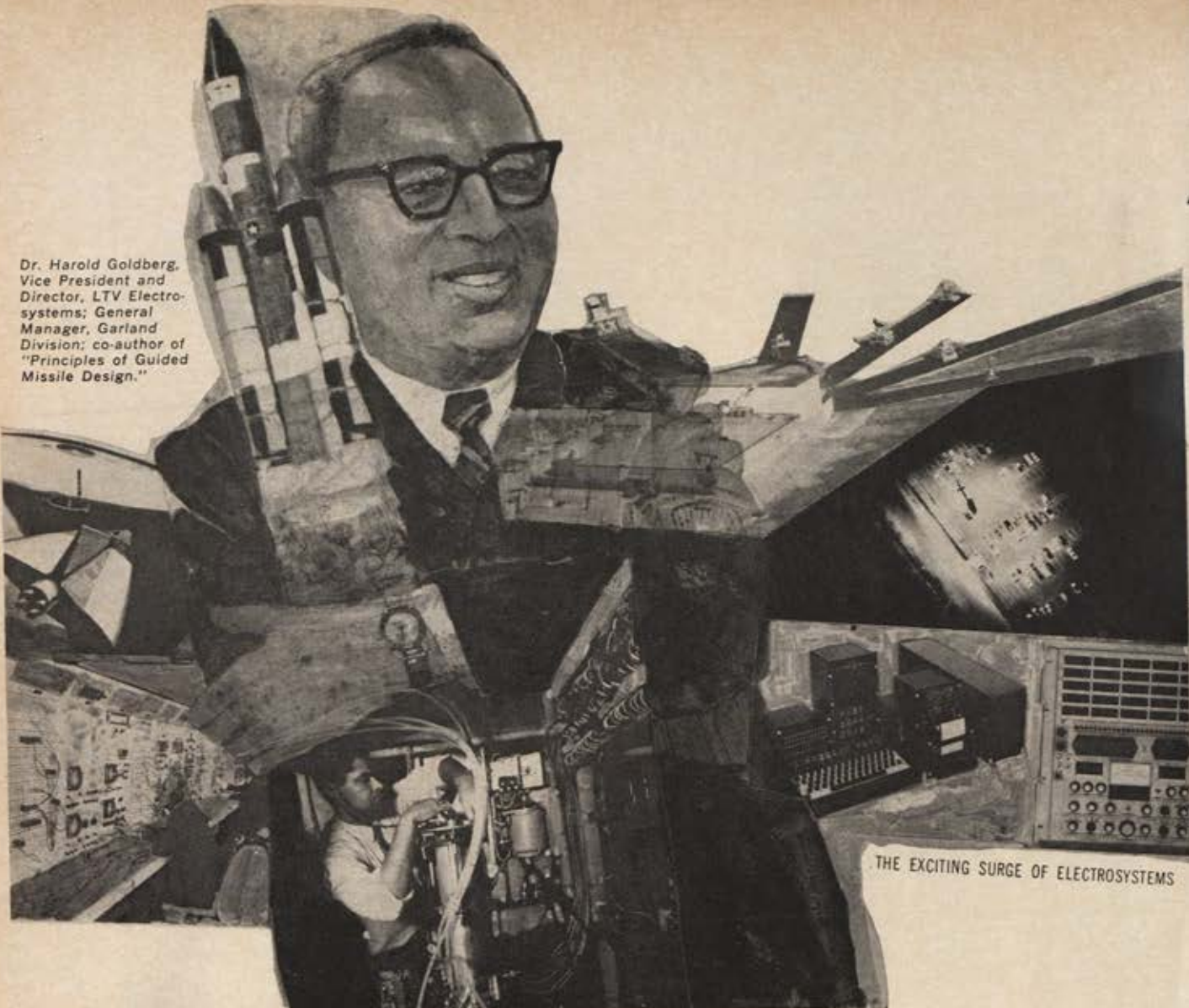
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AIR FORCE

and SPACE DIGEST

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JUNE 1967

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Loop with roll

Loop

Immelmann turn

The expanding role of helicopters is creating new demands for stability and controllability. Flying in gusty winds, hugging rough terrain, setting down on hillsides and flying in IFR weather are very sticky problems. Training green pilots is also a tough

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The Technological Hang-up

By John F. Loosbrock

EDITOR, AIR FORCE/SPACE DIGEST

FROM time to time we are taken to task by certain of our readers, accusing us of a preoccupation with technology. People are more important than machines, they say. Why get so hung up on the technology bit?

We don't propose at this juncture to defend our interest in people nor to count column-inches to prove our point. But we would like to talk a bit about our concern over the state of US technology, with special reference to military technology.

Technology is a people-oriented phenomenon. It is created by people. It can make life better for people. It can also kill people. It is very often the difference between living and dying, between affluence and poverty, for masses of people. Technology, as we have said before, salutes no flags, signs no exclusive contracts. It is neutral, amoral if you will. It is how people relate it to their needs that makes it significant.

Thoreau once wrote: "If a man does not keep pace with his companions, perhaps it is because he hears a different drummer." To our ears the drum of technology beats louder than does any other at this point in time and at this place in history. It furnishes our pace and direction, although with full recognition that it is not the only instrument in the band.

Having got that off our chest, we will become more specific.

Last month, Dr. John S. Foster, Jr., Director of Defense Research and Engineering, addressed the Aviation/Space Writers convention in Las Vegas. In discussing the Department of Defense's current strategic philosophy of "assured destruction," he lectured the assembled writers on their responsibilities relative to the credibility of our deterrent force. Said Dr. Foster:

"The whole point of 'assurance' is that everyone must appreciate the certainty and capability of our response to any major attack. Nevertheless, occasionally there is an oversimplified 'scare story' claiming that our deterrent force is in some way grossly inadequate. Such stories cannot be supported—either technologically or operationally. Such stories introduce unwarranted uncertainty, here and abroad. Such stories undermine the credibility of our deterrent. Because such stories cannot be supported, they are a great disservice to the country."

A couple of pages along in his prepared manuscript, Dr. Foster again shook a figurative finger at his writing audience. He said, in reference to the antiballistic missile:

"A number of recent articles 'discovered' X-rays as a kill mechanism at high altitude. Depending upon the

point of view of the author, either the US has made this breakthrough, or the US is behind in countering some Soviet threat based on this X-ray threat. Neither the 'pat on the back' nor the 'jab in the ribs' stories are true. One could read about these X-ray effects several years ago in unclassified official handbooks on nuclear weapons effects."

Both of the above references might well have been directed at AIR FORCE/SPACE DIGEST. In March we published an article entitled "The Myth of Technological Stalemate." It was written by our Technical Editor, J. S. Butz, Jr. In it, Sam Butz addressed himself to the possibility that a number of important technological developments were threatening the security of US strategic forces. One of these was the discovery that high-altitude bursts of very-high-yield nuclear weapons produced radiation effects of much greater magnitude than had hitherto been assumed. The point missed by Dr. Foster, both in this speech and in congressional testimony directed to the same article, is that Editor Butz did not project as news the fact that radiation effects are produced. An Atomic Energy Commission publication dated May 1962 is chock-full of pertinent information. But what was learned only after the Soviets had exploded a fifty-eight-megaton bomb at high altitude back in 1961 was that the effects of low-yield bombs cannot be extrapolated to provide useful data on the effects of high-yield bombs.

Butz wrote: "It now appears that, when exploded in space, these weapons [100 megaton and above] will generate more than 1,000 times the number of high-energy particles originally predicted."

It may well be, as indicated in congressional testimony, that our heavily instrumented underground test program has come up with the same conclusion. But it is also reasonable to believe that there is less confidence in data so obtained than from proof-testing in space. Certainly Dr. Foster thought so in 1963, when he said, "we can obtain a much better understanding of the situation with nuclear experiments in the atmosphere than without them."

The point is that the Soviets are almost certain to possess better information with which to build antiballistic missile defenses based on radiation effects than we do. The effect this could have on "assured destruction" is obvious.

It is one thing to undermine the credibility of our deterrent force by publishing incorrect information. It is quite another to call attention to certain potential deficiencies in our defenses, in the hope that public discussion may accelerate corrective action.—END



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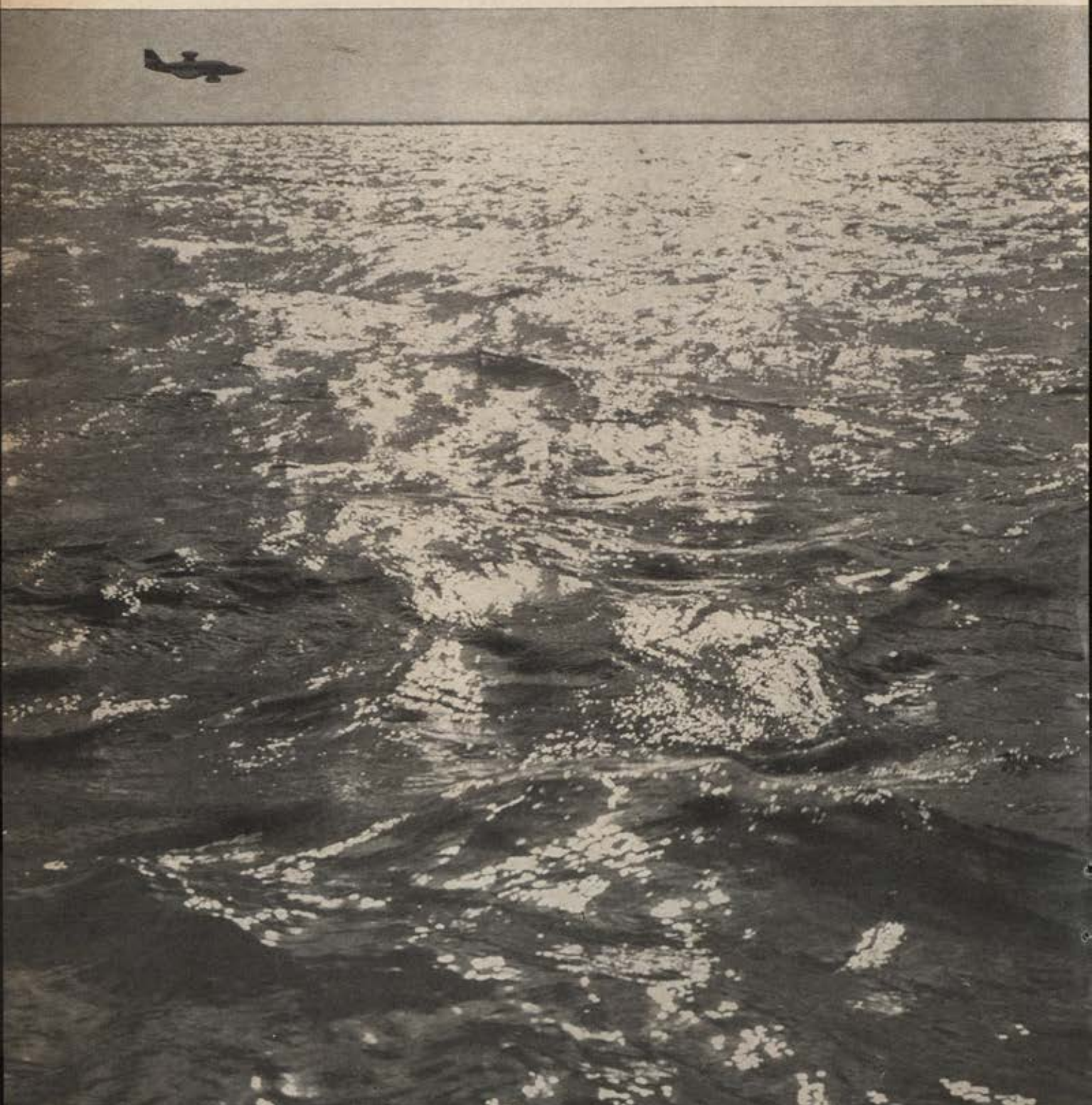
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AIR MAIL



USAF and Conventional War

Gentlemen: It occurs to me that the theory of graduated response, controlled response, flexible response, or whatever you want to call it, does have some validity when referring to escalation from nonnuclear to nuclear war. Since the Air Force had dominance in the nuclear area, the Army cut out conventional war as its special domain and developed the necessary philosophy, *ergo*, graduated response, and similar ideas. Being almost totally absorbed in nuclear affairs, the Air Force allowed itself to be cast only in a supporting role during conventional war.

Deleterious results far too long to list here have resulted from this situation. I will try to restrict myself to a few of the more important ones:

1. Air forces in the Korean War were commanded by the Army. (Do not let talk about unified command obscure your view of the facts of life.)

2. Air forces in the Vietnam War commanded by the Army with the Navy on top of all.

3. No air command in NATO. (An uninformed person might dispute this as did the Deputy Director of Plans in Hq. USAF in 1957. After about five minutes of discussion he agreed.)

4. Conventional inferiority in Europe since shortly after World War II. (If not, why didn't we help the Hungarians? Or, why does current policy call for us to initiate nuclear war in the event of a Soviet conventional attack?) Incidentally, the likelihood of such an attack has little to do with the problem.

5. Increased military budgets of nearly \$50 billion since 1960 (excluding Vietnam-caused increases) to improve conventional capability, all based on land strategy.

6. Tactical airpower in the US under Army command. (Really, would it be right to have the Army controlling the employment of F-111s if the Russians were invading through Canada?)

7. NATO still bereft of a conventional strategy which any of our allies will seriously support.

We assert our nuclear superiority with respect to Europe. Why have we not set a similar nonnuclear goal? The

answer seems fairly clear. It is not feasible when based on a land strategy. Has anyone proposed conventional defense of Europe based on an air strategy? It is impossible with existing organizational structures. Is it not clear that the friendly manpower deficiency in existing force structures prevents a feasible land strategy? Haven't both Korea and Vietnam shown that achievable air strength can offset any likely manpower deficiencies? Didn't the war against Japan show the same thing? Interestingly enough, the war against Germany gave the same answer, but the Allied emphasis on land strategy obscured what otherwise would have been obvious to all.

The record is far too long and dreary. The time is long overdue for the Air Force to reassess some of its fundamental positions. The job will be long and hard. When will we start getting about it?

BRIG. GEN. DON Z. ZIMMERMAN,
USAF (Ret.)

Mercer Island, Wash.

March Issue Revisited

Gentlemen: In your March 1967 issue, your technical slip is showing. In the picture on page 24, the dark flying machine is the British Javelin (not a Belgian F-104G)...

I hope Mr. Butz's "The Myth of Technological Stalemate" is digested throughout the government. One complaint: Let's not dismiss the Polaris weapon system so lightly. I suspect any sensor capable of seeing submarines at operating depths will have the ability to see land systems. The Air Force requirement is not to degrade a fine naval system, but to obtain a reconnaissance/strike system to ferret out and destroy mobile missile systems. If one assumes the initial nuclear exchange would be delivered almost entirely by strategic and tactical missiles, the enemy operational environment for a second strike will be significantly less sophisticated. Therefore, manned aircraft should be able to survive penetrations of the hostile environment. To the extent that strategic missiles become mobile, they will be increasingly difficult to locate as targets for other missiles. Hence, we must

have a reconnaissance/strike system that can survive the initial nuclear exchange and find the mobile missile and destroy it.

The history of Russian desire for mobility in all artillery and, indeed, the pictures of their longest artillery (missiles) in each May Day Parade offer a rare, clear picture of their operational concepts. Let's strive for what we need and not belittle the outstanding, mobile, and survivable (at least at this point in time) Polaris system.

LT. COL. JOHN R. REYNOLDS
Fort Carson, Colo.

• *You're right, of course. The dark plane is the British Javelin. One point we missed in the original caption on the photo was the phrase "background, right to left," the Belgian F-104G, the Netherlands F-104G, and the British Javelin. We just neglected to go into reverse. We're sorry that Reader Reynolds interpreted Sam Butz's comments as degrading the Polaris system as opposed to Air Force systems. In dealing with the prospective vulnerability of US missiles, it is made clear, we think, that the Air Force's hardened missiles are becoming just as vulnerable as is Polaris, albeit for somewhat different reasons.—THE EDITORS*

Gentlemen: I read with avid interest your "Southeast Asia Political-Military Chronology, 1948-1967" [compiled by Jacob Van Staaveren and Herman S. Wolk], in the March 1967 issue. I was stationed in the Southeast Asia area from April 1963 until October 1965 and was present in Vietnam when some of the events occurred.

In 1965 you list the Viet Cong attacks on Pleiku, Tuy Hoa, Nha Trang, and Qui Nhon. Yet you fail to mention the Viet Cong attack on Da Nang Air Base on July 1, 1965, which resulted in the destruction of five USAF aircraft and the damage of several others. In addition, one of the Air Police guarding the aircraft was killed by the Viet Cong. Was the omission of this attack on Da Nang Air Base an oversight on your part or was it deliberately omitted because it did not

(Continued on following page)

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result in a large number of US casualties? Radio Hanoi claimed a field day!

CAPT. EUGENE GAROVE

Seymour Johnson AFB, N. C.

• *Captain Garove is essentially correct about the events at Da Nang on July 1, 1965. The chronology was highly selective. Obviously, not all incidents were included and the authors selected only major highlights. This is not meant to downgrade the loss of life or aircraft and materiel that occurred at Da Nang and other places at other times.*—THE EDITORS

Gentlemen: Reference "The Feasibility of Fungibility" [AF/SD, March '67, pp. 97-99, in William Leavitt's "Speaking of Space"], I cannot restrain myself from a few comments.

The problem to which Dr. Carter addressed himself is a proper one. I would state it as "AFSC is being bled of its experienced officers in order to man the Vietnam effort, where these officers are not using their specialized and scarce technical and managerial skills." I submit that even if this were a true picture it is taken from too narrow a point of view.

Dr. Carter's interests lie naturally in preserving a viable R&D capability for the Air Force, but this must be done within the over-all Air Force manning structure. To elaborate, let us examine a possible outcome of his proposal to isolate the five to ten percent combat types from the non-fighting majority.

The first problem would be identifying the fighters. In order to assure the availability of an adequate number at some future date for an as-yet-undefined war, a very large pool would be required. These people would be limited in their technical and managerial training because otherwise they would become "too valuable to fight" and must be transferred to the non-fighters. Meanwhile, the nonfighters would not be trained in the arts of war for the complementary reasons. They would still be charged with developing and testing the arsenals of weapons to be used by the fighters, though. Can you picture the human relations problems such a course would engender? To say nothing of the types of weapons we would develop.

Dr. Carter's thesis is based on two wrong premises; the weapons' developers need not be fighters, and the managers cannot be properly utilized in combat. The first of these I believe I have already laid to rest. The second is wrong for the following reason: The

new techniques of systems management, logistic planning, suboptimization, linear programming, are not only applicable to the combat environment, they find their most fruitful application there.

War has always been, by its very nature, wasteful, primarily because the available information was insufficient to permit a commander to risk being niggardly in the application of his resources. The Army which can use these new techniques will find its power increased, its effectiveness augmented in direct proportion. I am myself a product of twelve years in R&D, as a test pilot, project officer, and most recently as Chief, Minuteman Weapons Division, 6555th Aerospace Test Wing, Cape Kennedy. I have a master's degree in R&D Management from the University of Southern California, where the curriculum included several courses with RAND and SDC. Now I find myself completing the F-100 RTU in preparation for my tour in Vietnam.

Frankly, I'm overjoyed! I had never hoped to get back into fighters nor have an opportunity for combat. I expect to return from Vietnam with broadened horizons, valuable command experience, and a host of new ideas with which to enhance my future usefulness in R&D.

LT. COL. WILLIAM E. HAYNES
Cocoa Beach, Fla.

Gentlemen: Re your March issue story on Maj. Bernard F. Fisher's Medal of Honor and the undoubted "conspicuous gallantry and intrepidity" that went with it, this type of rescue occurred on at least two occasions in WW II.

On March 18, 1945, Maj. Pierce McKennon, leading the 335th Fighter Squadron of the 4th Fighter Group on strafing runs of the Prenzlau Airfield, forty miles from Berlin, took flak hits in his P-51's engine, bailed out at 4,000 feet altitude, and landed in a meadow. While twenty-two P-51s orbited the meadow and strafed German troops moving into the meadow, 1st Lt. George Green of the 4th FG landed his Mustang in the meadow, made room for McKennon to take the seat of the P-51, then sat on his lap while flying the single-seater 600 miles at high altitude back across Germany, Holland, and the North Sea to their home base at Debden. Heavy weather at low altitude forced them aloft and to alternate use of the one oxygen mask because McKennon had passed

(Continued on page 14)



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out on one occasion from anoxia.

Pierce later wrote that this type of rescue had been accomplished only three times to that date during WW II, but it is recalled that Col. Francis Gabreski of the 56th Fighter Group was involved in a similar rescue. He can confirm or disaffirm [my] incomplete recollection.

It was a wild and dynamic day for both Green and McKennon, but also reflected overtones of the studied casualness that characterized such exploits during WW II, such trait being less noticeable during the Korean War and the present Vietnam War. I'm sure that Green didn't expect a CMH or a DSC for his heroism in that rescue of twenty-two years ago. I'm not certain but it appears that Green got a promotion to captain and the Arkansas "Ridge Runner," Pierce McKennon (killed in a training accident with a student pilot northeast of San Antonio, June 18, 1947), recommended him for the DFC.

Probably a reader or some air historian can supply details of the other similar rescues of WW II, or, if such occurred, of the Korean War. One reason (secondary) for my interest in the Green/McKennon exploit is that I also was out on that mission—at 24,500 feet over "Big B" in a B-17G—the largest daylight raid over Berlin of WW II, incidentally.

In spite of the above, all kudos to Maj. Bernard F. Fisher and may his good luck continue ad infinitum.

MAJ. R. H. HODGES, AFRes
Titusville, Fla.

Gentlemen: I have enjoyed reading your very timely and informative magazine each month. I would like to take exception to an article in the March issue entitled "US Tactical Aircraft in Southeast Asia."

A picture of the UH-34D helicopter was missing from your otherwise excellent pictorial presentation. The UH-34D helicopter, built by Sikorsky, has been and still is, the real workhorse of the US Marine Corps in Vietnam. They have participated in virtually every facet of helicopter operations in the I Corps sector.

Overlooking this old, reliable machine certainly did an injustice to the hundreds of crew members through which she has very proudly performed, under the most adverse conditions, and will continue to for some time to come.

MAJ. DAVID A. SPURLOCK
Arlington, Va.

• We did mention the CH-34, but just didn't have room for pictures of

all aircraft discussed.—THE EDITORS

Gentlemen: In the March issue, concerning "US Tactical Aircraft in South-east Asia," on page 126, the bottom picture on the right states that a CH-37 Mojave is lifting a Skyraider. If you look again you will see that it is lifting a T-28 Nomad, not a Skyraider.

GORDON R. DUKE
Sherman, Tex.

• We looked again—and Nomad it is.—THE EDITORS

UNIT REUNIONS

2d Air Division Association

The 2d Air Division Association of the 8th Air Force will hold its 20th annual reunion in Washington, D. C., at the Sheraton-Park Hotel on the 23d, 24th, and 25th of June. Contact

Col. Charles T. Merrill
7529 Windsor Dr.
Washington, D. C.
or
Mrs. Hathy Veynar
4915 Bristow Dr.
Annandale, Va.

19th Photo Charting Squadron, AAF

All former members of the 19th Photo Charting Squadron who are interested in a 25th anniversary reunion, to be held August 3, 4, 5, 1967, at Colorado Springs, Colo., please contact

T. T. Balon
112 Lakeside Dr.
Andover, Conn. 06232

356th Fighter Group

The reunion of the 356th Fighter Group, WW II, will be held in Albany, N. Y., on July 22-23, 1967. For further information contact

Louis W. Franzella
117 Main St.
Ravena, N. Y. 12143

469th Tactical Fighter Squadron

The first annual reunion of the 469th Tac Fighter Squadron, the "Fightin' Bulls," will be held in Oklahoma City, Okla., July 28-30. All pilots who flew 100 missions over North Vietnam while assigned to the squadron, or who were attached temporarily to the squadron to fly the F-105s, are urged to attend. Contact

Maj. Steve Sanders
1217 Bass Dr.
Enid, Okla. 73701

485th Bombardment Group

The third reunion of the 485th Bombardment Group will be held August 19 and 20, 1967, in Dayton, Ohio. For further information about this and future reunions, contact

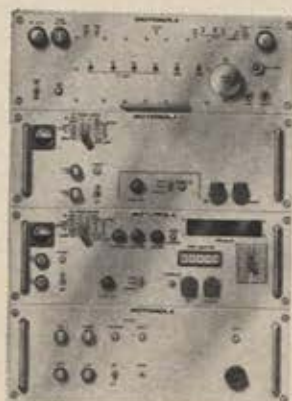
Carl P. Gigowski
344 Eola St., S. E.
Grand Rapids, Mich. 49507

557th Bomb Squadron (M)

The 557th Bomb Squadron's reunion is being held at Howard Johnson's Motor Lodge, Denver, Colo., June 16, 17, 18. Bring your families. Please let us hear even if you cannot attend. We want your correct address so we can send you the next issue of YEA BOTZ. Contact

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Government Electronics Division



AIRPOWER in the news



By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

Thinking for the Russians

WASHINGTON, D. C., MAY 16

With the Russians practicing détente by shipping MIGs to North Vietnam and bumping into our destroyers in the Sea of Japan, it shouldn't be necessary to look elsewhere for news. But it is, because this is the spring season when "sanitized" hearing transcripts start pouring down from Capitol Hill. The secret sessions on the military posture and budget, held in late February, March, and April by House and Senate committees, have been made public. First, of course, the Pentagon has the privilege of deleting whatever material it considers sensitive. There are spoken suspicions that some of this is sensitive for political reasons. That probably is less important, however, than the material that is deleted for what it tells about the state of our technology, how we have used it, and how we have stubbornly refused to use it.

Defense Secretary Robert S. McNamara at one point told Chairman George H. Mahon of the House Defense Appropriations Subcommittee that, with the exception of three items, "there is greater unanimity of opinion and support within the Department for the program and the budget that lies before you now than in any recent year."

This is the kind of statement that bruises the Secretary's credibility. While he was saying it, in early March, the word was out in Pentagon corridors that the "Joint Chiefs are seething." They were seething about the conduct of the war in Vietnam and a lot more than three other items in the Fiscal 1968 defense budget.

In his appearances on Capitol Hill, Gen. Earle G. Wheeler, Chairman of the Joint Chiefs of Staff, has been reserved, but honest. Annually, he gets the same question: Is this budget adequate for the defense and security of the United States at this time? The General made it clear that the uniformed chiefs favor deployment of an antimissile (ABM) system, development of an advanced manned strategic bomber (AMSA), a stepped-up

shipbuilding program, and more emphasis on an advanced ICBM.

The chiefs have sound military reasons for what they favor. This includes their case for the deployment of an ABM, for example, and this is the issue that stirs greatest interest. Mr. McNamara argues this way:

"Would we be safer as a result of it? I submit to you we would not be; I don't want to argue this because it sounds like an extreme position, but I think I could prove to you we would be less safe. I can also definitely prove this to you that [deleted]." He also believes "we must assume the Soviets are going to deploy ABMs all over the Soviet Union" and that it will be a highly sophisticated system. He plans to offset this by improving our offensive capability, and as a result "the Soviets will be worse off than if they had never started to deploy an ABM system in the first place."

General Wheeler had an answer to this. The Russians obviously do not agree with Mr. McNamara and neither do the Chiefs of Staff. They are worried about the "grave uncertainties" to targeting against such an enemy and believe that the risk of nuclear war will be increased:

"Should the Soviets come to believe that their ballistic missile defense, coupled with a nuclear attack on the United States, would limit damage to the Soviet Union to a level acceptable to them, whatever that level is, our forces would no longer deter. The first principle of our security would be gone."

General Wheeler also said "failure to deploy a US ABM creates a strategic imbalance both within our forces and between the United States and the Soviet forces. It could lead to Soviet and allied belief that we are interested only in the offensive, that is, a first strike, or that our technology is deficient, or that we will not pay to maintain strategic superiority."

Illustrating the benefits of ABM deployment, the JCS Chairman pointed out that the success of our effort to force Russian missiles out of Cuba relied heavily on our strategic superiority. He advanced this to 1967, re-

porting for the Chiefs of Staff that "regardless of anyone's feelings about the situation in Vietnam, we think it quite clear that we would have had even more hesitation in deploying our forces there had the strategic nuclear balance not been in our favor."

Before the House Armed Services Committee, Mr. McNamara was questioned about the technology involved in the ABM system and deferred to Dr. John S. Foster, Jr., Director of Defense Research and Engineering. There was good reason for this. A month earlier, Dr. Foster had testified on the same subject at closed hearings of the Subcommittee on Disarmament of the Senate Foreign Relations Committee. This transcript was released to the public, heavily censored, at least a couple of weeks after the House record was made available. Together, the accounts paint a new picture of our ABM effort and lend support to the Air Force Association's contention that very-high-altitude nuclear bursts may serve as a shield against incoming warheads.

The subject was discussed by our Technical Editor, J. S. Butz, Jr., in the March issue of this magazine. It also provided a root for the AFA Statement of Policy, adopted at AFA's recent San Francisco convention. That document said the current debate over an ABM system "merely scratches the surface of the technological challenge."

Dr. Foster explained some of the recent progress in the Nike-X program and disclosed for the first time that area defense, as opposed to point defense, now is feasible because of a "change in the concept of the nuclear warhead." The original Nike-X was a terminal system, using the Sprint missile to defend cities or such other selected sites as ICBM launching pads. This left it possible for an enemy to target undefended cities or to overwhelm the defense by concentrating his firepower on any selected target.

Area defense against ICBMs, Dr. Foster said, began to appear practical in the 1964-65 period. New perimeter acquisition radar (PAR) made it possible to detect and track missiles at long ranges. Then came the Spartan

missile, a long-range interceptor. He gave details:

"This interceptor has a range of over [deleted] miles, and intercepts the incoming missiles well above the atmosphere. Because of its long range the Spartan can intercept incoming missiles directed at targets several hundred miles from the Spartan battery location.

"The advance which made area defense feasible was a change in the concept of the nuclear warhead. The Spartan warhead is a high-yield nuclear warhead [deleted]." The witness gave a kill radius for the "X-rays" that a Spartan warhead would create upon detonation in space, but the figure was deleted. He was allowed to say in the record that "if there are any objects within that sphere with our explosion at the center, then we would believe that they are destroyed."

Dr. Foster described the Spartan as a 35,000-pound, three-stage missile, and he said that a comparatively few batteries could defend the whole United States.

Under examination, the research chief was asked, in effect, what can we do if the Russians are using a similar system? How can we ensure the penetration of our own offensive missiles through an "X-ray" effect? His immediate reply was that we have been working on this and "currently have in our missiles the products of the program."

The subject was brought up again before the House Armed Services Committee. Chairman L. Mendel Rivers listened with interest while Mr. McNamara predicted the Russians will set up a highly sophisticated ABM system all around their nation and that it will leave them worse off instead of better. It was clear that Mr. Rivers is convinced, along with many more expert than he, that the Russians are ahead of the United States in their knowledge of what happens when a very-high-yield weapon is exploded at high altitude. It has been estimated since 1963, when the limited test-ban treaty was under debate, that the Russians have conducted four times as many tests as the United States, and—as Editor Butz reported—they have conducted a test with a sixty-megaton weapon. Both Dr. Foster and Mr. McNamara argue that US scientists have known for years about radiation effects and have taken account of it in the design of warheads.

The witnesses cited US underground tests, the only ones we have been permitted to carry out under the treaty, and Dr. Foster said he believes they have been "adequate to provide a warhead for the Spartan missile." He did not say they have provided a warhead adequate to ensure penetration of



—Drawing by Jack Tippitt; © 1967 The New Yorker Magazine, Inc.

such weapons as the Minuteman and Polaris missiles.

It is of more than passing interest, at this point, to refer to testimony of the same witness before the Senate Foreign Relations Committee in 1963. At that time, Dr. Foster was opposing ratification of the limited nuclear test-ban treaty. He was arguing, at that time, for atmospheric testing. He held that "we can obtain a much better understanding of the situation with nuclear experiments in the atmosphere than without them."

He told the 1963 hearing that ballistic missile penetration and defense were two current problems. One solution suggested by Dr. Foster in that situation was the development of a new type of warhead. He said suitable warheads could be developed in underground tests, with his 1967 testimony indicating this has been done.

But in 1963 Dr. Foster viewed as the "starkest" of his worries the possibility that "we would not be able to proof-test our weapons systems." And that, if he were able to find a possible solution with underground testing, under the treaty "the crucial atmospheric tests would be prohibited and we would be denied the confirmation of this solution."

Against that background and our adherence to the treaty, his 1967 testimony is that we have improved warheads. And that, unlike the Russians, we have no proof they will work.

Dr. Foster pointed out in 1963 that the same story holds for our ICBM warheads. He said:

"On the opposite side of the coin, suppose that the USSR were to develop a defense such that our ability to penetrate might depend on a saturation attack. For this application, specially designed hardened warheads might be required.

"Considerable progress on such warheads can be made with underground tests, but under the treaty again the crucial atmospheric experiments to determine if the warhead actually has the necessary hardness against combined radiation and shock effects would be prohibited. We might thereby be denied assurance of such a penetration capability. The disadvantages resulting from the treaty in restricting our knowledge of site vulnerability, penetration, and defense, I believe, are very serious."

There is nothing in the 1967 testimony to indicate these conditions do not still prevail. Nor did Dr. Foster, or Mr. McNamara, say anything contrary to the Foster opinion of 1963 that "it is clear from recent Soviet tests that they appear more interested in high-yield weapons, high-yield warheads, than does the United States. They have pursued these in an aggressive manner. For that reason, I believe it is prudent to assume that the Soviets have in the area of high-yield

(Continued on following page)

technology information, knowledge and, if necessary, capability that exceeds that of the United States."

It is true that Mr. McNamara, who favors meeting the Russian ABM effort with a stronger ICBM capability, feels that our deterrent power will prevail. He believes an attack by Russia "can be prevented if it is understood by the Soviets that we possess strategic nuclear forces so powerful as to be capable of absorbing a Soviet first strike and surviving with sufficient strength to impose unacceptable damage on them. We have such power today. We must maintain it in the future, adjusting our forces to offset actual or potential changes in theirs. There is nothing we have seen in either our own or the Soviet Union's technology which would lead us to believe we cannot do this."

Then he looked behind the Iron Curtain:

"We believe the Soviet Union has the same requirement for a deterrent or 'assured destruction' force as the United States. Therefore, deployment by the United States of an ABM defense which would degrade the destruction capability of the Soviet's offensive force to an unacceptable level would lead to expansion of that force. This would leave us no better off than we were before."

Here, again, Mr. McNamara is dogmatic and does some thinking for the Russians that may be alien to their capability and intent. A British writer, John Erickson, has discussed the subject in a recent issue of *The World Today*. Mr. Erickson finds the Soviet concept is based on a combination of offensive and defensive capability and that there is no rigid insistence that escalation must be automatic. He finds the Russians are moving closer to the "flexible-response" idea, at least in part because their own deterrent position is not credible. To the Soviets, he says, total deterrence is obsolete; minimum deterrence is dangerous.

The result is more Soviet emphasis on improved quality, which is another way of saying reliance on more advanced technology. And this is manifest in the Moscow interest in the ABM, as well as improved ICBMs.

Of particular interest is the Erickson conclusion that building an ABM makes great sense to the Russians. Further, that what they have said about their ABM "focuses attention straightaway on the nature of the warhead carried by the Soviet ABM; and since the ban on nuclear tests within the atmosphere precludes airborne tests, warhead development must be based on what the Russians

learned both in their final pre-test-ban testing and on subsequent underground tests."

Erickson finds the Russians do not believe the introduction of an ABM is destabilizing. They think it will even up the balance. Further, their ABM may be a promising combination of weapon systems, and "exploitation both successful and rapid could hoist the Soviet forces on the way to that superiority, strategic superiority, which military doctrine makes mandatory."

Mr. McNamara, and the Administration, still hold some hope that Moscow will agree to a curtailment of the ABM effort. The likelihood that Russia will do so is remote.

The Price of Commonality (cont'd)

A year ago there was included in this space a rundown on the cost of the controversial F-111 aircraft program, taken from the House Defense Subcommittee transcript. It was considered essential news because of the history of this Air Force and Navy system. Known as the TFX before it had the present designation, the F-111 embodies some of Secretary McNamara's concepts, particularly his idea that a single plane can be designed from the start to serve purposes as diverse as the USAF fighter-bomber mission and flying from the deck of an aircraft carrier. There are previous examples of a Navy design adapted to the Air Force, but this is the first sent to the drawing board with this intent. The Defense Secretary's aim was economy. He argued that he could save \$1 billion and that the compromises in performance would be marginal.

Figures entered in this year's hearings show that the Air Force will have appropriated, through Fiscal 1968, a program total of \$4,417.4 million. Of this, \$1,383.6 million is for research, development, test, and evaluation and \$3,033.8 million for production. Three USAF versions involved are the F-111A, the RF-111A, and the FB-111A.

The Navy arithmetic shows a total of \$696.8 million for funding through Fiscal 1968. The Navy version is called the F-111B. For research, development, test, and evaluation the figure is \$257.7 million. Added to this presumably should be a total of \$402.3 million for work done on the Phoenix missile system. The Navy does not expect to fly an F-111B from a carrier until next year.

It was made clear in the testimony that the Phoenix missile and the F-111B go together. Admiral David L.

McDonald, Chief of Naval Operations, testified that this "is not an airplane, but an airplane and the Phoenix. It is a system. If any one part of this system goes out, unless you can correct it, you lose your system."

On the stand, both civilian Secretaries and Chiefs of USAF and the Navy expressed satisfaction with the progress of the F-111 program. However, Admiral McDonald was asked, at one point: "If you had to do it all over again, would you follow the course that the Defense Department has or would the Navy start over and design its own airplane?"

The Admiral said he was not in the Pentagon at the time and suggested he is glad of it because "if I had been around at that time, I might not be here now."

His inquisitor smiled and asked again for the answer to the question.

Did he want the answer off the record? No.

Then the Admiral said, "No, I would not have done it that way."

"What would you have done?"

"I would have designed a plane giving full consideration to the weight limitations that are imposed upon operations from an aircraft carrier."

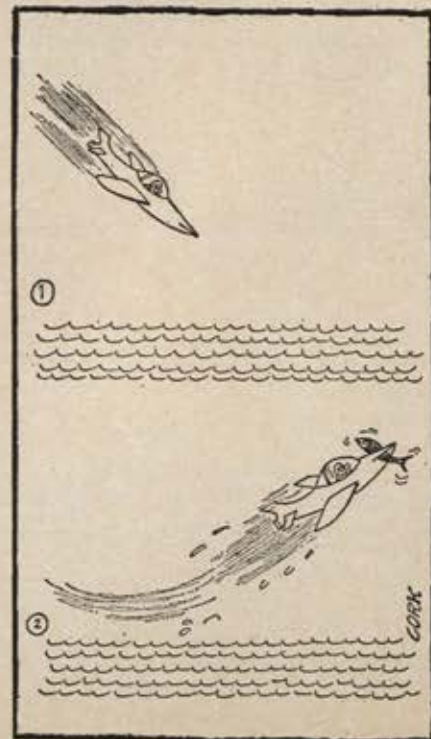
"Is this the general feeling in the Navy?"

"I could not answer that."

"I mean among your experts."

"I have been aviating myself in the Navy since 1929."

"That is good enough for me."—END





THE AEROSPACE WRITERS' WRITER...

AIR FORCE/SPACE DIGEST's Technical Editor J. S. "Sam" Butz, Jr., has won the Aviation/Space Writers Association 1967 Award for Best Writing and Reporting in Aviation/Space Magazines. This marks the eighth time in the last seven years an AF/SD editor has been honored by his peers.

Sam's winning article, "Taking the Night Away from the Viet Cong," appeared in the June 1966 issue of AIR FORCE/SPACE DIGEST.

This is not Sam's first award from AWA. In 1963 he won the Robert S. Ball Memorial Award for Best Space Writing and Reporting in Any Media.

One reason AF/SD editors are consistently chosen by their contemporaries as the aerospace writers' writers is that they go where the action is. Last year Sam spent three months in Vietnam. Senior Editors Claude Witze and Bill Leavitt also spend a lot of time in the field. Their efforts have been recognized by six of AWA's top writing awards since 1961, including the Ball Trophy to Leavitt and the Strebbig Award to Witze. It is this kind of leadership in aerospace reporting that makes AF/SD the nation's most credible publication in its field—with the world's largest aerospace circulation.

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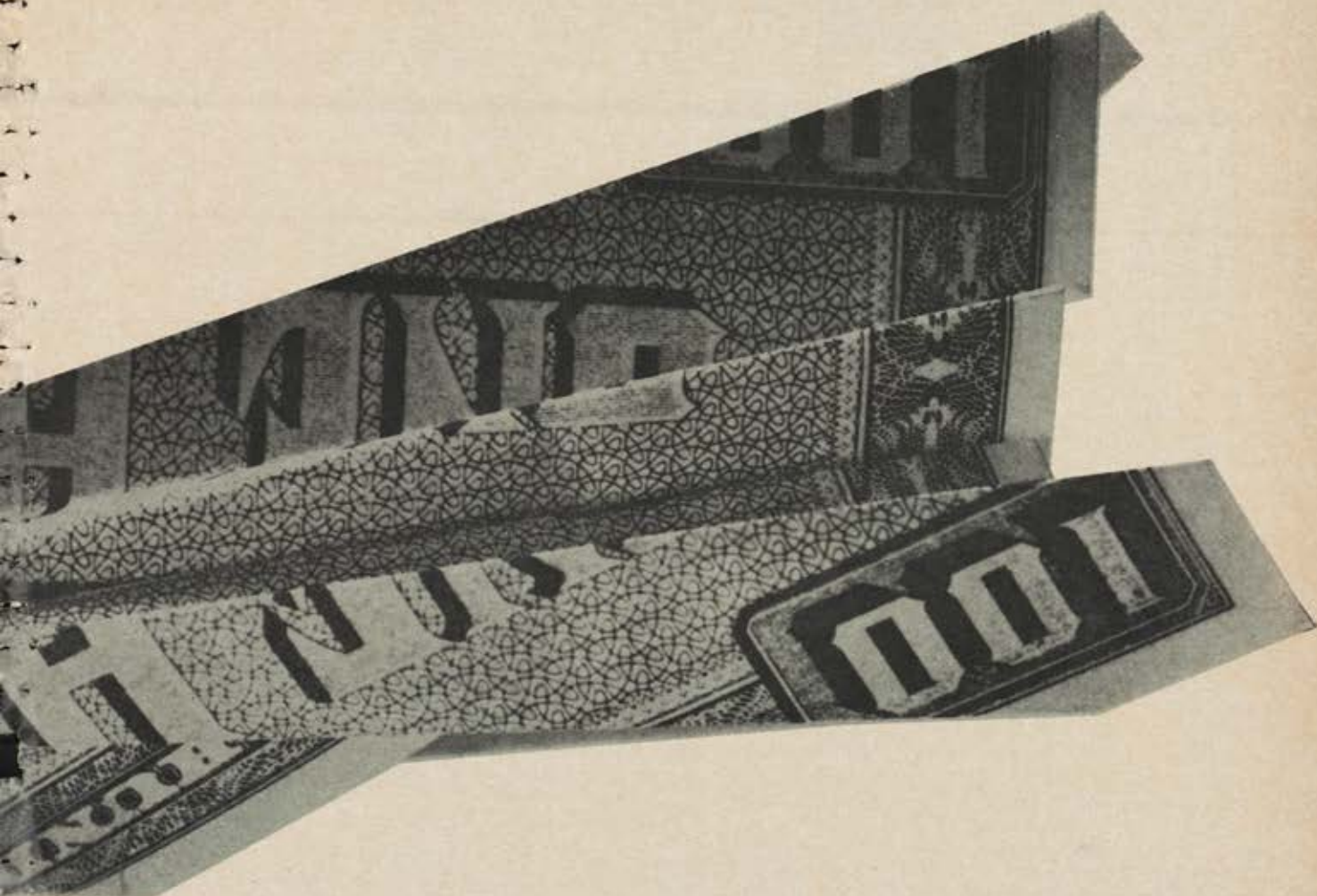


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AEROSPACE WORLD

By Allan R. Scholin

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D. C., MAY 22

The skies over North Vietnam are daily taking on more of the characteristics of Korea's famed MIG Alley, as increasing numbers of MIG-17s and -21s swarm up to meet USAF and Navy fighter-bombers attacking military and industrial targets. The step-up in the air war, forecast in this column last November, now is moving into high gear.

There are offsetting differences between conditions in Korea fifteen years ago and over North Vietnam today. One is the introduction of surface-to-air missiles into the combat equation; another is that enemy MIG bases, out of bounds beyond the Yalu in the Korean War, are today, in North Vietnam, fair game for US planes.

So far, US pilots are well ahead in air-to-air combat, though the ratio is below that scored in Korea. In nine days between May 13 and May 21, Air Force F-4 and F-105 pilots shot down twenty MIGs, bringing the US total to seventy MIGs destroyed in air combat, against twenty losses to enemy interceptors.

Col. Robin Olds, Commander of USAF's F-4-equipped 8th Tactical

Fighter Wing at Ubon, Thailand, shot down his third and fourth MIGs on May 20, leaving him only one short of becoming Vietnam's first jet ace. Colonel Olds, an ace in World War II, credited with 24½ kills over Germany, got his first MIG-21 in January and his second on May 4.

Now that North Vietnam's airfields are being bombed, will the enemy move their MIGs to sanctuary bases in China, as some opponents of airfield-bombing predict? USAF experts think it unlikely for in several ways such a move would benefit US aircrews. The range of MIGs operating from bases in mainland China or from the island of Hainan in the Tonkin Gulf would be stretched to the point where they would have little time for combat. More important, interceptors which now appear with little warning from bases close to US targets could readily be tracked as they approached the battle zone, giving US interceptors time to get in position and bombers time to hit their targets and get out.

Hanoi has apparently been able to call on its Communist allies for replacement aircraft almost as fast as their planes are destroyed in the air or

on the ground, but this could soon get tiresome as well as expensive. The USSR has available an interceptor with longer range—the SU-9 Fishpot—which might be effective from bases in China. But considering their strained relations with Red Chinese leaders, the Soviets may be reluctant to let them get their hands on the Fishpot. Another possibility is that the USSR may give North Vietnam more modern SA-3 antiaircraft missiles. But this, too, could pose an unwelcome risk, for Soviet prestige would suffer if the SA-3 proved no more effective than the SA-2 in downing US aircraft.



Reassignment of fifteen high-level Air Force officers, including six to be promoted, and retirement of four others was announced by President Johnson in mid-May. (See also "Senior Staff Changes," page 97.)

Lt. Gen. Thomas P. Gerrity was nominated for the four-star post of Commander, Air Force Logistics Command, effective August 1, succeeding Gen. K. B. Hobson, who is retiring. Replacing General Gerrity as Deputy Chief of Staff/Systems & Logistics at Hq. USAF will be Maj. Gen. Robert G. Ruegg, who moves up from Assistant DCS/S&L, with promotion to lieutenant general.

Others nominated for promotion to three-star rank are Maj. Gens. Jack J. Catton, named DCS/Programs & Requirements; Earl C. Hedlund, to become Director of the Defense Supply Agency; John C. Meyer, named Director of Operations of the Joint Staff, JCS; and John W. O'Neill, to head AFSC's Space and Missile Systems organization. General Catton has been Director of Aerospace Programs and Assistant DCS/P&R; Hedlund was Deputy Director of DSA; Meyer was Vice Director of the Joint Staff; and O'Neill commanded the Electronic



Key figures in high-level USAF reassignments are Lt. Gen. Thomas P. Gerrity, left, to be Commander of Air Force Logistics Command with four-star rank; Lt. Gen. Arthur C. Agan, center, new chief of Air Defense Command; and Maj. Gen. Robert G. Ruegg, who succeeds General Gerrity as DCS/Systems & Logistics at Hq. USAF. General Ruegg is nominated for promotion to lieutenant general.

Systems Division at Hanscom Field, Mass.

The nine lieutenant generals being reassigned are:

Arthur C. Agan, Vice Commander in Chief, USAFE, becomes Commander, ADC, upon retirement of Lt. Gen. Herbert B. Thatcher;

Benjamin O. Davis, now Chief of Staff, US Forces and UN Command in South Korea, is being named Commander of PACAF's Thirteenth AF, Clark AFB, Philippines;

Leighton I. Davis moves from Commander, National Range Division, AFSC, to Commandant, Industrial College of the Armed Forces, Ft. McNair, Washington, D. C.;

James V. Edmundson, Director of Inspection Services, OSD, goes to PACAF as Vice Commander in Chief;

Robert J. Friedman, DCS/P&R at Hq. USAF, succeeds Lt. Gen. Benjamin Davis as Chief of Staff, US Forces and UN Command in South Korea;

Jack G. Merrell, USAF Comptroller, replaces General Agan as Vice Commander in Chief, USAFE;

Theodore R. Milton, USAF Inspector General only since March, becomes USAF Comptroller;

Joseph H. Moore moves from Vice CinC, PACAF, to USAF Inspector General; and

James W. Wilson, now Commander, Thirteenth AF, is being assigned as Vice Commander, MAC.

Others retiring, in addition to Generals Hobson and Thatcher, are **Lt. Gens. Paul S. Emrick**, Chief of Staff, Pacific Command, and **Charles B. Westover**, Vice Commander, ADC.



The death of Soviet Cosmonaut Vladimir Komarov, apparently when his capsule parachute failed to deploy properly as he was returning from orbit on April 24, was the first casualty announced by the USSR in its manned space program. But according to a research expert at Stanford University's Hoover Institution, he was at least the twelve victim of Soviet space accidents.

The researcher, Julius Epstein, told the press that American authorities know of at least eleven other Soviet spacemen who were killed in launching or orbital mishaps. He said the US does not disclose such accidents because it doesn't want to embarrass the Soviets.

In one such case, Epstein said the USSR's former Premier Khrushchev announced that a Soviet cosmonaut would broadcast a message from space at the opening of the United Nations general assembly in October 1960. The message was never delivered, Epstein said, because transmissions



Direct hit is scored on railway bridge spanning Song Cau River at Bac Giang, thirty miles northeast of Hanoi, by 3,000-pound bomb dropped from the F-105 Thunderchief of Lt. Col. James L. Hughes of Santa Fe, N. M., member of USAF's 469th Tactical Fighter Squadron based at Korat, Thailand. Rail line snapped by Colonel Hughes is one of two main arteries serving Hanoi from Red China.

from the pilot ended thirty minutes after launch on October 11, 1960.

Epstein reported two occasions in May and October 1961 in which worldwide tracking stations monitored conversations from two or more cosmonauts in space, including at least one woman. These missions were never announced by the USSR, presumably because the flights ended in failure, he said.



Britain and France have once again postponed committing themselves to coproduction of a swing-wing fighter for their air forces. Their principal problem is in getting together on the

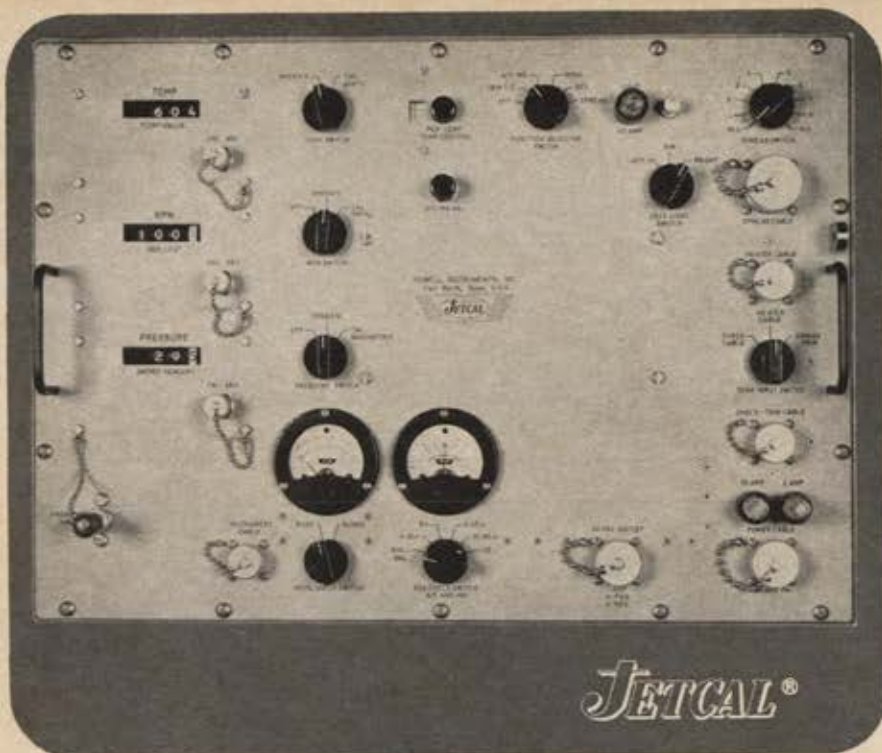
basic design of the AFVG—for Anglo-French variable geometry—plane. The British want a long-range strike aircraft to augment and eventually replace the F-111K, while the French are interested in a shorter-range interceptor. The two nations have agreed to set back the production decision to early 1969, but by continuing design and component development the plane could still be operational by the mid-1970s.

The AFVG would thus come into use in about the same time span projected for the US-West German V/STOL fighter being designed jointly by Fairchild Hiller's Republic Division
(Continued on following page)



Lt. Gen. Jimmy Doolittle, second from left, shown here with B-25 Tokyo Raider crew members in reunion at Travis AFB, Calif., received Air Force Academy's 1967 Thomas D. White Award on twenty-fifth anniversary of the historic event.

—Wide World Photos



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WORLD

in the US and by the Entwicklungsring Süd combine in Germany. US and West German defense leaders will decide this fall whether to proceed with prototype development. Meanwhile, West Germany has been invited to join in the Anglo-French project.

And, just in case Britain decides not to go along on the AFVG, the French are continuing design work on the Dassault Mirage G, an advanced V/STOL and variable-wing version of the prolific Mirage III family.



Four US Air Force F-4 squadrons will be brought home from Germany early next year, along with 30,000 Army troops, in the first major withdrawal of US combat forces from Europe since the formation of NATO.

USAF has three Phantom II wings in Germany, each with three squadrons, one of which is still in the process of converting from the F-105D Thunderchief to the F-4D. The four squadrons being returned to the US will not only be rotated periodically with the five remaining in Germany, but will rejoin the others on exercises for at least two weeks each year, thus maintaining their readiness to return to Europe on short notice. The same procedure applies to the two Army brigades being withdrawn from the 24th Division in Bavaria.

The move was dictated primarily by financial considerations. The US estimates that bringing home some estimated 35,000 military personnel, plus their dependents, will reduce the gold flow by about \$100,000,000 annually.



Two new US combat aircraft were delivered for service tests in May. They are the Army's AH-56A Cheyenne armed helicopter and the Air Force's A-37A light strike aircraft.

Lockheed-California has been awarded a contract to build ten prototypes of the AH-56A, growing out of the Army's advanced aerial fire-support system (AAFSS) program. It is expected to become operational by 1970, replacing the Bell UH-1B and the AH-1G HueyCobra, the latter billed as an interim AAFSS.

Incorporating a radically new concept, the AH-56A is a compound helicopter with stubby wings and a pusher propeller in the tail in addition to its main and tail rotors. It employs a rigid-rotor system, in which rotor blades are fixed rigidly to the mast instead of being hinged as on other

helicopters—a concept perfected by Lockheed on the joint Army-Navy XH-51 research craft. An XH-51 fitted with wings and an auxiliary jet engine flew at 272 mph, world's fastest known rotorcraft speed.

The AH-56A will carry wire-guided antitank missiles, rockets, a grenade launcher, and a belly machine gun with a 360° field of fire. Powered by a 3,400-shp General Electric T64-16 gas-turbine engine, it will cruise at 240 mph, with the ability to stop quickly to hover in midair. It employs a two-man crew—pilot, and copilot-gunner. Gross takeoff weight is just under 17,000 pounds.

The Air Force's A-37A is the first of thirty-nine being built by Cessna for Tactical Air Command, with fifty-seven A-37B models to follow. A modification of the T-37B jet trainer, it is powered by two General Electric J85-17 turbojets with 2,400 pounds thrust each. Carrying almost 5,000 pounds of weaponry within a gross takeoff weight of 12,000 pounds, it can be operated by a two- or one-man crew.



General Dynamics has been awarded a \$1.8 billion production contract for 493 of its F-111 aircraft, including 331 F-111A fighters and sixty-four FB-111 bombers for the Air Force, twenty-four F-111Bs for the Navy, twenty-four F-111Cs for the Royal Australian AF, and fifty F-111Ks for the British RAF.

The contract averages out at about \$3,660,000 per plane, but it includes only the cost of the basic airframe and



First prototype of US Army's AH-56A Cheyenne, formerly called the Advanced Aerial Fire-Support System (AAFSS), was unveiled early in May at Lockheed-California Company's Van Nuys plant. The rigid-rotor compound aircraft, designed to cruise at 240 mph, will be armed with rockets, wire-guided antitank missiles, a grenade launcher, and belly machine gun. From left in photo are Jack Real, Lockheed's AH-56A manager; Lt. Col. Woodbury Johnson, Army project officer; and Herman Salmon and Don Segner, Lockheed test pilots.

some electronic equipment. Not yet determined are costs of the engines, remaining electronic gear, and modifications, which may more than double the total cost per aircraft.

In a joint statement, Secretary of the Air Force Harold Brown and USAF Chief of Staff Gen. J. P. McConnell called the contract award "an expression of our confidence in the F-111 as a vitally needed addition to

and improvement of the operational inventory.

"The technological advances that have been achieved in the development of this aircraft, with its variable-sweep wing and afterburning turbofan engine, provide a major and far-reaching increase in the combat effectiveness of our tactical forces at any level of conflict."

(Continued on following page)

NEW BOOKS IN BRIEF

Airline Safety Is a Myth, by Capt. Vernon W. Lowell. An airline pilot's crusade for improved safety conditions in the air and on the ground. Taplinger Publishing Co., N. Y. 211 pages plus appendix. \$5.95.

Between Two Worlds, by John Hohenberg. The result of a 12,000-mile journey by a Columbia University journalism professor through seven Asian countries researching policy, press, and public opinion in Asian-American relations. When AF/SD Senior Editor Claude Witze spent six weeks in Vietnam during the summer of 1964, he was interviewed by Hohenberg and is quoted in the book. Frederick A. Praeger, N. Y. 507 pages. \$8.95.

The Bombs of Palomares, by Tad Szulc. The search for the H-bomb lost after the midair collision over the Spanish village of Palomares in January 1966 prompted this study of worldwide response to an extraordinary event. Viking Press, N. Y. 274 pages. \$6.50.

The Doom Pussy, by Elaine Shepard. The head of a yellow cat with a black eye patch, a jet plane between its teeth, and the Vietnamese legend, "I have flown into the jaws of the cat of death," are embroidered on the Doom Pussy patch. Miss Shepard writes about the airmen in Vietnam who wear this patch. Trident Press, N. Y. 300 pages. \$4.95.

Hollywood Pilot, by Don Dwiggins. From the great days of flying comes this biography of Paul Mantz, one of aviation's legendary figures. Doubleday & Co., Garden City, N. Y. 249 pages. \$6.50.

Incident at Muc Wa, by Daniel Ford. A novel about war in Vietnam. Doubleday & Co., Garden City, N. Y. 231 pages. \$4.95.

Project NERO, an interdepartmental student project in systems engineering at MIT on near earth rescue and operations. M.I.T. Press, Cambridge, Mass. 266 pages. \$7.50.

Range Instrumentation, edited by Ernest H. Ehling. A reference work for engineers in optics, photogrammetry, radar, etc. Prentice-Hall, Englewood Cliffs, N. J. 634 pages. \$16.00.

Triumphs and Tragedies in the East, 1915-1917, by Trevor Nevitt Dupuy and Włodzimierz Onaciewicz. Volume 4 in the Military History of World War I series that tells of wartime struggles on the Eastern Front. Franklin Watts, N. Y. 89 pages. \$2.95.

The World Guide to Combat Planes, Volumes I and II, compiled by William Green. A survey of the latest trends in warplane development. Doubleday & Co., Garden City, N. Y. 222 and 212 pages respectively. \$4.95 each.

—JAQUELINE A. DAVIS



First of thirty-nine Cessna A-37A attack aircraft ordered by USAF is now undergoing field tests at TAC's Air Commando Wing at England AFB, La. At gross weight of 12,000 pounds, it will carry more than 4,800 pounds of ordnance. Air Force is also buying fifty-seven A-37Bs as replacement for A-1 Skyraiders and T-28s.

Britain's P.1127 Harrier, V/STOL close-support and reconnaissance aircraft, is shown for first time in operational service camouflage. This advanced version of the Kestrel is equipped with Pegasus 6 turbofan producing 19,000 pounds of thrust, compared with 15,200-pound-thrust Pegasus 5 engine in XV-6A version furnished US under tripartite test program.



Frank W. Davis, president of General Dynamics' Fort Worth Division, in commenting on the many problems which have beset the controversial plane, reported his company is solving, or finding "compensating improvements," for every problem area.

In recent testimony before Congress, Navy leaders also commented more or less favorably on the aircraft.

Adm. David L. McDonald, Chief of Naval Operations, said "we feel better than we have in the past" about prospects for the F-111B. He said he and Secretary of the Navy Paul Nitze "believe we are getting a carrier-suitable airplane in spite of the weight,

and one that will do a job for us."

In Britain, where the Labor Government has faced continual criticism for scrapping its own TSR.2 tactical strike fighter project in favor of the F-111, Defence Secretary Denis Healey told the House of Commons the government was satisfied the F-111K would meet the RAF's requirements in range, speed, and payload. Although he acknowledged that final costs had not been determined, because of possible future modifications, he said the F-111K and Anglo-French fighter together will cost far less than the estimated expenditures for a comparable TSR.2 force.



NEWS NOTES—The first increment of Lockheed C-5A jet transports will be assigned to a MAC transitional training unit to be established at Altus AFB, Okla., USAF has announced. Altus, now a SAC base with B-52E bombers scheduled for phaseout, will be transferred to MAC in July 1969. MAC will also transfer to Altus its C-141 training unit, now at Tinker AFB, Okla.

Less than two months after issuing invitations to bid, the Air Force has awarded preliminary design contracts on its projected A-X close-support at-

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tack plane to four companies—General Dynamics, Grumman, McDonnell, and Northrop. Under terms of the contracts amounting to \$232,500 each, the companies will come up with design characteristics and estimated costs.

A fantastic—and devastating—rate of fire has been achieved in an Air Force test in which sixteen General Electric 7.62-mm Miniguns were mounted on an F-4 Phantom II, each firing at the rate of 6,000 rounds per minute. Dummies scattered over a football field sustained at least three hits each in a single pass. GE is also testing a .22-caliber Mini-minigun which fires at the rate of 11,400 rpm.

The Air Force will train 100 Marine Corps pilots a year at USAF undergraduate pilot training bases for the next three years, augmenting an annual output of 673 Marine pilots by the Naval Air Training Command. Like USAF pilot candidates, the Marines will fly thirty hours in the T-41, ninety in the T-37, and 120 in the T-38. Subsequent combat crew training will be provided by Marine operational units.

Quietly the Air Force Manned Orbiting Laboratory project to explore man's military utility in space proceeds. On May 19 the Defense Department announced that Douglas, the contractor for the laboratory section, had been awarded a \$674 million contract for tasks associated with MOL, while McDonnell, contractor for the modified Gemini capsule in which the MOL crew will ride into orbit, had received \$180 million. The two aerospace firms recently merged.

Air Marshal C. R. (Larry) Dunlop, RCAF, Deputy Commander in Chief of NORAD since August 1964, will retire on August 25 after thirty-nine years of service. He will be succeeded by Air Marshal William Ross MacBrien, Ass't Chief of Staff at SHAPE headquarters in Belgium.—END



This configuration of an Airborne Warning and Control System (AWACS) aircraft is one proposed for USAF by Boeing. Airframe is a 707-320C intercontinental jet, carrying mushroom-shaped radome and advanced electronics equipment to detect enemy bombers and control their interception.

TRADER VIC



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Call it what you will—the art of barter began with the first two cave-men, wound its way through the Forum, the Casbah, Tijuana... and into aerospace engineering. We call it "trade-offs."

The technique involved in engineering trade-offs isn't that much different from the method that used to get us one Lou Gehrig card for six Ducky Medwicks. You say you want more rpm? Will do—if you come down ten percent on the duty cycle. Reduce weight? Sure, if you'll give us a break on the flow rate. Practical men trading practical considerations in the course of attempting the near-impossible.

Scene: the office of the project engineer for advanced hydraulics at Hydro-Aire. On stage: Vic, the project engineer; Cliff, systems manager at the — company (better known as "the customer"); and Helen, Vic's secretary (better known as "legs") in an almost-mini skirt. Helen is getting something out of the lowest filing cabinet. Cliff is listening to Vic. You bet he is. Vic has the first line.

"...keep in mind that it isn't just an ordinary variable displacement hydraulic pump. The pump actually shares this ball bearing with the motor. This gives you a much more rigid and stable package with low weight, minimum torque loss..."

"Yeah, I know. But I still need a higher ankle—I mean, flow at input, for our system."

"Well, if you can give a little on the weight even though the package is already down to just a little over eight pounds, we might be able to..."

"No, no, the weight is very attractive... very, very attractive. So's the low power consumption."

"Well, something's got to give."

Something did. From the sound of it, it may have been Helen's girdle. Curtain.

We saw Helen again as we walked by the guard gate at five p.m.

"How did Vic's negotiation go this afternoon?" we asked.

"You mean the trade-offs? Went real well."

"Cliff gave in on the weight?"

"Yup. Gave a little on the power consumption, too."

"Great. What did Vic give up?"

"His dinner date. There's Cliff's car across the street. Bye now."

Like we said, practical men trading practical considerations. If you want to dicker about variable drive hydraulic pumps or other advanced hydraulic products, come on over. Forget about Helen, though. She got married last week. Congratulations, Cliff.

Submarines at Work: A report from General Dynamics

For sale: Choice 400-acre plot west of Bermuda. Lat. 32° 06'N., long. 64° 04' W. 250 fathoms down. Ideal for algae farming, fish grazing. Includes all water rights to surface and bottom mineral rights.

A farm at the bottom of the ocean?

Before this century is over, man will undoubtedly be farming, mining and manufacturing under the sea. With the world population growing and our natural resources shrinking, we will have to exploit the oceans for necessary food supplies and raw materials.

But before it happens, we must learn how to live and work in the strange and hostile marine environment.

Blue collar submarines:

A new breed of fish—the research submarine—has already begun the job of exploring and working in the depths of the ocean.

Unlike World War II submarines, which could dive to only a few hundred feet, research submarines will have to descend *thousands* of feet. And unlike bathyscaphs, which are essentially underwater elevators, research submarines move and maneuver under their own power and can perform a variety of jobs. In fact, "research" is a misnomer; they are really *working* submarines.

General Dynamics, which delivered the first submarine to the United States Navy in 1900, has already built five operational research submarines and is currently building three more. One of them, *Aluminaut*, an aluminum-hulled submarine built for Reynolds International, went mineral prospecting in 1966.

The boat searched for deposits of ore along the Blake Plateau, a section of the Continental Shelf stretching from Virginia to Florida. As *Aluminaut*

travelled along the bottom, it scooped up samples of sediment and brought them up to the surface escort ship.

Doing the impossible:

Last year, two other research submarines built by General Dynamics—*Star II* and *Asherah*—performed jobs that had not been possible before. They inspected underwater cables, diving to depths and carrying photographic equipment that puts the job well beyond the capabilities of skin divers.

A cable does not always lie undisturbed on the bottom once it has been laid. It can be dragged by fishing nets and tidal currents; abraded and strained by rocks or sunken wreckage; and corroded by salt water and chewed on by sea life.

Star II, diving to depths of 1,050 feet, inspected and took more than 3,000 still photographs of 42 miles of underwater cable.

Asherah's assignment was to inspect a six-inch power cable that ran for seven miles along the bottom of Rosario Strait in the state of Washington. Before throwing the switch that would send electricity through the cable, officials of the Bonneville Power Administration wanted to know how the cable was oriented on the bottom.

Fitted with externally mounted strobe lights and floodlights, a 35mm. still camera and a television camera, *Asherah* followed the seven miles of cable, making a complete record of it on video tape and in still photographs.

Hunting the aku:

The aku, or skipjack tuna, is one of the mainstays of Hawaii's fishing industry. The annual catch of tuna in Hawaiian waters averages 5,000 tons—largely from netting fish near the sur-

face. Some experts believe the yield could be as high as 200,000 tons a year if a key question could be answered: how deep do schools of tuna live?

In 1965, the research submarine *Asherah*, on loan to the Bureau of Commercial Fisheries, found the answer. In the course of diving to depths of 600 feet off Oahu, *Asherah's* observers discovered tuna much further down than anyone had expected. On the basis of this evidence, the Bureau outfitted a surface ship with sonar to locate and track deep-swimming schools of tuna. A General Dynamics study showed the feasibility of a research submarine fast enough and with sufficient endurance to follow oceanic fish and to discover their migratory habits and spawning and feeding grounds.

Fish talk:

Research submarines have already extended our knowledge of rock and coral formations, the marine phenomenon known as plankton, and the habits—even the conversation—of fish.

Far from being silent, fish talk a great deal. During its dives off Hawaii, *Asherah* was able to record fish conversing in their cave homes. Fish talk has an immediate application to underwater telephone communication; the "chattering" of fish can be picked up, and distort human conversation.

In the summer of 1966, General Dynamics' *Star III*, diving off Bermuda, investigated an ocean phenomenon that sometimes plays havoc with sonar listening results: the deep scattering layer. This is a layer of plankton—organic and plant particles that small fish feed on.

Research submarines have also inspected the understructures and footings of offshore oil wells. There is a

STAR III can carry its two-man crew and 1,500-pound payload, including scientific equipment, to depths of 2,000 feet for up to 12 hours. Its manipulator can perform a variety of jobs.

ASHERAH was designed and built by General Dynamics for the use of the University of Pennsylvania Museum.

ALUMINAUT, built by General Dynamics for Reynolds International, has first all-aluminum hull and is the deepest diving submarine.



large market for submersibles capable of this kind of work.

And in 1964, *Asherah*, diving in the Aegean Sea off the coast of Turkey, photographed the hull and cargo of a sunken 5th century Byzantine galley on the sea floor. The submarine accomplished in one hour what would have taken skin divers weeks to do.

Ambidexterity:

Many first-generation research submarines have a single external manipulator, or "arm," enabling them to scoop up sediment or pick up objects from the ocean floor.

Second-generation submarines now under construction at General Dynamics will have considerably greater work and repair capacities.

These new submarines will have two manipulators, rather than one—each analogous to the human arm. That is, it has shoulder, elbow and wrist joints (see illustration at right). Fully extended, the manipulators have an 82-inch reach; when not in use they can be folded back against the hull of the submarine to improve its hydrodynamic motion through the water.

Interchangeable claw "hands" will allow new submarines to pick up objects as heavy as 100 pounds—or as delicate as an egg. Clamshell scoops enable them to collect mineral and marine specimens.

But their greatest advance over present manipulators is their power tool capacity. Detachable snap-on tools will enable them to cut cables, drill holes, install or remove nuts on equipment—and do a variety of other deep-sea construction and repair work.

Manipulators may be operated independently of each other or together, depending on the nature of the job.

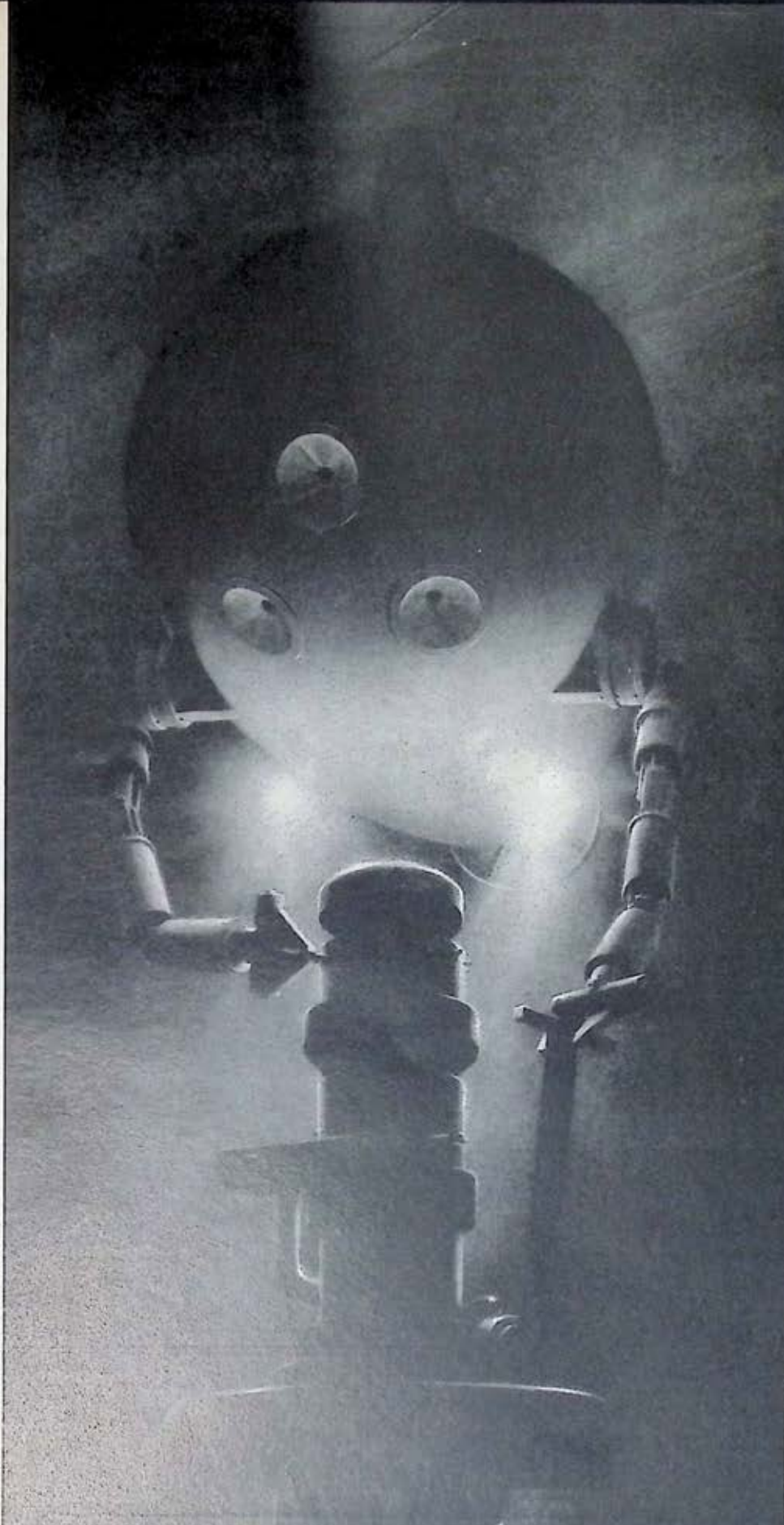
With manipulators that approach the human arm in dexterity and control—and exceed it in reach, strength and versatility—the ability of research submarines to perform meaningful work will be dramatically advanced.

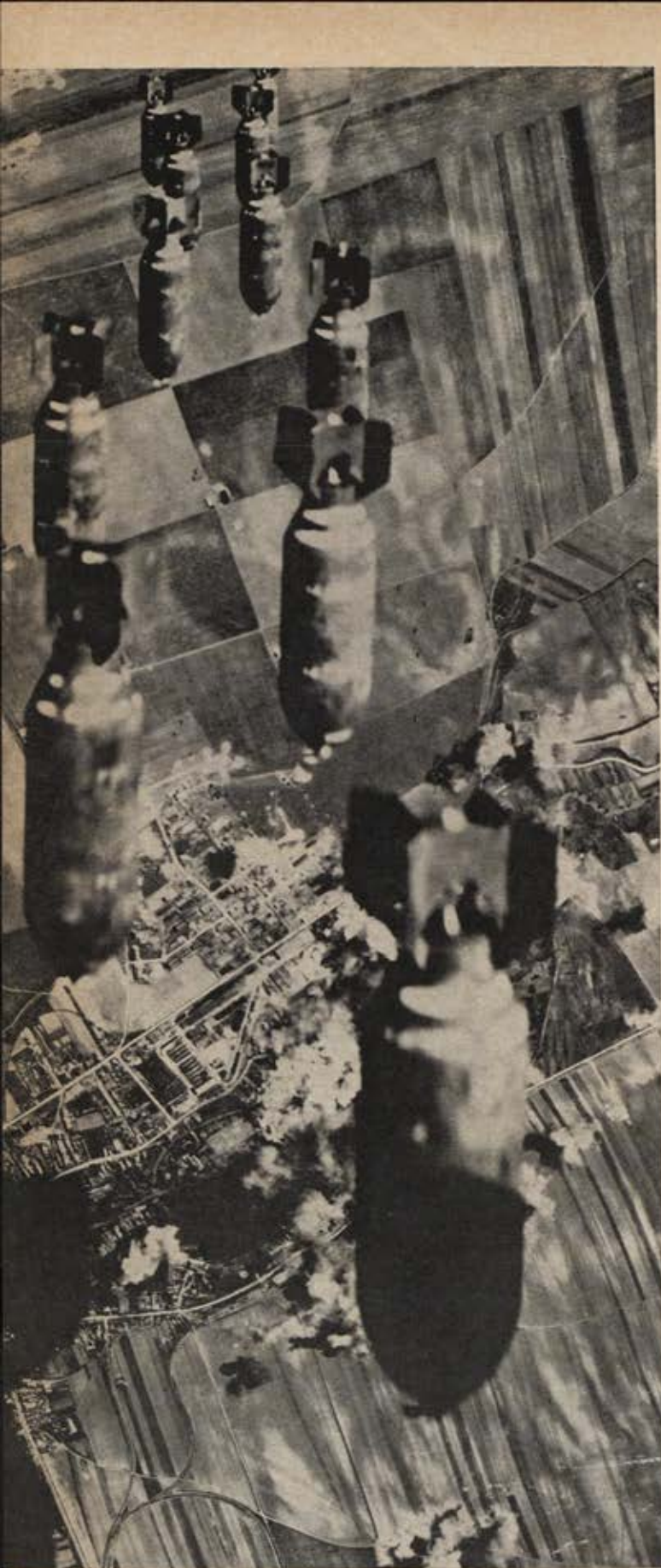
General Dynamics is a company of scientists, engineers and skilled workers whose interests cover every major field of technology, and who produce: aircraft; marine, space and missile systems; tactical support equipment; nuclear, electronic, and communications systems; machinery; building supplies; coal, gases.

Reprints of this series are available.

GENERAL DYNAMICS

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The aims of World War II were completely military and unrestrained—win, then rebuild. For this reason veterans of that war found the politically based restraints of Korea confusing and sometimes frustrating. The Vietnam War is even less "military," as we are trying to rebuild physically and politically even while we fight. We are learning much about how to cope with Communist "wars of liberation," and this author suggests that a new agency be formed to collect data on our current experiences in Vietnam and elsewhere and devote itself to developing strategy, not only on how to win such wars, but on how to prevent them . . .

The Short Run and the Long Walk

By Amrom H. Katz

As symbolized by these bombs dropping on a target in Germany during World War II, the prime objective of that war was completely destroying the enemy's resources, weapons, and will to fight so that he would unconditionally surrender. It wasn't until after the military victory that rebuilding began and political problems were considered.

EXAMINATION of World War II and the Korean and Vietnam Wars exhibits a steady decline in the "military exclusivity" of these wars. The complexities of Vietnam exceed those of previous wars, and US style seems less adapted to Vietnam than it did to World War II. The tools of analysis and discussion developed by the strategic establishment seem inapplicable to Vietnam. If indeed we recognize that "wars of national liberation" present novel problems, and that these are really "interdisciplinary wars," we need to settle down for the long pull, restructure US efforts to better anticipate combustible situations, instead of simply reacting when they get to be forest fires. Because our real interests are not embraced by the notion of and the phrase "counterinsurgency," and because the efforts covered by that inadequate term are minor activities in the several government departments, it is suggested that a new agency, the National Independence Support Agency, be constituted in the Executive Office of the President.

Wars Are Getting Less Military

The last three wars in which the US has participated are World War II, Korea, and Vietnam. They illustrate a progressive decline in the dominance of the military aspect of the war; a decline in what may be called the *military exclusivity* of the war.

World War II was certainly the latest, and probably the last, all-out war. Both sides in World War II were unrestrained in their ferocity and velocity, their use of geography, their choice of weapons—at least when they really got going. Production miracles astounded even production experts. And not only were weapons and trucks and airplanes and tanks produced—technicians and military men were also produced. Who now remembers how terribly short it was between the time when American soldiers, short of equipment and few in numbers, were using wooden rifles on maneuvers in Louisiana, and the time when they invaded the continent of Europe? And how it was but two and a half years between the first demonstration of a nuclear chain reaction (December 1942) and an atomic bomb being dropped in war on Hiroshima?

Limits on where we went, what we did, how hard we fought, and how fast we brought new weapons to the battlefield were imposed only by available energy, production ability, time, and resources. We worked and fought to the limits, and were not limited by self-imposed constraints. What seemed to be a gradual quickening of pace, an acceleration of violence, was more likely the result of accumulating experience and increasing availability of both men and the tools of war.

The nonuse of gas is, possibly, the only exception to this general point. However, recollection serves up the point that on the several occasions during World

War II when the use of gas was seriously considered, it was discarded only because of military arguments. Other weapons were "better," as judged by a kind of "cost/effectiveness" analysis, performed before that term was invented.

With the super-acuity conferred by hindsight, many have suggested that political and other long-term factors should have played a larger and continuous part during World War II. But they didn't—at least for the Allies. It was, especially for the US, a nearly 100 percent military war.

The passage of time since the end of World War II has inevitably blurred and defocused those years of desperate struggle. The dominant, permanent, and remembered fact of allied victory remains. Yet it was hard enough, the Allies found, to win that war—no matter how certain that victory seems under confident and retrospective analysis. After all, with the "answer" in hand, and the difficulties and uncertainties of the war itself resolved, one can afford to wonder why so little attention seems to have been given during the course of the war to latent and looming long-range postwar problems.

There are many explanations, reasons, or excuses. The great difficulties, the numerous problems, the inordinate complexity of the war itself absorbed priorities, emotions, and energy—and forced both vision and attention to concentrate on matters at hand. Further, the United States, though a major partner in the alliance and a major participant in the war, had little experience, and even less taste, for the kind of politics whose absence during World War II seems more conspicuous and important now than it appeared then. Additionally, the United States had only recently discarded its isolationist blinders. Unaccustomed to and inexperienced in its new role, it was willingly foisting off part of its hopes and responsibilities on to the just-born United Nations organization, whose structures and powers, for substantive problems, proved inadequate and resistant to forced feeding.

Such long-term intrawar considerations (planning for an indefinite and lengthy period of worldwide involvement and accompanying the plans with matching actions) would make sense only if the United States consciously intended to become and to remain an active participant on the world scene. Such uncongenial plans would be unnecessary if the United States intended only to fight, win, and, repeating an earlier withdrawal, disengage from continued and indefinite responsibility and response. In addition, and probably decisive, was the notion that we would get to the other problems in due course. The logic of first things first was hard to refute—and few were trying.

Many military men serving in Korea (which started less than five years after V-J Day—the end of World War II) looked back to their participation in World

(Continued on following page)

The author, Amrom H. Katz, a senior staff member of the RAND Corporation, is an articulate and widely recognized expert on such subjects as arms control and reconnaissance. Before joining RAND in 1954 he was chief physicist of the Aerial Reconnaissance Laboratory, Wright Air Development Center, Wright-Patterson AFB, Ohio. This article is from a paper he presented at the Wingspread Symposium on Southeast Asia held by the Asia Society, the University of Chicago, and the Johnson Foundation. Views in this paper are those of the author. They should not be interpreted as reflecting the views of the RAND Corporation or the official opinion or policy of any of its governmental or private research sponsors.

THE SHORT RUN AND THE LONG WALK

War II and were puzzled by the operative restraints in Korea. Many constraints were tacit on both sides; others were one-sided. We didn't go everywhere we could, and we didn't use every weapon we had. This is how it looked to our military, and this is how it was. The reasons were defensible, but to many it was, and remained, an uncongenial "puzzlement."

Vietnam—current phase—started about ten years after Korea. One of the many anomalies in Vietnam is that no one can accurately state when "it started." In the first place, there is only sparse consensus about what "it" is. Do we mean the early Vietnamese struggle against the French before the beginning of World War II, or the fight against the French after World War II? Or the post-1954 phase? Which?

A recent personal experience highlights the point. In talking to a senior US military officer in Vietnam, the writer suggested that "part of the political disquiet and unease in the United States [about Vietnam] derives from a feeling that we've been there too long. Some will argue that we've been there since 1954; others, disputing this date, claim we've really been there only since 1961." The General interrupted, saying: "We [my division] didn't get here till the late summer of 1965, and we're doing very well. 1954, or 1961, as starting dates mean nothing. Measured against a starting time of late 1965 we've done magnificently." He could not be faulted; he was certainly right, but so were those who were concerned with 1954 and 1961.

Of course, each of those who opted for the different "starting" dates meant something different. And truly the nature, extent, and commitment of the summer of 1965 was massive enough to qualify as a qualitatively different and significant milestone.

This comment illuminates a related point. Whether one is a student or a statesman, it is convenient to be able to answer the question, "When did the war start?" For the former, if he were asked about Korea, he can answer, "On June 25, 1950, at 0400, the North Koreans crossed the line with shot and shell and

flag and bugle." For the statesman, the sharpness of the date and time of Korea and the galvanic reactions produced made the aggression very noticeable, and this in turn made for prompt response.

The techniques of gradual aggression have only compounded the as-yet-unsolved problem of defining aggression, a problem with which the UN has been concerned. The UN grappled with this problem for a long time, but completely failed to solve it, and this topic has now lain abandoned for years.

Although the waging of war has not been eliminated from international relations, declaring war does seem to have gone out of style. It appears that the declaration of war by the Soviet Union against Japan, a couple of days after the atomic bomb was dropped on Hiroshima on August 6, 1945, was the latest example. Since the formation of the United Nations, there has been no declaration of war in the world. India-Goa, India-China, Indonesia-Malaysia, UAR-Israel, Sinai, Korea, Greece—these are but a small sample of the many post-1945 conditions and states of war. All were fleshed out by the full apparatus, personnel, and consequences of war—without an accompanying preliminary declaration of war that would have tidied up the records. Declaration of war as a classic prologue to war itself seems to have passed from the scene without much notice—or effect, either.

Declaring war permits—and encourages—the nation's leaders to mobilize and channel resources and opinion, to rearrange priorities, and to quiet opposition—among other things. But a war that is formally declared (at least in the examples furnished by the past; the future holds no referable examples) usually requires formal conclusion. A declared war can't just fade away. Declaring war in the present case would add complications and inconvenience to all concerned, severely restricting possible modes of settlement.

It came with considerable shock to the writer to discover many US military men in Vietnam who were not yet born when World War II started. To them, World War II is for and from the



In the Korean War the decline of the purely "military" war was evident. The US strove to learn how to build a nation while fighting aggression. However, there was still a definite battleline and recognized armies faced each other.



In Vietnam, the evolution of the parallel approach to war has reached its height. We must simultaneously fight, teach, and build—physically and politically. Tactical airlift must carry cows and pamphlets as well as troops.

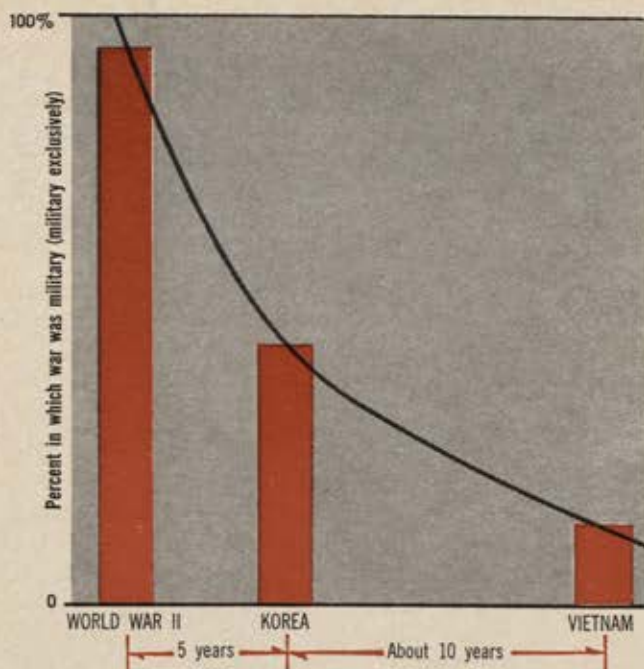


FIG. 1—THE DECLINE IN THE MILITARY EXCLUSIVITY OF THE LAST THREE WARS

To the military men, World War II constituted the "good old days." Then our fighting men could, and did, go all-out to "get the job done." Korea, five years later, posed different problems and required different solutions. Today in Vietnam, political considerations are paramount.

history books. Some of this group remember Korea, albeit dimly. Of course, there are American fighting men in Vietnam who fought in World War II and Korea—and US armed forces remain in Korea today. But as the fighting men in Korea, puzzled by restraints and constraints on operations, looked back to World War II—without enjoyment and glorification—as the "good old days," so too does the fighting man in Vietnam look back at Korea. (See Fig. 1.)

Why? Perhaps the most conspicuous difference is that Korea had what is completely missing in Vietnam—a *front line*. It is almost impossible to draw a map of Vietnam which shows who's who and what's whose. The map pulsates from day to night, the lines aren't firm, and the map is speckled. Further, meanings of the map shadings aren't unequivocal. When there is a genuine moving front line as in World War II and Korea, it is relatively simple to tell how one's doing.

The front line is not the only thing missing from the military landscape. In Korea (and of course in World War II), the landscape featured many enemy military *objets d'art* such as tanks, trucks, and artillery, and they cooperated with our reconnaissance efforts, both by standing still long enough to be photographed, and by not moving very far away by the time response was mounted. Not so in South Vietnam. There the Viet Cong make very difficult reconnaissance targets.

And Vietnam sees the full flowering of complicated and numerous "rules of engagement"—the description of the conditions under which firepower can be employed. The restrictions and the coordinating and verification processes employed to tell friend from

foe are necessary, but make difficulties. Not all military men—on either side—wear uniforms. That this makes difficulties and is not "fair" accounts for most of the reason that it is so. Further, and in addition to the formal military forces in Vietnam, there are several types of friendly paramilitary forces under control of the province chiefs. The Viet Cong do not go out of their way to make themselves conspicuous. Their presence is felt, but their visibility is low. Identification problems add to other complexities. In sum, the military part of the war in Vietnam is novel to our recent and available experience and is extremely difficult.

The Statistical Substitute for a Front Line

In the absence of a front line, we are left with an avalanche of statistics—"incidents," target destruction, defections, weapons lost and captured, kill ratios. And the statistical "front line," constructed from and balanced on these statistics, is a poor and unconvincing substitute for a real front line. But it's the only substitute we have, and in the absence of either conspicuous and overwhelming defeat or victory, the equivocality of the statistical indices accounts for much of the travail and argument about the war.

In late August 1950, two months after the North Koreans crossed the 38th parallel, when the UN forces were confined to the Pusan perimeter, no statistical presentation could have outweighed or outshouted the fact that we were losing and were being shoved back into the sea, off the Korean peninsula. The North Koreans knew how they were doing, they knew exactly how we were doing, where we were, and which way we were moving. And we knew and shared the same data about them.

No statistical potpourri of data, no matter how well presented, would have convinced anyone, on either side, of a conclusion opposite to the one that was accurately and vividly portrayed on the map.

And when, after the stunning success of the Inchon invasion, the direction of movement of the front line reversed, both sides again knew and agreed on what was happening.

The *de facto* agreement by both sides on the position of the front line and the direction of its movement finds no ready parallel in Vietnam. Of course, the front line doesn't exist in Vietnam, but more important, and directly relevant, is that there is no a priori, tacit, or *de facto* agreement between the antagonists on what are the relevant statistics, data, indicators, or measures of progress. Simply put, Hanoi likely doesn't use the same data that Washington or Saigon do. Hanoi has its own data, and evaluates them via its own politico-military calculus. This point requires further, extensive, and detailed development.

Vietnam: A Mismatch to US Style

The number and magnitude of problems that the US has faced since the end of World War II is truly
(Continued on following page)

formidable: for example, the development, deployment, and understanding of strategic weapons, the Korean War, the Berlin Blockade, the Cuba confrontation.

Many other problems of major importance could be listed as well.

Yet Vietnam, perhaps because it has proved more difficult for the US than any of the above examples, serves better than any other single or continuing event since World War II to focus on and to illuminate questions and problems posed by:

- The US role, responsibilities, and responses in the world arena;
- The likely character of future aggressions;
- The multifaceted character of Communist revolutionary warfare;
- The Sino-Soviet split;
- Arguments about morality, intervention, isolationism.

The American responses to Korea, to the Berlin Blockade, to the Cuba confrontation, and the others, although different from each other, were straightforward. The problems were either soluble or reduced to manageable proportions by congenial and understood US techniques and style.

Interdisciplinary War

In former wars the American style was to do things serially. First we fought—and the War Department (now the DoD) was predominant. When the fighting ended, the next job was making peace, and the State Department was predominant. And when peace was established, we'd next go in and rebuild the place—the job of an agency like ECA, or now AID, the Agency for International Development.

But in Vietnam the luxury of the serial solution is unavailable. The job there is to beat the Viet Cong militarily, create the conditions that would permit and enhance government stability and viability, pacify and secure the countryside, and win the political and psychological war for the hearts, minds, and votes of the peasants while teaching them how to raise pigs and how to use fertilizer, to cope with and satisfy legitimate aspirations and needs of civilian, religious, political factors, student groups, and refugees. In short, the job is to do in parallel and *simultaneously*, all the tasks and more which formerly we did serially (see Fig. 2). We have not been conspicuously successful.

It is widely appreciated, although needing constant restatement, that the word "win," as used in discussions about Vietnam, does not and cannot have its classic meaning. "Win" in Vietnam, for us, means "favorable outcome." However, as an example of the numerous asymmetries besetting the Vietnam problem, "lose" more nearly retains its classic meaning. Another asymmetry is found in the generally understood notion that military success, though necessary, and hence indispensable to a "win" (however non-classic), is not sufficient in and of itself to "win," whereas military failure by the government of Viet-

nam and the free world forces assisting it is sufficient to guarantee loss.

We are involved in an interdisciplinary war. Military success is necessary; without it, success on the political, psychological, economic, and social fronts will be impossible. But military success alone is insufficient. This dilemma, and a persistent failure by many to think this through—that what is necessary (military success) is insufficient—accounts for much current domestic argument, vexation, unease, non-understanding, and misunderstanding about Vietnam.

Where Are the Strategists?

The years since World War II have seen the emergence in the US of a sizable, vocal, and by now well-known group of civilian strategists located in non-profit corporations, university institutes, and government. They constitute a recognizable and influential strategic establishment. They have addressed the problems of thermonuclear war, deterrence, and defense; they have invented tools of analysis and have debated, argued, written. They have constructed and promoted strategic theories. *Almost without exception, they have had nothing to say, and by and large, have said nothing about Vietnam, counterinsurgency, and wars of national liberation. Why?*

There are many reasons. Detailed and more complete exploration of the failure of our "official" strategists, fascinating as it may be, lies off the axis of

The serial approach: former US style



The requirements of interdisciplinary war: doing everything simultaneously

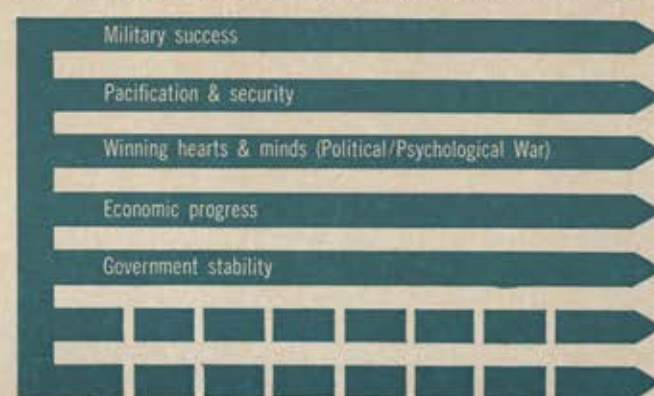


FIG. 2—CONTRASTS IN STYLES

Top of chart illustrates how the US used to wage war. We used to say, "First things first"—one step at a time. We won the war and then worried about the peace. In today's different world we are learning to apply a parallel approach, fighting, stabilizing, and rebuilding all at once.

this paper. But at least two points need making. First, expertise on thermonuclear war is continuously earned by those who claim credit for preventing thermonuclear war. The expert, in this case, is one who so behaves himself as to preclude his obtaining experience. This notion lies behind the following (only partly tongue-in-cheek) definition of deterrence:

Deterrence is threatening to do something to someone else if he does something to you, so that when he doesn't do it to you, you say "he's deterred," whereas he may never have had it in mind in the first place.

Thus, the condition of deterrence is fuzzy while it's going on, but the failure of deterrence would be clear and conspicuous.

Furthermore, when two decades ago the problem of nuclear war began to be addressed, everyone got off the starting blocks at the same time. Who had experience? *No one*. The problems addressed were those amenable to analysis and discussion, and the race went to those whose logic, tongue, and pen were fastest.

One should hesitate long and hard before proposing solutions to a real problem, where others did get off the starting blocks early, where others have had relevant experiences, and where the problem requires more and different tools, data, and insights than can be supplied only by logic, wit, and the standard tool kit of the strategist.

Real war does many things—and Vietnam is a complex furnace that can reduce to ashes fine theories invented elsewhere and not grounded in relevant experience.

Despite these cautions, it is easy and safe to predict that the massive ongoing fact of Vietnam, institutional priorities, concern with future problems, and the continuous embarrassment of silence, will pull the strategic establishment into this problem.

Systems analysis, operations analysis, model building, optimization, cost/effectiveness, and other tools of strategic analysis—so far are, by and large, inapplicable to the Vietnam type of problem. This comment, of course, does not argue against the relevance and application of operations-analysis techniques to what, in the context of the war as a whole, are relatively minor problems.

To "optimize"—in systems-analysis usage—means to choose the best among several choices—and the choices have to be solutions. But first we need a solution. After several inefficient, expensive solutions are found, these tools—and practitioners—are useful and can be valuable. But the tools are tools of choice and discussion, not discovery or invention. *We are not yet at that second stage in Vietnam.*

We have been confronted with the possibility of an inefficient, expensive loss. Certainly the first order of business is not to construct an efficient, inexpensive loss. The adjectives are regrettable, but tolerable. The noun is not.

First we must find out how to convert Vietnam into an inefficient, expensive win. Later we may be per-

mitted to use the second-order tools of the analyst to save money and improve efficiency. First we need the invention. And we do not mean an item of military hardware.

Yet there are people—quiet, unorganized, known mainly to insiders—who are "good" at this kind of war as demonstrated not by eloquence but by performance charts. They are, by and large, not part of the regular establishment, and so far the structure of the US government and the style of its operations seem ill-suited to using such people. This point was made with elegance and perception by an unidentified author writing in *The Reporter* (January 13, 1966):

... Within a week, I know many Americans who are involved. Fanatics, mavericks, losers, non-team-players, fluent speakers of Vietnamese, old Vietnam hands who have hung on or gotten back (despite the warnings of the "career management" specialists in their bureaucracies) or have found a place on their own that keeps them in Vietnam. They are mostly distrusted or handled with great reserve by their organizations, because they care too much, because they fight the problem, because they are arrogant and contemptuous of the majority of uninvolved, not very highly motivated Americans who necessarily fill the ranks. More and more I come to suspect that these men are essential; that we simply cannot succeed without them. Which means that the system must somehow come to adapt to them, to learn to find them and place them and keep them and bear up to them. The system, as yet, is not geared to do that.

Reorganization and Refocus of US Resources

Let's see what the US can do to reshape itself to better cope with such wars. US performance in Vietnam must improve, even were Vietnam a one-time aberration and discontinuity, instead of a prototype and herald of the future. Political geologists studying and charting the massive and ongoing Sino-Soviet rift have found many abrasive edges, strange formations, chasms, and fault-lines. However virulent and noisy may be the overt parts of the dialogue between the principals, and between their surrogates, stand-ins and proxies in the Communist world, we had better not forget that they continue to agree on many more important matters than they disagree on. We need to recognize and remember that there is no Sino-Soviet dispute on the importance, the justification, and the necessity of "wars of national liberation"; the differences between the Soviet Union and Communist China, with respect to this important problem, lie mainly in the evaluation of risks attendant on tempting the full weight of Western power.

Nikita Khrushchev has been retired. The doctrinal and operational differences there are between him and his successors with respect to domestic policies do not extend to the Soviet view of (to repeat *their*)

(Continued on following page)

preemptive euphemism) wars of national liberation. That portion of Khrushchev's oft-quoted speech of January 6, 1961, dealing with wars of national liberation (and he used Vietnam as an example) still stands as working doctrine.

Briefly, the Soviets argued that nuclear war is too dangerous for all concerned (and we agree)—further, they believe that high-level conventional war (such as a large-scale nonnuclear war in Europe) is also too dangerous because it might erode into nuclear war. But wars of national liberation—that's another matter. To them, these are "just" wars, and are safe.

We had better settle down for the long pull, and recognize that new problems loom, requiring new approaches, new solutions.

Our perception about Communist-style wars of national liberation contains a paradox: On the one hand, such wars are low-level. They are slow-paced, seemingly less consequential than the larger wars we know about and have prepared for. However, the admixture of almost equal military, political, psychological, and economic components makes the nonorthodox war extraordinarily complex and more complicated than larger-scale conventional war.

There is no suggestion or implication here that the US either could or should respond to every situation over the entire world. Neither is it valid to argue that because we can't or won't respond to *all* situations, we should therefore refrain from responding to *any*.

We cannot cope with the new problems by traditional and orthodox techniques. To many old hands and to many beginning students of these new problems, the organization of US effort to anticipate, detect, identify, and respond to combustible situations seems ineffective and insufficient. Clearly there are enough resources, but they need focusing and correlation.

The phrase "counterinsurgency" (and its common abbreviation: COIN) conveys too much of a reactive, defensive, *status quo* approach. It should be excised from our vocabulary before it finds its way into the dictionary. What is needed is a concept, attitude, and program which does not exclude, in its title, possible support of insurgents in some future situation. We need to support freedom and independence, not just "counter" someone else's initiatives.

Further, the several activities now lumped under the umbrella of "counterinsurgency" are minor specialties within the various concerned military and civilian agencies.

Smooth, interdisciplinary effort is not the result of a simple sum of the separate efforts. Coordination is not integration. As noted earlier, many of the people who have had useful, insightful experiences in the prominent post-World War II insurgencies do not find understanding, continuity, major activities, and career opportunities in the standard government agencies. This is not to say that, by now, Vietnam is not exceedingly high on everyone's problem and action list. The bureaucratic version of the universal law of gravitation explains why all agencies are strongly attracted to programs high on national priorities, espe-

cially if the President exhibits continuing high personal interest. Thus, in 1957, when space "hit," there was a frantic, unseemly scrambling by departments, agencies, and bureaus to get into orbit. Prestige, control, jurisdiction, and money—all were up for grabs. More recently, the establishment and rise to prominence of the Special Warfare School at Fort Bragg (since renamed the John F. Kennedy Center for Special Warfare) was a direct reflection of and response to the interest of President Kennedy. Under similar impetus, the Air Force created a matching organization, the Special Air Warfare Center in Florida.

The organization of the Atomic Energy Commission (AEC) in 1946, National Aeronautics and Space Administration (NASA) in 1958, and Arms Control and Disarmament Agency (ACDA) in 1961 were responses to new problems. These organizations are not the respective and exclusive proprietors of atomic energy, space, and arms control and disarmament, but when one visits these agencies, he knows what the main business of each is.

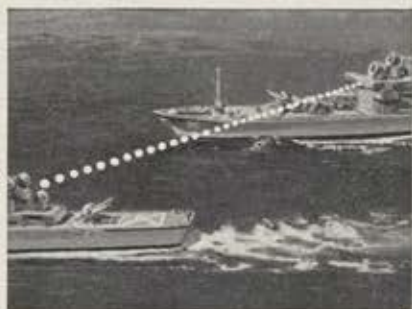
By now it is clear that coping with "wars of national liberation" is at least as difficult, serious, and important as these other subjects.

This suggests that a new agency devoted to these new problems on a full-time basis needs to be established. The title of the organization should reflect the earlier comment about counterinsurgency; that word should be dropped. A suggested name for such an organization could be the National Independence Support Agency (NISA). It should probably be in the Executive Office of the President. The agency need not be large, but should be big enough to make effective use of the talented, dedicated men who now find no useful continuous career; it would be a place where the interdisciplinary nature of the problem is recognized by using all the various skills and techniques.

Above all, properly established, it would let everyone know that we are taking the problem seriously, and are indeed settling down for the long pull. And this has a value of itself. Hopefully we can do fire prevention as well as fire-fighting. The suggestion that another agency is needed does not come lightly or quickly from this old bureaucrat; nor is it expected that NISA could be useful for Vietnam. Vietnam is a forest fire, barely under control. The new agency need not start out with operational responsibilities, though this door need not be tightly or permanently closed.

NISA would be the focus of US efforts to collect data on current experiences, to retrieve—before it is too late—data from past experiences. It could and should conduct and sponsor research in this field. The US continues to pay heavily in blood, treasure, prestige, and credibility for its participation in Vietnam. It would be cruel and wasteful not to learn how to do better or differently. Costly experiences and events do not automatically leave their lessons; passage of time leaves only bitterness, war stories, and anecdotes. We certainly have more to learn than that.—END

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The C-124 Globemasters and the Air Force Reservists who fly them are part of the backbone of the Vietnam War structure. Leaving their homes and civilian jobs, Reservists hedgehop across the Pacific carrying tons of cargo that keep our troops supplied. Here is an account of a typical citizen-airman's mission to Da Nang and back . . .

A WEEKEND WARRIOR'S VIETNAM DIARY

By Grover C. Tate, Jr.

The author, a native of North Carolina, was on active duty in both World War II and Korea. Now a member of the 728th Military Airlift Squadron, March AFB, Calif., he is a combination public-relations representative and flight-crew member on the F-111 Flight Test Program for General Dynamics in California.



NOT AN unusual sign when it's on the desk of a military man or a newsman or a government official, but a strange sight on the desk of an Anaheim accountant or in the office of a junior high school band instructor. But ridiculous as it may seem, this sort of thing is happening with increasing regularity throughout the United States when such a mixed bag as a grocery salesman, a policeman, a car salesman, a blackjack dealer, an electronics engineer, a forest ranger, a commercial photographer, and a district attorney team up to fly an airlift mission to Vietnam. These men change from the clothing of their regular profession to Air Force blue and take on their second identities as pilots, navigators, flight engineers, or loadmasters.

These split-profession airmen assemble, get their orders and briefings, load their cargo, and become a

vital cog in the giant machinery of the Military Airlift Command. They are part of the Air Force Reserve, which last year delivered 25,706 tons of cargo, transported 108,870 passengers, and, during the airline strike, carried an additional 122,863 military passengers.

With the change of costume come many other changes—some loud and noticeable, others almost imperceptible. The sudden switch from the peace and plenty of home to war-ravaged misery is startling and can be unsettling. Changing from such simple aggravations as filling out a tax form to suddenly having to avoid a burst of ground fire during final approach demands some getting used to. So, even more, does looking over a casualty list in your morning paper one day and, a few days later, finding yourself loading coffins for the last sad journey home.

These cargo-passenger missions in C-124 aircraft are not particularly spectacular nor do they command the attention of the news media as do the fighter and bomber strikes. Globemaster missions are long, slow, grinding affairs, mostly dull and routine. But without them the combat tasks would be impossible, for the cargo craft are the supply link between originator and user. The big lumbering aircraft look clumsy alongside the sleek sweptwing fighters. As they taxi between the rows of B-52s, magnificent in their war dress of black, the C-124s look like refugees from a long-ago war. They're not esthetically impressive, these Globemasters, but they are part of the backbone of the war structure. And to those of us who fly them, they are faithful, dependable machines doing

an excellent job, and they have a special beauty of their own.

What's a typical Air Force Reserve mission from the States to Da Nang like? Perhaps these excerpts from a diary of a recent such trip will be enlightening.

Thursday, 23 Feb

Signed "Leave of Absence" papers, "Without Pay" X'd in.

Made peace with wife and children. Gave wife copy of orders, approximate itinerary, and hoped-for date of return. Went over economic matters and made list of goodies to be brought home.

Packed, departed for March AFB, Calif.

Drove 102 miles to March, checked in BOQ, called it a day.

Friday, 24 Feb

Had breakfast at snack bar, reported to briefing room.

Crew for the trip:

Pilots—FAA controller, school teacher, casino dealer.

Navigators—Civil engineer, public-relations representative.

Flight Engineers—Regular AF adviser, auto salesman.

Loadmasters—Commercial photographer, laboratory technician.

Briefed on all aspects of mission.

Transported by bus to Norton AFB where aircraft was loaded.

Preflighted aircraft, made flight plan, filed, and taxied out for departure.

No. 3 prop would not control during takeoff. Aborted, returned to flight line.

Made numerous trips to snack bar for coffee, doughnuts, etc. Mostly, sat on ramp and read while troubleshooting was done on prop.

Prop fixed—next takeoff attempt was successful. Eight hours and forty minutes since starting the day.

Split nav duties with other nav. After eleven hours, thirty-five minutes, touched down at Hickam AFB, Honolulu. Debriefed maintenance and weather, had bag of popcorn and some orange pop, went to bed. Day was twenty-one hours and twenty minutes long.

Saturday, 25 Feb

Cleaned up, had breakfast. Read morning paper. Went back to bed.

Alerted to get up and get ready. Bus to Ops, planned flight, had hamburger and milk shake at snack bar. Stocked up on in-flight rations—peanut butter and crackers. Preflighted. Departed lovely Hawaii for Wake Island.

Nine hours and fifty minutes later arrived at Wake. Had another breakfast.

Real change started here. Breakfast eggs were cold storage—taste much different from fresh eggs. Remembered powdered eggs of past war.

Had crossed International Date Line so yesterday was now today. When to go to bed and when to get up becoming confusing.



Between flights to Southeast Asia and elsewhere, Capt. Fred Birch, C-124 pilot with the Air Force Reserve's 452d Military Airlift Wing, March AFB, Calif., is a music director for the Corona, Calif., junior high school band.



Another Reservist whose civilian job is far removed from his military specialty is Maj. Lyle Murkins, also a Globemaster pilot with the 452d. In civilian life he is an accountant with the US Post Office branch in Ontario, Calif.

Went to bed—only a fifteen-hour day.

Second Saturday, 25 Feb

Got up ahead of alert. Ate lunch, wandered beaches still strewn with debris of WW II. Alerted. Took off for Kadena AFB, Okinawa.

Flight to Kadena took twelve hours, five minutes. Quarters not available on the base so we were bussed

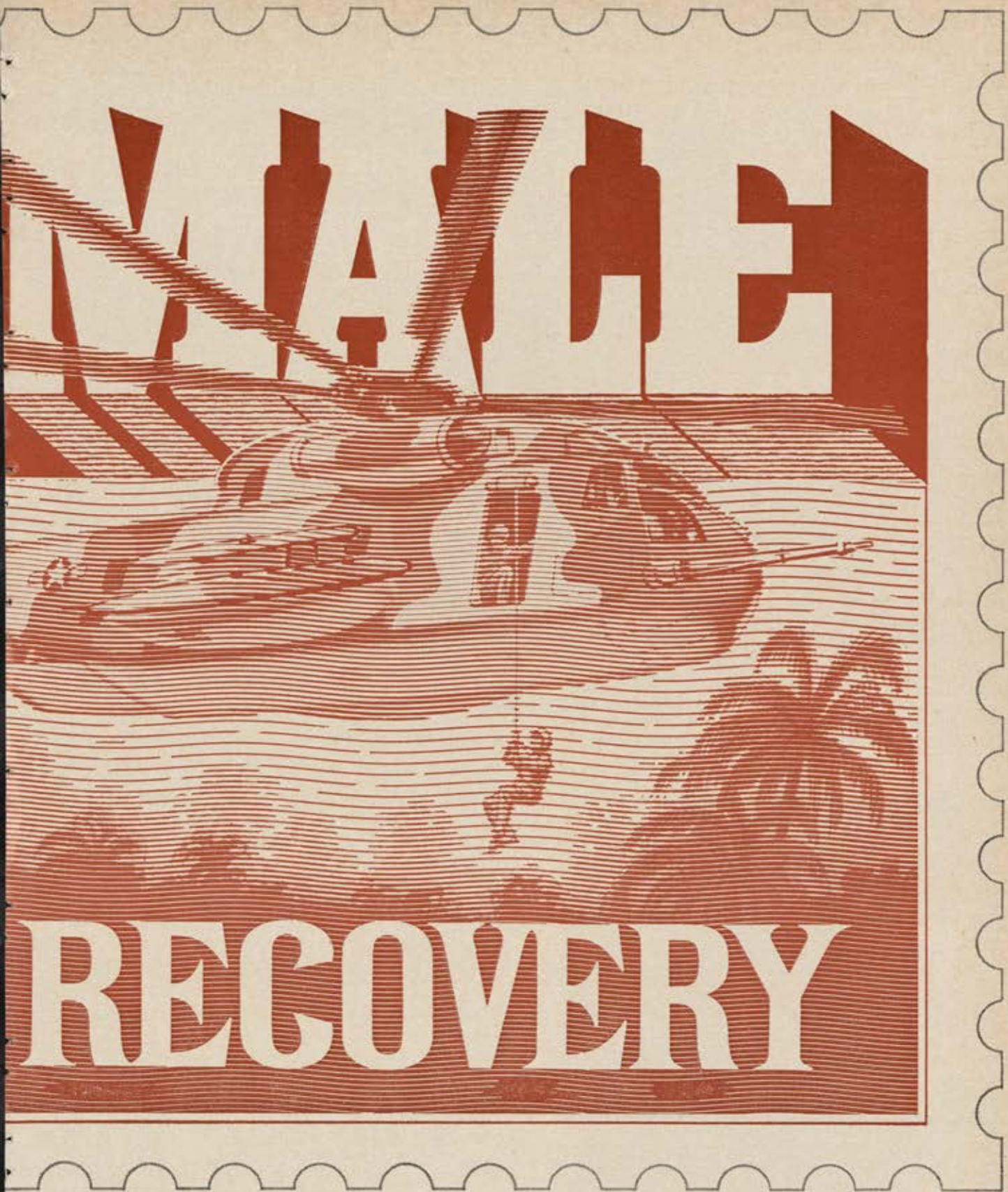
(Continued on page 42)



**U.S. Air Force has Sikorsky HH-53Bs for
Aerospace Rescue and Recovery Service**

The free world's largest, fastest production helicopter has a new assignment: rescue of combat crews.

The Air Force chose Sikorsky's twin-turbined HH-53B because its unique capabilities will mean more combat "saves." It can get in and out faster, reach deeper into enemy territory, fly



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higher, and carry a heavier payload.

The Marine Corps version of this helicopter, the CH-53A, is already in volume production. It carries 38 combat-equipped troops over 230 miles at 196 mph, and it has flown at a gross weight of 42,000 pounds with a payload of 20,000 pounds.

The HH-53B joins an ARRS mainstay, the HH-3E, already on duty in Vietnam. Each aircraft has armor plate, a special rescue hoist, jettisonable fuel tanks, and a retractable probe for mid-air refueling.

Sikorsky's CH-53A / HH-53B is ready to do any job, anywhere, anytime.

Sikorsky Aircraft

DIVISION OF UNITED AIRCRAFT CORPORATION

STRATFORD, CONNECTICUT



The Douglas C-124 Globemaster is gradually replacing the Fairchild C-119 Flying Boxcar in the 452d Wing and other Reserve units. The last C-124 was built in 1955, but because of its ability to handle outsized cargo some are being retained by the active Air Force until the huge Lockheed C-5A enters the Military Airlift Command inventory in 1969.



Father and son serving in 452d Wing are Maj. John Goggin, full-time pilot technician, and A3C Thomas Goggin, C-124 loadmaster and student at Riverside, Calif., City College, who are here loading an engine bound for Southeast Asia.

into town of Koza and assigned rooms in Hotel Texas. Each room has double bed, two huge chairs, coffee table, TV, clothes cabinet, and a private bath. Hotel has steam bath. Bathed, shaved, manicured, pedicured, wine, and dined. Back to hotel and to bed. With extracurricular activities, a nineteen-hour day.

Sunday, 26 Feb

Alerted. Entire family of hotel owner came out to bid us good-bye.

Flight planned. Got Vietnam briefing and ate at snack bar.

In terminal, awareness of war becomes more acute. Here soldiers, sailors, and Marines wait for flights to Vietnam. Activity at high pitch. Extreme youth of troops in terminal made me sorely aware of own gray hair and wrinkled countenance.

Departed for Da Nang. Flew precise corridor into Da Nang; no difficulty other than some reported ground fire—which we diverted around.

Cargo (17,000-pound Marine truck) unloaded; return cargo (repairable engines, tip tanks) taken aboard. Quick trip to BX for some goodies.

Flight planned, filed for Mactan, Philippines. Got Coke from machine and went back to aircraft. Austerity of base emphasizes nearness to war.

(Continued on page 44)



Reserve crew member supervises technicians performing minor maintenance on a C-124 at a Southeast Asia base. Airlift crews seldom leave the flight line in Vietnam. As soon as the aircraft is unloaded, and repairable equipment or other cargo is put aboard for the return trip, the Globemaster transport will take off again on the first leg of the trip home.



Air Force Reserve Globemaster taxis along a ramp past a pair of Military Airlift Command C-141A StarLifters. On a typical day, more than 200 transports are in the Pacific pipeline, carrying passengers and essential supplies from the US to Southeast Asia. They include planes of the active Air Force, the Reserve and Air Guard, and contract carriers.

Here we're truly in the war. Guns boom in the distance, flares glimpsed through fog, fighters roar off with sense of urgency. Gunners in bunkers are keen and alert.

Ceiling of heavy fog. Difficult to see other aircraft parked nearby. Had choice of waiting two or three hours for better weather and being subjected to violent activity on base or taking off into fog without chance to return. Elect to go.

Landed in rain at Mactan after flying five hours, forty-five minutes. Predictably, had breakfast again. Twenty-two-hour day. Went to bed—fully intending to get up in time to prowl local curio shops. But slept until alert time; off and running without glimpse of shops.

Monday, 27 Feb

Routine from Mactan to Guam except for snaking around some unpleasant weather. Mag went out en route, and we were delayed at Guam. Rained as if whole sea had risen in protest. Waited for both weather and repairs. B-52s returning from missions. Awesome sight as their black masses broke through overcast.

Finally airborne, made our way to Wake Island. Vicious wind had just lashed island but now subsided, and landing was uneventful.

Another twenty-one-hour day. Again breakfast and to bed.

Tuesday, 28 Feb

After six-hour sleep, got up and walked the littered beaches. Had lunch for a change, sat in sun for a while, then back to bed.

After alert, we were delayed briefly at Base Ops. Terminal filled with people who work at Wake Island, leaving for annual trip to homes in Philippines. These are magnificent people who must leave homes and families behind to work at Wake. But they can make enough money in a few years to support their families adequately and provide educational fund for children. I had made friends with several of these people during previous trips, and they were at terminal. Prospect of going home and being with loved ones after year's separation inspired holiday spirit. They played "Somewhere My Love" over and over on jukebox. Rather than be despondent over long separations, they are happy because they have opportunity to earn enough to survive with dignity. How fortunate we are in America, I thought; if only I could hold the magic of my elation at times like this, I'd never complain again.

Takeoff routine, and ten hours and fifteen minutes later we land at Honolulu. Unbelievably, got there just in time for breakfast.

Thursday, 2 March

After fitful sleep went to snack bar for lunch. Delightful thing about Honolulu—ever-present fresh pineapple and papaya.

Met an old friend at snack bar, and went to Pearl Harbor to see Arizona Memorial. Emotions truly



The author, Grover Tate, on the Edwards AFB, Calif., ramp after an evaluation flight in the F-111A. Between active-duty tours, he has worked for General Dynamics since 1947.

mixed as you stand on this glistening white tribute to men entombed below and think of the current conflict.

After alert had some time to kill. As usual spent it wandering about terminal. Met an Army pilot returning to Vietnam after going home to Los Angeles to be with wife during birth of their first child. Promised to call her when I got to LA.

3-4 March

Takeoff routine. Eleven hours, fifty minutes later landed at Norton AFB—just in time to hit breakfast menu at snack bar.

Cargo unloaded. Flew to home base at March, arriving shortly after noon. Filled out necessary forms. Disbanded as crew and headed individual ways.

Drove home, and, as always, arrival there brightest part of trip. All petty problems momentarily forgotten, we bask in supreme joy of being together again. Gifts are passed out and routine of preparing for return to normal starts all over.

Monday, 6 March

Back to work. I've spent nine days away from home, flown eighty-three hours, fifty-five minutes, an average of nine hours and fifteen minutes a day. Flown over 18,000 miles through all kinds of weather, sweated out nine ADIZs, dozens of ETAs, worn out a box of pencils and four erasers, consumed untold numbers of cups of coffee, eaten eleven breakfasts, nine in-flight lunches, and only one dinner. I've seen beauty, ugliness, joy, and heartbreak. I've sweated through two flying suits, arrived smelling like an unwashed moose. I have temporarily alienated my family and placed my civilian job in jeopardy. My rate of pay per hour for those nine days would horrify any union worker worth his salt. Now I return to that civilian job and sarcastic greetings: "How was the vacation?" ... "The Hero Returns," and more imaginative salutations.

I look back and realize that I'm proud of what I've done, that I loved every second of it—and that I'll do it all again as soon as my turn comes around.—END

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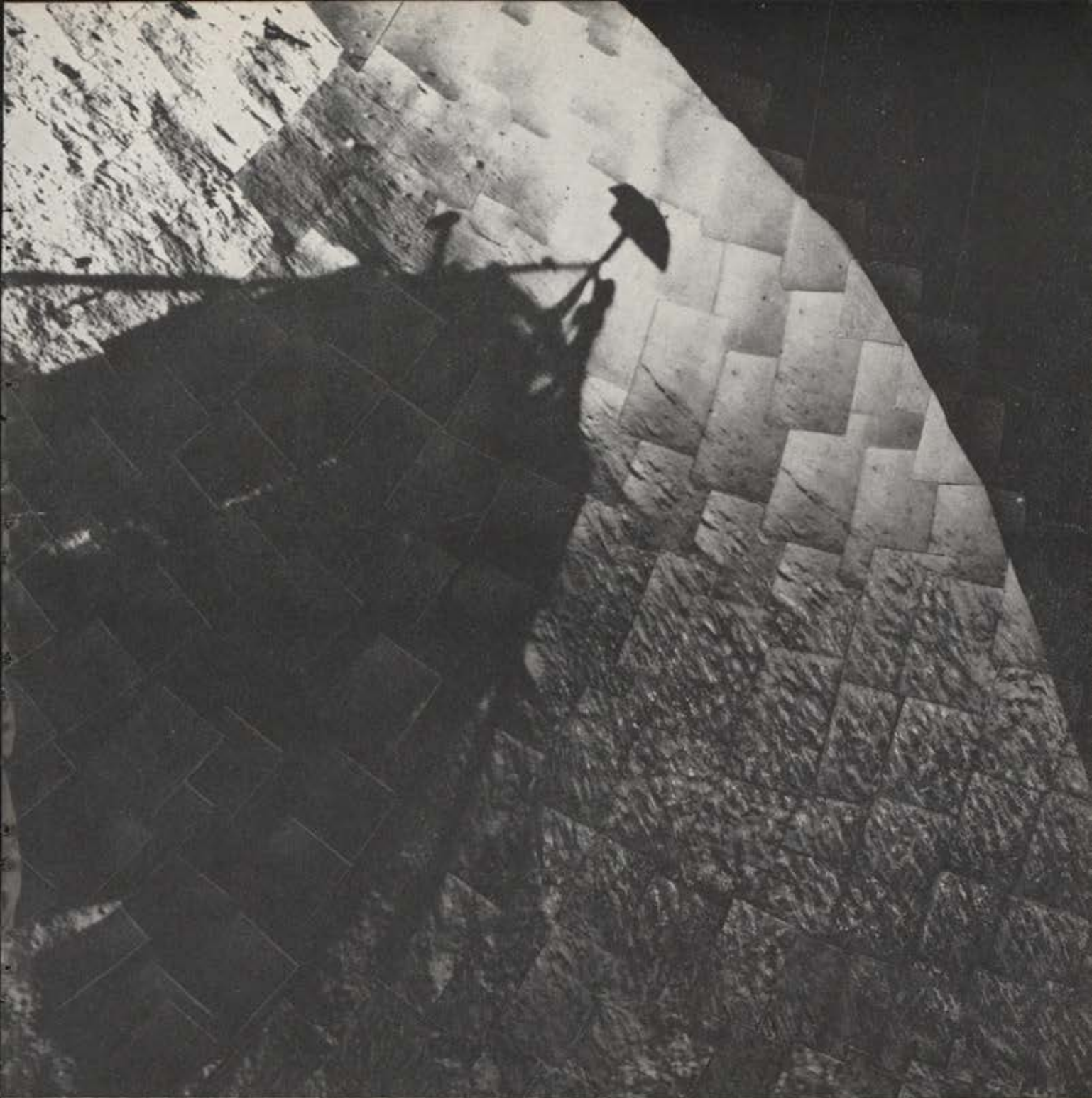
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How does he aim the camera?

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Since aerial bombardment was first used in warfare, there has been a continuing irrational reaction to it. The argument has almost always been that bombing involves innocent civilians in war. Yet civilians have always suffered in battle, and bombing has, in the long run, saved lives, both civilian and military, by making huge ground campaigns unnecessary . . .

THE ETHICS OF BOMBING

By Air Marshal Sir Robert Saundby, RAF (Ret.)

K.C.B., K.B.E., M.C., D.F.C., A.F.C., D.L.

THE subject of air bombardment is one that is hardly ever discussed objectively and reasonably. It arouses, especially in [Great Britain], all kinds of illogical antagonisms and emotional responses. Even when used against a leaking and derelict tanker aground near the Scillies, napalm bombs cause shudders of horror, and one almost expects to see banners in Trafalgar Square, "Stop Bombing Defenseless Tankers," and hear the usual fatuous protest from Bertrand Russell.

These irrational feelings are strongest amongst the young and among so-called progressive people, and are almost always directly proportional to their ignorance of the subject. When these people descend to the level of rational argument, the commonest objection to air bombardment is that it involves civilians in war, whereas they have a right to be treated as non-combatants.

The fact is, of course, that civilian populations have always, to a greater or lesser degree, been involved in hostilities. A glance at the history of war will suffice to make this clear.

From the very earliest days of civilization, cities and towns have been besieged, bombarded, sacked, pillaged, and burned. Often their defenders, and sometimes their civilian inhabitants also, were slaughtered or driven off into slavery. Land battles are not fought in deserts but over the countryside, across farms, houses, orchards and gardens, the property and homes of civilians, who have to flee for their lives.

It is true that with the gradual merging of the feudal into the monarchical order in Europe in the Middle Ages, there came into being for a time a system of conventional warfare, waged by standing armies composed of professional soldiers. During this period the usages, forms, and ceremonies of war were taken very seriously. Generally speaking, a fairly clear distinction was drawn between combatants and noncom-



The author, RAF Air Marshal Sir Robert Saundby, is well known in flying circles. From 1943 to 1945 he was RAF's Deputy Air Officer Commanding-in-Chief, Bomber Command, with the acting rank of Air Marshal. During this period he was created a Knight Commander of the British Empire. In 1946, as a result of injuries he had suffered years earlier in a crash while on operations in Belgium in 1917, he was invalided from the RAF. He served in the Royal Flying Corps in World War I, receiving the Military Cross for downing a Zeppelin. He served in a variety of operational posts between the two World Wars as well as in the Air Ministry and as an instructor at the RAF Staff College. In 1940 he became Assistant Chief of the Air Staff (Technical) and later S.A.S.O. at Bomber Command. Since retirement he has been an active leader of the RAF Association. This article is reprinted, with permission, from the June 1967 RAF Quarterly.

batants. This was comparatively easy, because the ordinary people did not take sides as they cared little who won or lost the war. Usually no religious or ideological principles were involved in those struggles for territory between the petty kings, dukes, and counts, and the civilian population did its best to carry on with its normal affairs and avoid trouble.

The conventions of war were rather like a set of trade-union rules, drawn up to make the profession of soldiering tolerable. Campaigns were normally conducted during the summer months only, and armies went into winter quarters to escape the trials and discomforts of frost, snow, and floods. The campaigns themselves were mainly affairs of maneuvering for position, formal sieges, and investitures, all conducted in a regular manner according to the rule book.

It was against the conventions to try to take unfair advantage by unorthodox actions. Thus it was contrary to the usages of war to attack the base camp or baggage train of an enemy. A vivid and amusing example of the professional soldier's reactions to a breach of these forms is to be found in Captain Fluellen's indignant protest in Act IV, Scene VII, of Shakespeare's *Henry V*.

"Kill the poys and the luggage! 'tis expressly against the law of arms: 'tis as arrant a piece of knavery, mark you now, as can be offered; in your conscience, now, is it not?"

But even the professional soldier expected a bonus now and then in the form of loot or rapine, and there were occasions when the civilian inhabitants were plundered, ill-treated, and even slaughtered. Cities were sacked and countrysides laid waste. But such lapses were unusual, and on the whole material destruction was avoided and the rights of noncombatants respected as far as was practicable.

At the end of the eighteenth century a great change occurred. The French Revolution, followed by the

rise to power of Napoleon, completely altered the whole character of war. It became the affair of the whole people, and in France the professional army, devoted to conventional warfare, was replaced by the *levée en masse*, the nation in arms. The Grand Armée disregarded most of the conventions, and all over Europe the professional armies of other States went down before its onslaught.

The whole system of conventional war was rapidly swept away, and all nations began to raise large conscript armies. War became far more serious and pervaded the whole life of the nation, and a new, more realistic concept of military strategy appeared.

This fundamental change in the character of war made a great impression on contemporary students of military affairs, and the German General von Clausewitz clothed in words the theory of war originated by Napoleon. Clausewitz believed that war had finally escaped the bonds of convention, and that in the future, when Great Powers were engaged, it would be total and absolute. It would involve not only the armed forces but the whole nation, and its successful prosecution would, therefore, need the support of public opinion. He insisted that war, whether we liked the idea or not, was now a violent clash between nations in arms, which could never be humanized or civilized, and that if one side attempted to do so it was likely to be defeated.

He had no faith in the reliability, in time of war, of any international rules or agreements, since no nation facing the possibility of defeat would allow itself to be bound by them. It was clear that in total war the distinction between combatants and noncombatants was bound to become blurred.

Alone among the countries of Europe, Britain was able by virtue of her seapower and island situation to avoid the creation of a large conscript army. One of
(Continued on following page)

our main weapons was sea blockade, a legal and internationally recognized method of sea warfare, which aimed at starving the enemy nation into submission. Since the armed forces and the essential workers must be fed and clothed, those who suffered most were the women and children, the infirm, and the aged. Our blockade of Germany in the 1914-18 war caused the death from malnutrition of far more civilians than died in all the air attacks on Britain in both World Wars.

In the heyday of our seapower, we not only waged war indirectly against civilians by our sea blockade, but our warships bombarded Copenhagen and Alexandria, and many other ports, and we felt fully justified in doing so. No one, as far as I know, has ever called Nelson or any other of our great admirals a "baby-killer," yet that was the epithet which, encouraged by our Government, we applied to the crews of the German Zeppelin airships in 1914-18. Small wonder that we have managed to acquire a national reputation for hypocrisy.

There is thus abundant evidence that, more often than not, the civilian population is deeply involved in war, and that in the past we ourselves have, by our own actions and especially by sea blockade, tacitly admitted this on numerous occasions. On the other hand, our own civilians have tended to regard themselves as privileged noncombatants. Since the Norman invasion of 1066, except for a few civil wars, all our fighting was done on the high seas or in other people's countries. From the end of the seventeenth to the beginning of the twentieth centuries, our seapower completely sheltered our people from the direct impact of war. This encouraged the view that war was exclusively the business of the armed forces, who were paid to fight and risk their lives, while civilians were noncombatants who had a right to be left unmolested to go about their lawful occasions. Their part in the war, they believed, should be limited to waving good-bye to the troops, paying extra taxes, knitting cardigans, mittens, and balaclava helmets, and submitting to a few minor inconveniences.

This comfortable view was shaken by the attacks carried out by German airships and airplanes against targets in this country in 1914-18, and completely shattered by the all-out onslaught on us from the air in World War II. The coming of the third dimension into war brought about great changes, and another and even more realistic concept of military strategy emerged. The conventions of war that we had come to believe in, however unreal they might have been, were annihilated, and our indignation was even greater than that of Fluellen.

The main focus of this indignation was against air bombardment. It is a curious thing, but condemnation and criticism of bombing began with the very first occasion on which an explosive weapon was dropped from an aircraft. During the Italo-Turkish war in Libya in 1911, Lieutenant Gavotti dropped four bombs on November 1 of that year. These bombs were converted Swedish hand grenades weighing four and a half pounds each. Several more such bombs

were dropped during the next few days, and before long Turkey protested against the bombing of a hospital at Ain Zara by Italian aircraft. Extensive inquiries failed to establish the existence of a hospital at that place, but it is possible that some Turkish military tents may have been used as a casualty clearing station. The Italians pointed out, not unreasonably, that they had shortly before bombarded the encampment at Ain Zara with 152 heavy naval shells without any protest from the Turks.

There followed in the Italian, Turkish, and neutral press a considerable discussion about the ethics of air bombardment, a discussion which has continued, more or less violently, ever since. It is astonishing that the very first feeble attempt at air bombardment should have provoked an illogical protest, suggesting that a few tiny bombs were more dangerous and destructive than a large number of heavy naval shells.

In Iraq and Transjordan, large land forces were replaced in 1922 by small air forces, and a very successful system known as the air control of undeveloped countries was instituted. It did not involve a direct attack on the tribesmen or their houses, but was a form of air blockade. Unlike sea blockade, however, it did not seek to achieve its aim by starvation, but by unacceptable discomfort and inconvenience. The system proved to be so effective, and so economical in money and in casualties (to both sides), that in 1928 it was extended to the Protectorate of Aden, where it was an immediate success. The Northwest Frontier of India was ideally suited to this humane and efficient form of control, and whenever it was tried there it produced excellent results. The Army, however, with its system of punitive expeditions, was too strongly entrenched and was able to frustrate all attempts to introduce the air method.

As might be expected, there was considerable opposition here at home to the idea of air control. Its opponents had predicted that its reliance on the bomb, which they stigmatized as violent, horrible, and inhumane, would leave a legacy of hatred and ill will. This prediction proved to be the reverse of the truth, and for many reasons air-control operations produced far less rancour and ill feeling than did the former method of punitive action by land forces. Airmen were held in high esteem, and not one of those who fell into tribal hands during air-control operations was killed or even badly treated.

Nevertheless, the system continued to be bitterly attacked by many people who had an instinctive horror of any form of air bombardment. Most of these people were sincere and well meaning, though hardly any of them had the faintest idea of how the system worked, or were even interested in trying to find out. They were reinforced by others, less naïve, who had vested interests in the older methods, and accusations of quelling disorders by "indiscriminate bombing" were made by those who should, and quite often did, know better. But the undeniable improvement in security and public order, and the demonstrable saving of lives and money brought about by air control,

(Continued on page 53)

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blunted these attacks and the system was able to survive. Even today, however, among those who take pleasure in denigrating the very real achievements, in human and economic terms, of our former Colonial Empire, we often hear fantastically untrue stories about our barbarous bombing of innocent tribesmen because they would not pay their taxes!

During the years between the two World Wars the alarm felt by civilians at the prospects of air bombardment led to determined efforts to outlaw or restrict it. At the League of Nations Disarmament Conference, held at Geneva in 1932-34, the British Government proposed a Convention to prohibit all forms of bombing from the air, to which it later added a rider permitting its use under certain conditions in undeveloped countries. Further amendments from various sources were added to permit the attack of strictly military targets in support of land and sea operations. But the difficulty of defining what was, and what was not, a military target eventually proved insuperable. Britain then tabled another proposal, limiting the unladen all-up weight of military aircraft to 3,000 pounds, which would have ruled out everything but the defensive fighter and the very-short-range light bomber. Armies and navies of many countries welcomed this proposal, and for a time there seemed to be a chance that it might be accepted. But eventually the Disarmament Conference broke up, as such things usually do, without achieving any result whatever.

At the outbreak of the Second World War, both the British and French Governments gave instructions that only strictly military targets were to be attacked. The Royal Air Force was not even allowed to attack German warships in docks or at quay sides, for fear of causing casualties among civilians.

This raised again the question: What is a military target, and how can it be defined? It is generally agreed, for example, that the man who loads or fires a field gun is a military target. So is the gun itself, and the ammunition dump that supplies it. So is the truck driver who transports ammunition from the base to the dump. So—in the last two World Wars—was the man who transports weapons, ammunition, raw materials, etc., by sea. But are the weapons and warlike stores on their way from the factories to the bases, and the men who transport them, not also military targets? And what about the weapons under construction in the factories, and the men who make them? Are they not also military targets? And if they are not, where do you draw the line?

If they are military targets, are not the industrial areas, and the services—gas, water, electricity—that keep industry going, also military targets? Where, again, can you draw the line? Or is it permissible to starve these civilian workers by blockade, or shell them if you can get at them, but not to bomb them from the air? This is surely a *reductio ad absurdum*.

As the Second World War went on we and the Americans followed the German lead in attacking from the air industrial areas, power stations, railway centers, and other essential services, and accepting the

certainty of a considerable number of civilian casualties. With very few exceptions our people warmly supported this policy during the war, but as soon as it was won many tried to ignore the vital contribution made by the Allied bombers, and to dissociate themselves from the policy. Bomber Command, as a whole, was denied the 1939-45 Star, or other campaign star, and given the mainly civilian Defense Medal instead. Its Commander in Chief was, in the opinion of many people, slighted; and the Command's achievements were commemorated in an official history written in a singularly equivocal and lukewarm style.

In progressive circles nowadays it is fashionable to assert that the strategic bombing campaign was a mistake, and a waste of valuable resources. Yet even the official history is compelled to admit that "strategic bombing and, also in other roles, strategic bombers, made a contribution to victory that was decisive. Those who claim that the Bomber Command contribution to the war was less than this are factually in error."

The truth is that it is war itself that is wrong and immoral, or more accurately speaking, aggressive war, for it must be right to defend one's country and oneself against attack. By this standard the war waged by North Vietnam, backed by Russia and China, against South Vietnam—fought in South Vietnamese territory, be it noted—is wrong and immoral. On the other hand, the defensive war against the attack from the north, fought by South Vietnam with backing from the United States, Australia, and New Zealand, is right and proper. No twist of argument, no sophistry, no emotional outcry against bombing can controvert those two plain facts.

It is certainly not intended to imply that all actions, even in a just war against aggression, are necessarily permissible. The test is whether the action in question genuinely furthers the aim and main strategic concept of the war. Thus, taking revenge on civilians by mass slaughter does not help to win a war, and is not permissible. But the diminution of an enemy's power to continue the war, by the destruction of industrial areas, power stations, dams, railway centers, and depots, is legitimate, even though such action must cause civilian casualties. It goes without saying, however, that all practical steps, short of prejudicing the success of the operation, should be taken to minimize the risk to civilians.

A study of the subject of this article cannot fail to remind us that we are illogical creatures, still far more swayed by emotion than by calm reason. We have wonderful powers of self-deception, and of the uncritical suppression of unwelcome facts. And we are still capable of believing what we want to believe, in the face of overwhelming evidence to the contrary. Indeed, there are none so blind as will not see, or so deaf as will not hear.

It is, therefore, no doubt unrealistic to hope for the general acceptance of rational views about such an emotive subject as the ethics of air bombardment.—END

The New Department of Transportation

In an exclusive interview with *AIR FORCE/SPACE DIGEST*, Alan S. Boyd, who heads the newly formed US Department of Transportation, discusses some of the complex problems ahead and answers the question, "Can DoT, with its restricted power, act quickly enough and efficiently enough to unravel the traffic jams on the ground and in the sky which are laying siege to the nation's mobility?" Secretary Boyd believes it can . . .

The Systems Approach: Solution to The National Transportation Muddle?

By Edgar E. Ulsamer

ASSOCIATE EDITOR, *AIR FORCE/SPACE DIGEST*

IN DESCRIBING America's dependence on its mammoth, complex, and fragmented transportation system, President Johnson called it "the web of union." Yet this web of transportation, which absorbs one dollar out of every six spent in the United States, is coming apart. In the process, Americans stand to lose the fundamental freedom of mobility, or at least the privilege of choosing from among a number of kinds of transport.

Railroad passenger service is declining rapidly and is no longer even available in many parts of the country. The automobile, the bus, and the truck are ensnared in self-perpetuating congestion, reducing urban travel to essentially two speeds—slow and slower. Ironically, the automobile—the least efficient transport mode and the one most culpable in terms of safety and air pollution—is the one that keeps proliferating to the detriment of other means of mobility.

Commercial aviation, the leading carrier in inter-city passenger travel, has succeeded in keeping pace with the staggering traffic increases and the rapidly mounting volume of air cargo. This is true, however, only insofar as the air leg of a given journey is concerned. The over-all efficiency of air transport is being affected by the congestion and fragmentation of the ground transportation system.

The Aging US Maritime Flaglines

The diagnoses of the condition of the US merchant marine and shipbuilding industry vary, but none is good. Most government officials, especially in the defense field, consider the maritime field the sick old man of American transportation.

Eighty percent of the American flagline ships are twenty or more years old. The current number of ships under US registry—1,040—is barely one-fifth of the total in 1945. In comparison, the Soviet maritime industry has gone from a small and antiquated fleet of 432 ships in 1950 to a current total of about 1,500. In addition, the Soviet Union is delivering new ships to its fleet at a rate eight times higher than that of the US so that by 1970 the Soviet merchant fleet will dwarf that of the US.

As a result, nobody argues with the need to infuse modern management methods and technology into the US shipbuilding industry, if the maritime industry is to remain competitive internationally. Yet only last month a broad plan prepared by the Department of Defense, which could have advanced the state of the art in shipbuilding, was rejected in Congress. This was the Department of Defense's billion-dollar Fast Deployment Logistics Ships program, involving thirty ultramodern vessels to be built under design and procurement concepts of the aerospace industry. For the time being, at least, the US maritime industry will remain untouched by modern technology.

DoT's Functions

To try to bring a sense of order into a transportation system that is fast approaching chaos, the new US Department of Transportation (DoT) came into being on April 1, 1967. The new Department is charged with over-all responsibility in the transport field.

In the words of President Johnson, it is "to stimulate technological advances in transportation, to pro-



vide general leadership in the identification and solution of transportation problems, and to develop and recommend to the President and Congress, for approval, national transportation policies and programs to accomplish those objectives."

As wide-ranging as the field it serves, the Department encompasses such dissimilar branches as the Great Lakes Pilotage Administration and the Supersonic Transport Program Office. The key components, known as operating agencies, are: The United States Coast Guard, the Federal Aviation Administration, the Federal Highway Administration, the Federal Railroad Administration, and the St. Lawrence Seaway Development Corporation (*see accompanying chart on page 57*).

Sitting astride the departmental power structure and cutting across all its branches is the National Transportation Safety Board, made up of five presidential appointees who serve overlapping, five-year terms. It is attached to the Department only loosely, answering essentially to the Congress. The Board's powers are investigative as well as judicial; it initiates accident investigations, undertakes safety and accident-prevention studies, and performs the functions of an appeals court in instances of suspension, revocation, or denial of licenses or certifications by any branch of the Department.

Fourth Largest Department

With a budget of about \$6 billion and some 100,000 employees, the new Department of Transportation is the fourth largest government department. It unites under one roof most of the government's transport

functions that previously were diffused among thirty different agencies. It will guide, regulate, and assist a conglomeration of industries producing about \$140 billion in annual sales, equal to the total US Gross National Product of a generation ago. At present growth rates this volume will double over the next seventeen and a half years.

Heading the new Department is Alan S. Boyd,
(Continued on following page)



—Wide World Photos

The new head of the Department of Transportation, Alan S. Boyd, is shown here during a recent press conference at which plans were announced for starting construction of two prototype supersonic transport aircraft. The SST is just one of many large programs now under the new department.

a forty-four-year-old lawyer and former Air Force major, the former Chairman of the Civil Aeronautics Board (CAB), and former Undersecretary of Commerce for Transportation. He brings to his job this basic philosophy: The transport chaos which accumulated over the past 200 years can be solved most readily with the help of the refined commonsense techniques pioneered by the United States Air Force and the aerospace and defense industry—techniques known as systems analysis, systems engineering, and systems management.

These sophisticated, yet simple and logical techniques enabled the United States to complete its ICBM program in record time and are finding widespread application in the management of civil programs. To grossly oversimplify, these techniques compress time through the concept of concurrency, fortified by analyses of all components of a problem as well as their effect on one another. They tend to reduce the trial-and-error approaches inherent in other processes. Secretary Boyd points out, however, that the systems approach can't be applied productively until after specific decisions in the political sphere have been reached on the desired goals and scope of the national transportation system.

With a presidential mandate that government has to serve as a full partner with private enterprise in meeting the nation's urgent need for mobility, Secretary Boyd plans to operate the Department (which has already acquired the acronym of DoT or "Dottie") in such a way that it will safeguard private enterprise as much as possible.

Transportation Safety

One obvious area of high priority is that of safety, both in existing and future transport systems. Trans-

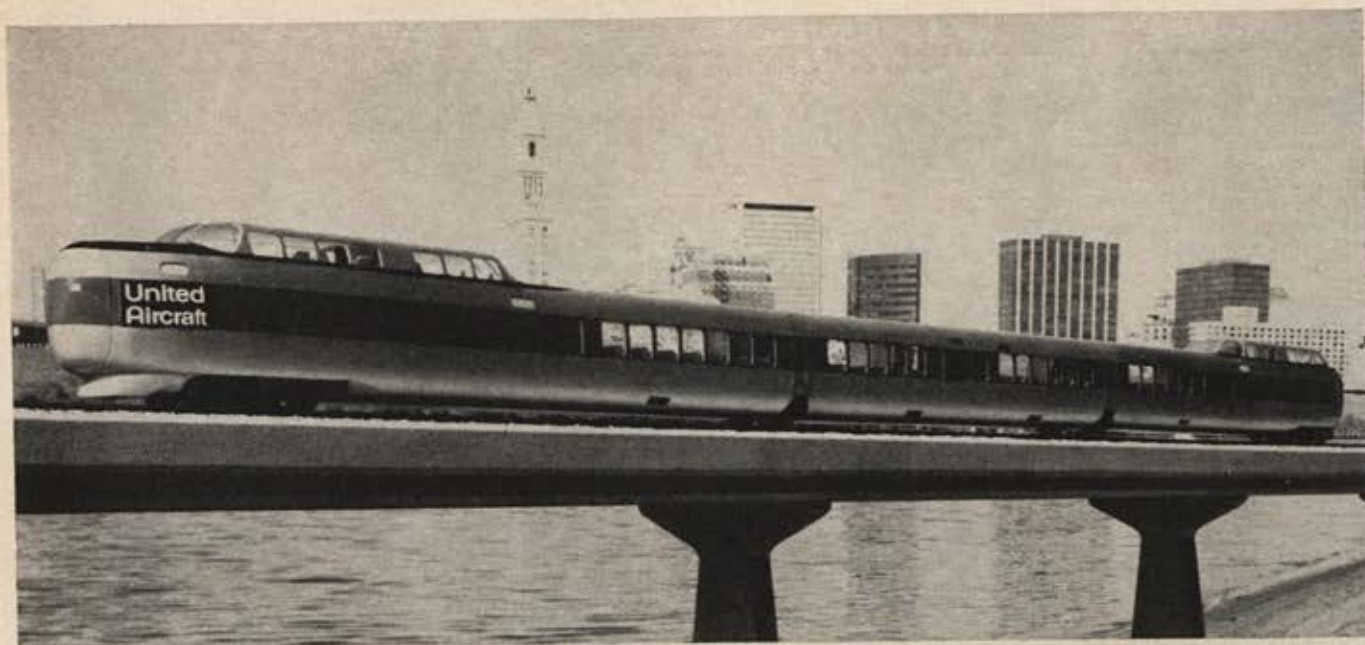
portation kills more Americans than war. The automobile alone has killed 1,500,000 Americans in this century, more than the total toll in all wars fought by the United States in its entire history. Just last year the breakdown of transport fatalities in the United States was: 49,000 killed in motor-vehicle accidents, 2,300 in railroad accidents, 1,500 in ship and boat accidents, and 1,300 in aviation accidents.

US commercial aviation fared considerably better than did general aviation. Commercial air transport accounted for only a minor portion of this total, retaining its position as the world's safest transport mode.

In analyzing and evaluating these death totals the Department finds that aviation, especially commercial aviation, and the Federal Aviation Administration may well serve as a model for handling safety matters by other forms of transportation. Approaching accidents in a thoroughly analytical fashion to establish the cause and thereby help find ways of prevention is in contrast with the current practice of coping with auto accidents. There the emphasis is on punitive action.

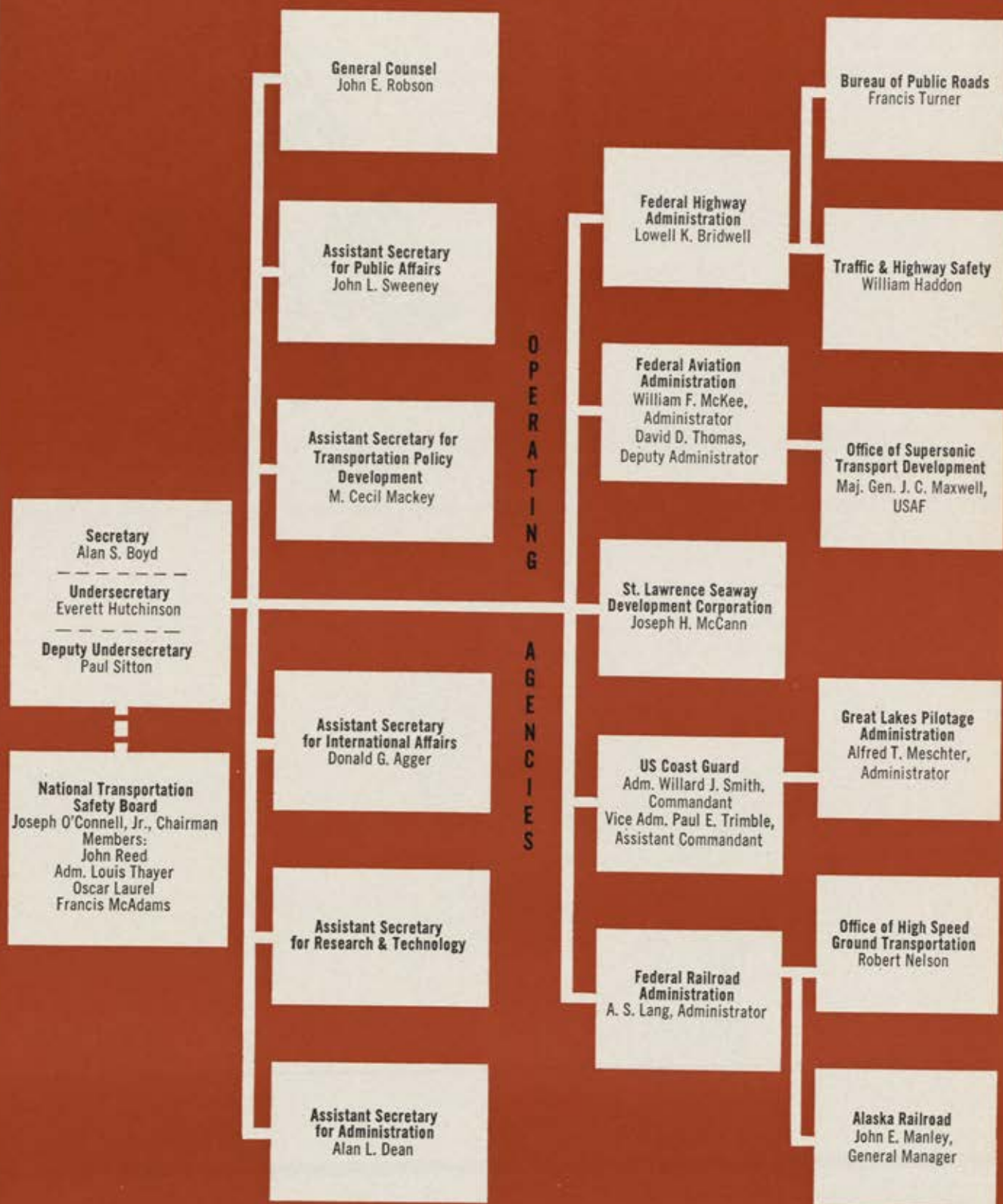
Secretary Boyd considers safety an area of great promise but not the only one where aviation experience can play a pioneering role. The chronic freight-car shortage in the United States, decidedly a management rather than equipment problem, can be alleviated substantially, if not completely cured, in the opinion of Mr. Boyd, by employing the highly sophisticated aircraft control techniques of the FAA.

By necessity, the efficiency of transportation is the Department's major concern and its improvement the Department's principal task. In the quest for a streamlined transportation system Secretary Boyd is motivated by the broad impact that transportation
(Continued on page 59)



United Aircraft TurboTrains are expected to enter service later this year between Boston and New York, and Montreal and Toronto. Gas-turbine-powered trains are based largely on flight technology, with interiors like those of jetliners. The aerodynamic shape of the train, which will be capable of speeds up to 160 mph, is shown by this plastic scale model.

DEPARTMENT OF TRANSPORTATION



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has on the development of society, economically, politically, culturally, and in many other ways. "We are," he says, "in elementary school when it comes to evaluating this kind of impact." He agrees wholeheartedly with President Johnson that a generation from now today's transportation decisions "can make one place a purgatory and another a paradise." In consequence, and recognizing that the time lag between the start of the planning of a new system and its actual operation is between fifteen and twenty years, Mr. Boyd is determined to "coordinate" the components of transportation "to give America the kind of transportation it deserves."

A New Partnership

A firm believer in the free enterprise system, he says, nevertheless, that the various transport modes need to understand that the time has come to "coordinate together or be coordinated separately." He is keenly aware of the fact that most of America's great entrepreneurs in transportation bankrupted themselves in their efforts to bring new technologies to the national transportation systems. This long line of transportation failures extends from the builders of the great clipper ships, such money-losing undertakings as the building of the first monorail and the early canals, to a number of pioneering aviation enterprises, he points out. As a result, Mr. Boyd has vowed that "if there is one thing I hope can be accomplished by the new Department, it is the restoration of profitability to all transport modes." Society, he explains, must hold open financial rewards commensurate with the risks of transport innovation in view of the "surprisingly brief life of many important transportation modes."

He sees the creation of DoT as a historic dividing line separating the old era in transportation from the new: the transition from decentralized, self-serving, and egocentric subsystems to the total systems concept, aided and encouraged by the government at the community, state, and federal levels.

The days when transport decisions were based solely on profit maximization and engineering efficiency are definitely over, in the opinion of Secretary Boyd. "Today's superhighway interchange means a new suburb tomorrow; today's new airport means a new city tomorrow. Transportation stands for a great deal more than the actual movement of people and goods. At the least it means industry location, open space provisions, residential development, and an integral part of our social mechanism," he says.

But Mr. Boyd's idea of DoT's "mission analysis" of transportation related to national policies and goals, economic growth, and the required technologies to translate planning into action, is firmly anchored in his belief that "we need to retain the spur of competition which has served us so well throughout our history." He points to the decline of the British aerospace industry, which he attributes to "too much government interference and government ownership." The United States and its transport programs are not

"going to fall into this kind of trap," Mr. Boyd insists.

But Mr. Boyd's zeal for integrating the development of transportation with the broad national interest and the social growth mechanism may be hindered by a number of factors. In spite of President Johnson's strong specific request to include the Maritime Administration in the Department of Transportation, Congress excluded it. As for urban transit, the Department of Housing and Urban Development is basically in charge, although it is required to cooperate with DoT, and both are to furnish a joint development program in about a year's time.

The Government and Transportation

While there have been, of course, those who hold that the creation of the Department represents yet another covert move toward total government control, the business community is strongly in favor of a unified transport policy. There are weighty reasons for this almost universal support of a unified approach. The absence of even a clearinghouse for information on who is doing what and why in transportation has hurt everybody, from operator to consumer. The business community also recognizes that at the places where the various forms of transportation overlap a guidance and control function is necessary. The government is best suited for this role. Further, the act establishing the Department does not provide for any new governmental controls over transport matters but merely streamlines the governmental overseer functions already in existence. Also, government participation in transportation projects is not new in the United States in terms of research and development as well as in an operational way.

Research grants, the beginning forces behind the majority of scientific undertakings in the US, were first used to solve an early transportation problem. In the 1830s Philadelphia's Franklin Institute received the first such federal grant to investigate the causes of boiler explosions in locomotives and steamships. The oldest scientific agency in the government, the Coast and Geodetic Survey, was founded in 1807 to chart the coastal waterways of a new nation largely dependent on ocean transportation.

The federal government also made substantial land grants to the railroads in the middle of the nineteenth century with the result that the first fast and reliable transport facility linking the East and West Coasts was created. Perhaps the most shining example of government investment in transportation was the building of the Panama Canal.

Another compelling reason for heavier government involvement in transportation is manifested by the side effects of transportation that are impinging more and more on the private life of every citizen. As Secretary Boyd put it: "The noises, the odors, the civic disorders, dislocation, and demolition have been bombarding the public consciousness for years. Now the reaction has begun, and I believe that it marks the end of an era in this country."

(Continued on following page)

Lastly, any program which seems destined to make transportation more efficient, more economical, and more expeditious obviously strengthens national security and, therefore, warrants government monitoring and guidance.

How the Department Functions

The aviation community initially feared that its interests would be submerged and diluted in the new transportation department, but the retention of the FAA in a relatively autonomous fashion has reduced these anxieties. While the arguments in behalf of the Department of Transportation find little challenge, there is a considerable concern over its limited power. The Department has no economic regulatory power, or, as it was put in Congress, "no muscle." It must function through persuasion, by means of research-and-development grants, the ability to recommend legislation, and, first and foremost, the persuasive talents of its key officials.

Still, Secretary Boyd categorically rejects the idea that DoT's "wings were clipped before we ever got off the ground." He is confident that the Maritime Administration, kept out of the DoT through strong pressure by the shipping industry, will join the Department in the not-too-distant future. He regrets that the ocean carriers, by their decision to go it alone, have made it "more difficult for the Department of Transportation to assist them in research and technological development. But what is so futile of this gesture of our maritime friends," he says, "is the fact that America's national transportation policy can't possibly stop at the water's edge."

Nevertheless, he insists that this temporary absence of the maritime interest in DoT is a blessing in disguise "because we have our hands full getting organized and gradually absorbing various agencies. With the maritime field coming in later we will have a more orderly progression."

In his talk with AF/SD it was evident that Mr. Boyd wants to exert a more direct control over the planning and development of mass-transit systems, a responsibility currently assigned to the Department of Housing and Urban Development (HUD). Again, he feels that it is only a matter of time before an arrangement more compatible with DoT's mission of planning and creating the total spectrum of transportation will be worked out. He stresses that urban transportation is fundamental, that generally all other forms of transportation depend on it, and that to exclude it from the total transportation planning concept "is impossible."

The proponents of the present condition argue, of course, that HUD needs control over urban transit systems because they represent a vital weapon in fighting the current decay of the cities. The prestigious Massachusetts Institute of Technology pointed out in a recent study how proper transportation policies can remedy urban poverty by bringing downtown closer to nearby suburbs. This kind of mobility for the low-income groups concentrated in the city cores becomes

vital at a time when the number of laboring jobs in the city decline while those in the suburbs go up. The 1965 disorders in the Watts district of Los Angeles have been linked directly to inadequate transport conditions resulting in economic blight. Mr. Boyd agrees that close cooperation between his Department and HUD is vital to assure that land use, social goals, and other areas of broad public interest are met in an optimal fashion.

The R&D Challenge

The Department's role as the central voice in all research-and-development matters that pertain to transportation, of course, can be expected to be quite weighty. There is no plan to develop any substantial in-house R&D capabilities on the departmental level. These will be retained at the level of the operating agencies and linked to the R&D capabilities of industry, the campus, and the "think factories." Mr. Boyd is flexible on the question of whether or not DoT should develop actual hardware prototypes. "Obviously, this was necessary in the case of the supersonic transport. But, I doubt we should do this if we come up with a new type of city bus or similar system," he says.

Within three years, Mr. Boyd has told Congress, he hopes to introduce and exercise a so-called Programming Planning Budget System (PPBS)—the budgeting method used by the Department of Defense—for all government-funded research-and-development programs in transportation and civil aviation. This alone gives industry a decided incentive to operate in keeping with DoT's plans.

There is little doubt that government funds for transportation technology will increase in the years ahead. At the moment, less than one percent of the government's research and development for nondefense and nonspace programs is allocated to advanced transport technology. The parsimonious funding policy has taken its toll in US rail and ocean-going transportation. This becomes especially noticeable when compared with countries employing a more progressive approach. Aeronautics has managed to get by because of benefits from military R&D. But this era is drawing to a close.

Less Military R&D Fallout

The precisely targeted mission orientation underlying the Department of Defense's weapon systems concept, Mr. Boyd testified before Congress, "will result in sharply reduced fallout to commercial aviation." A case in point is the military V/STOL program. According to his testimony, it is "too different in design philosophy to become interchangeable" with civil aviation. Moreover, there is evidence that civil aviation in the future may require aeronautical technology more advanced than that which is being generated on the military side. A case in point is the SST program. It not only is the most advanced aeronautical challenge facing this nation, but it already has introduced

(Continued on page 63)



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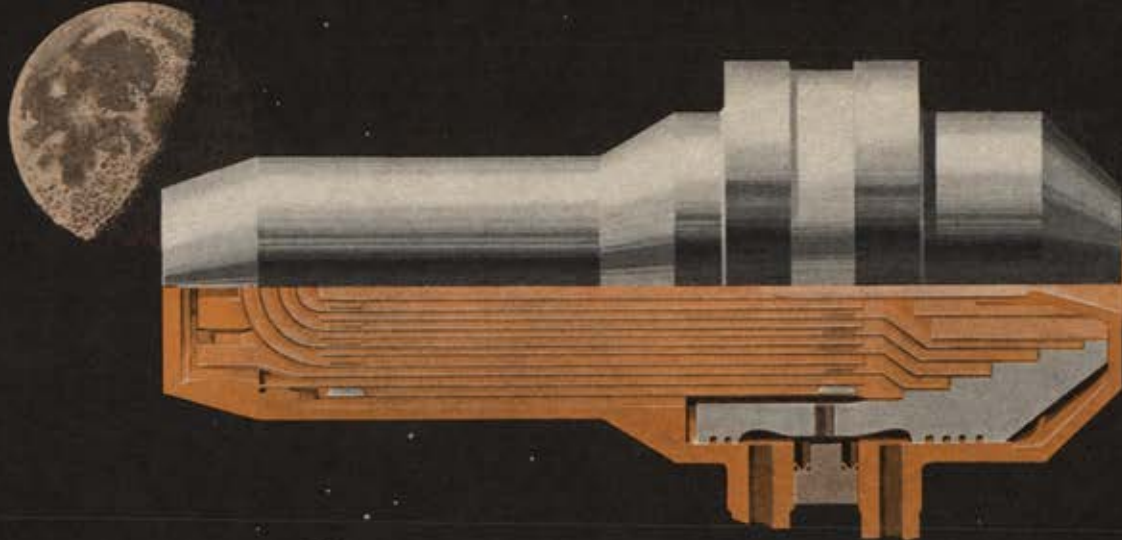
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Principals of the SST program who gathered for the May 1 contract signing are, from left, Lowell P. Mickelwait, Vice President of Boeing; Maj. Gen. J. C. Maxwell, SST Program Director; FAA Administrator William F. McKee; and George McTigue of GE, makers of the engines.

—Wide World Photos

a new concept in government sponsorship of an essentially civilian project through the processes of source selection and financing. Ninety percent of the development costs of the American SST are to be paid by the government. This "loan" is to be recouped with interest in the form of royalty payments by the user airlines.

Mr. Boyd said, incidentally, that the SST program office would be separated from the FAA before the latter has started its SST certification efforts, to avoid any conflict of interest.

The SST cost-sharing approach, Secretary Boyd predicts, will become a pattern for the future. "I believe that where there is an identified need for the development of a particular type of vehicle, and that development is not taking place in private industry, and where the national need outweighs the cost development, the government ought to consider financial assistance," he told Congress.

The SST: Pattern for Tomorrow

The SST, he added, can serve as an ideal casebook study for massive ventures of this sort. Secretary Boyd is firm on the need to proceed with the SST program, explaining that its benefits, while not yet fully quantifiable, will be vast. As for a hypersonic transport (HST), he conceded that the United States could be doing more research, but the Secretary explained that budgetary considerations prevent steep increases in HST funding. He doubts that allegedly intensive Soviet and other foreign efforts in this field will threaten US preeminence in high-speed aviation.

The development of a viable commercial V/STOL aircraft is expected to cost between \$300 and \$500 million. Many transportation planners consider V/STOL a prime necessity to head off what otherwise could become an all-out paralysis in high-traffic corridors on the eastern seaboard and in California in the next decade. This is substantially below the cost of the

SST but still exceeds industry's ability to commit to a high-risk venture. Because of these circumstances commercial V/STOL is a likely candidate for DoT assistance.

But there are other areas which also are being considered for governmental support. They range from guided highway vehicles, hovercraft, and semiautomated vessels, to linear-induction propulsion for high-speed ground transportation and the use of lasers in tunneling.

DoT's ability to apply systems engineering to the successful development of a massive and vital transportation complex is already under test in the so-called Northeast Corridor Transportation Project. Covering the megalopolis stretching from Boston to south of Washington, D. C., this overloaded and unwieldy transportation net poses a monstrous challenge to the planners. At the moment it is afflicted by about every conceivable transport ill, from mammoth traffic congestions of its city cores and highways to overcrowded airways and clogged and inaccessible airports. Since by the year 2000 more than ninety percent of America's total population of 300,000,000 is expected to live in an urban environment similar to that of the Northeast megalopolis, an early solution of the Corridor's transport woes is seen as imperative.

The project's short-term aspects include determining the real economic usefulness of the current major systems of ground transportation, together with such pragmatic questions as how important is price in relation to transport efficiency, and the elusive problem of anticipating future federal, state, and community growth. In terms of hardware, this phase includes tests with high-speed trains and auto/rail service.

On a long-term basis, the use of V/STOL, site selection of future airports integrated with other transport modes, and a host of other planning considerations will come into the focus of the project.

The interdependence between aviation and ground
(Continued on following page)

transportation, and the need to link them through systems planning, in the opinion of Secretary Boyd, will become vastly more pronounced with the advent of "jumbo" aircraft in the next few years. He expects that cargo aircraft of the 747 and C-5A type will make aviation "a full-fledged partner in a coordinated freight system," while standardized highway-size containers used by all transport modes and by both civilian and military authorities will lower costs and further the intermodal cargo transportation. Developments of this type are contingent upon the efficiency and capacity of the interface points between the different forms of transportation. In the last analysis it will be here that systems planning must prove that it is not a political nostrum but a sound development tool.

The basic difficulty of translating theory into practice, in the Northeast Corridor as elsewhere, lies in the fact that the federal government is far from omnipotent in such matters as airport construction. Not only are these matters of fragmented jurisdictions initiated and funded essentially on the community level, but the planning is often impeded by competitive factors. Air carriers quite understandably are not too eager to advise local planners of their expansion programs because this can tip off their competitors.

The Red-Tape Problem

Not all the Department's challenges lie in systems management and advanced technology. Right now armies of transport employees are filling out, filing, checking, stamping, and just reading the 810 different categories of forms covering the imports and exports entering and leaving the United States. The US alone prescribed forty-three separate and mandatory forms for exports and eighty different forms for imports. President Johnson has termed this condition "paperwork run wild." Cutting back this red tape in concert with other government departments and with the country's trading partners will be an important task of the Department of Transportation.

Handling much of this work will be an Office of Facilitation in the Department under Assistant Secretary of Transportation for International Affairs, Donald G. Agger.

The Department will work closely with industry, other governmental agencies, and the commercial attachés in the various US embassies to achieve a mutually agreeable "deescalation" of the number and complexity of documents currently hindering international commerce.

The Department's International Role

In a similar vein, DoT's international program includes efforts to stimulate standardization of shipping containers on a worldwide basis and for all forms of transportation.

DoT's international mandate covers a number of other areas.

Primary among them is that of technical assistance

and technology exchange. With transportation projects representing more than one-third of the basis for loans made by the World Bank (but only three percent of this total for the development of aviation), DoT will coordinate all future Agency for International Development (AID) and other assistance programs that pertain to transportation. Yet this assistance is meant to be a two-way street, with the United States both making available, and seeking advances in, transport technology that can be useful to either a foreign country or to the United States.

A special international office for R&D cooperation is planned. It will function as a coordinator and catalyst in bringing together foreign and local, public and private interests which can facilitate technological developments in transportation of mutual benefit to the countries concerned. Among the envisioned areas of discussion are hydrofoil ship technology, technical coordination with countries engaged in SST programs with an eye toward pooling technology for a follow-on version, advances in lighter-than-air vehicles such as the Soviets are using in logging operations, V/STOL advances, and similar challenges in sophisticated technology.

Also to be emphasized in the field of international cooperation is highway safety. US participation in international forums concerned with the construction and planning of advanced highways, safety devices, and electronic safety systems is to be stepped up. Similarly, an Office of Emergency Transportation in the Department of Transportation will maintain close international ties. Both in case of natural disasters and in case of war its function will be to coordinate transport matters with the friends and allies of the United States.

The same is true for interdepartmental coordination with foreign countries of telecommunication frequencies assigned to the Federal Aviation Administration and the Coast Guard. Additionally, the DoT, in conjunction with the Department of State, will provide a coordinated departmental position on international telecommunications matters. One of the department's initial efforts will be to improve highway safety through the use of advanced telecommunications technology.

The Watchword Is Progress

Clearly, the range of DoT's mission is vast. The question is, can this new cabinet department with its restricted power act sufficiently quickly and efficiently to unravel the traffic jams on the ground and in the sky which are laying siege to the national mobility? Secretary Boyd says it can. He is gratified by the universal concern with transportation. Transport technology, in his view, is in a state of revolution and, if properly mobilized, capable of doing the job. He knows only too well that the transport policies which are being formed, or are not being formed, at this time may well spell the difference between progress and paralysis for generations to come. He is determined to make the choice one of progress.—END

THE SPACE AGE IN PERSPECTIVE

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SPACE

DIGEST

VOLUME 10, NUMBER 6 • JUNE 1967

Speaking of Space

By William Leavitt67

The Apollo disaster has not only delayed the moon-landing program but has also cut into its follow-on Apollo Applications orbital program, which should have preceded the mission to the moon in the first place. This is part of the price being paid for the politicality of the original Apollo moon-landing program decision.

The Aerospace Industry and the Public Interest

By Karl G. Harr, Jr.74

The aerospace industry, while continuing its prime function of serving defense and space requirements, is emerging into the larger marketplace and offering its skills in the solution of various nagging public problems. It is vital that government take the broad view and encourage aerospace efforts in these nonmilitary, nonspace fields.

Science—The Wellspring of Our Discontent

By Dr. Walter Orr Roberts78

If we ever needed optimism, we need it now, especially the optimism of science with its potential for helping us attack creatively and forcefully the enormous problems that have been created by the pace of science-based progress.



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Speaking of Space

The Apollo investigation and the reams of testimony on Capitol Hill are now all on the record and the program will proceed under tighter management. The cost is high—delay not only in the moon mission but in the follow-on earth-orbital Apollo Applications program, which should have preceded the moon-landing effort in the first place. We are paying the price of having put the cart before the horse back in 1961 . . .

APOLLO: A High Price For a Political Decision

BY WILLIAM LEAVITT

Senior Editor/Science and Education

IT IS about four months since the shocking Apollo capsule fire on January 27 at Cape Kennedy that killed Astronauts Virgil Grissom, Edward White, and Roger Chaffee. The National Aeronautics and Space Administration's investigation of the disaster is now on the record, as are the reams of testimony on Capitol Hill by NASA Administrator James E. Webb, his agency associates, and the representatives of the prime Apollo contractor, North American Aviation. But there are still basic issues that need to be explored.

There is no doubt that NASA has confessed error and complacency and that North American has done the same. Nor is there much doubt that in future Apollo operations great care will be taken, through the use of safer materials and tighter management, with emphasis on quality control and safety procedures, to prevent a recurrence.

But are the investigations, the testimony, the new procedures, the addition of new members to the Apollo and its follow-on Apollo Applications programs enough to revive the public's faith—so badly shattered by the disaster—in the judgment of the planners of our national space effort?

It is a nagging question, but it needs to be asked. And more importantly, it needs to be answered. To pose the question is in no way to reflect on the dedication, or even the competence, of all the aerospace engineers and managers and technicians, in and out of government, who have achieved so much in the way of unmanned and manned space capabilities.

It is rather to ask if, to some degree at least, the very rationale on which the space effort has been based has really been a sensible one. There are strong indications that the Apollo disaster was in part the consequence of the inevitable pressures of the landing-on-the-moon deadline that has hung over NASA and its industrial contractors since the Apollo program was announced in 1961.

The commitment to go to the moon first—and

then backtrack into large-scale manned earth-orbital operations, as represented by the NASA Apollo Applications program—was a political decision made in the aftermath of the 1961 Bay of Pigs debacle and the epochal orbital flight of Russia's Yuri Gagarin. That commitment put enormous pressures on NASA, pressures which have continued relentlessly to this day. NASA itself has admitted that it was time and the desire to avoid complexity that ruled the decision to use pure oxygen in the Apollo environmental system, instead of going to the safer oxygen-nitrogen mix that will eventually be used aboard long-term operational spacecraft. That NASA decision was taken in the face of North America's recommendation of a two-gas system for Apollo.

There is no question that when the late President Kennedy gave the moon-landing assignment to the space agency the task was theoretically feasible. But not much more. That is where the trouble began that culminated in the tragedy of January 27. The enormous pressure for time-critical decisions made inevitable the kind of planning troubles that technical people should not have to cope with.

In jumping directly from the relatively modest Gemini orbital program to an assault on the moon, and skipping, for all practical purposes, what should logically have been the intermediate step, the development of extended manned earth-orbital capability, we bit off more than we could chew. Looking back at the history of Apollo, the haste with which it was approved without question in Congress, the arguments between the advocates of earth-orbital rendezvous and lunar-orbital rendezvous, the management struggles between the NASA headquarters in Washington and the strong-willed directors and staff of the NASA field centers, it seems nearly miraculous that the program has gotten as far as it has.

But at what price? It is revealing in this connection to note the testimony of NASA's Deputy Administrator Dr. Robert C. Seamans, Jr., before the Senate



—Wide World Photos

National Aeronautics and Space Administration witnesses, led by space agency Administrator James E. Webb, second from left, testify before the Senate space committee on the agency's plans for corrective actions in the wake of the Apollo disaster of January. With him are (from left): Dr. Robert C. Seamans, Jr., Deputy Administrator of NASA; Dr. George Mueller, NASA manned spaceflight chief; and Maj. Gen. Samuel C. Phillips, USAF, Apollo program director.

space committee during the agency's final report presentation on the Apollo disaster.

Dr. Seamans was reassuring the senators that the Apollo before-the-end-of-the-decade deadline might still be met. He spelled out probable dollar costs—some \$70 million—of the changes in hardware that would be required as a result of the accident.

"I believe that a lunar landing before 1970 remains possible. The impact of the Apollo 204 accident has been to reduce that probability, not eliminate it," he declared, as he described the adjustments and delays in the flight program of Saturn I and Saturn V boosters that will lead to the eventual moon-landing mission.

But then he went on to comment on the impact of the disaster on the NASA Apollo Applications program, which, starting in 1968, was to have led to wide-ranging manned earth-orbital capabilities in missions from weather observation to astronomy.

"The impact of the Apollo 204 accident, together with current assessment of readiness for the Orbital Workshop and the Apollo Solar Telescope experi-

ments, led to a slightly different organization of program elements than that projected at the time of the Fiscal 1968 budget," Dr. Seamans said.

One result of this reprogramming, he said, has been the decision to include in "mainline" Apollo earth-orbital flights "only those experiments relating directly to the eventual lunar mission." Another result has been "the need to reconsider the use of the Apollo prime spacecraft contractor for experiment integration and spacecraft modification required by the individual Apollo Applications orbital missions."

All this is governmentese for announcing that the Apollo disaster has delayed the moon landing by many months and that these delays and their costs in money and talent will complicate and delay the Apollo Applications program, which NASA had fought so long and so hard to get okayed.

There is great irony here, since, as Dr. Seamans himself put it to the senators, "through Apollo Applications we will identify what are the goals and rewards that mastery of the space environment can offer—and at what cost and for what returns."



Spaceflight veteran and one of the original NASA astronauts, Capt. Walter M. Schirra, USN, will head the three-man crew to fly the first manned Apollo mission in 1968, delayed a year as a result of the January disaster.



Civilian astronaut, Walter Cunningham, will also be a member of the first Apollo manned mission crew. The first man-rated Apollo "Block II" spacecraft will be delivered to Cape Kennedy late this year, NASA says.



Maj. Donn F. Eisele, USAF, rounds out the new crew for the first Apollo manned mission. The Navy-Air Force-civilian trio of astronauts replaces the three astronauts who lost their lives in the Apollo capsule fire in January.

In short, we have, as a consequence of a decision back in 1961 which we're stuck with now, reaped a bitter technological harvest: a delayed moon-landing program and a delayed earth-orbital program that should, by all logic, have preceded the moon-landing program in the first place.

But we are stuck with it. There is no point in turning back on the moon-landing effort now. The important lesson is that putting the cart (landing on the moon) before the horse (building the extended manned capabilities in orbit that would have led logically to a moon flight based on much more experience) was a sacrifice of technological good sense on the altar of political expediency. For Apollo, the lesson is too late; but in developing post-Apollo plans, the lesson should be remembered.

It should be added that even if Apollo had proceeded to its completion without any troubles at all, it still would have been an ill-considered decision. We still would have put large-scale orbital operations after the moon landing.

In the meantime, NASA, striving as it is for a renewed vote of confidence from the public, would do well to understand the benefits of candor as it scales the final heights of the Apollo mission.

It is unlikely that the public understands the enormous difficulties that attend the execution of the Apollo plan. This is not surprising, since NASA has never spelled them out clearly. No matter what reorganizations occur in the agency, no matter how NASA headquarters tightens its direction of both its field centers and all the contractors working on Apollo, it is still a fact that the Apollo mission, as planned, is a very-high-risk operation.

Three astronauts are expected to fly from earth orbit to lunar orbit, then to drop gently onto the moon's surface a lunar excursion module carrying two of the party. The manned lunar excursion module must work perfectly without ever having been tried out under the same exact conditions. It must later

effect a perfect ascent and rendezvous with the orbiting "mother ship." The crew must then successfully jettison the lunar excursion module and fly home to an extremely narrow reentry path with an uncomfortably small margin for error. This is asking a great deal of man and machine. It is depressing to think of the chances for failure all along the line—no matter what the record of quality control and simulation success prior to the main mission.

Candor, it must be admitted, is not the usual currency of large government agencies, and it is perhaps too much to hope that NASA will be as frank in the future as it should be with the public and with the Congress.

The matter of the now-famous Phillips report, which caused such a stir during the Apollo investigation on Capitol Hill, is a depressing case in point. In late 1965, Air Force Maj. Gen. Samuel C. Phillips, who is Apollo program director for NASA, submitted to North American Aviation a series of criticisms of the Apollo's prime contractor's operations—the kind of critique NASA says it has made of many of its contractors. To the great irritation of several House and Senate space committee members, the existence of this report was at first virtually denied. At least two legislators, Rep. William Fitts Ryan, Democrat of New York, and Sen. Walter Mondale, Democrat of Minnesota, obtained copies of versions of the document, which ruffled NASA. Meanwhile, under pressure, Mr. Webb provided a summary of the report to Rep. Olin Teague, chairman of the House space committee's Subcommittee on NASA Oversight, and that summary was released to the public. Mr. Webb also finally offered to discuss the report in detail in executive session with the Senate space committee membership. But that was only under pressure, too.

The public and the press, watching this circuitous drama, could not help thinking that NASA had something to hide and that the contents of the mysterious

Vociferous in his demands that NASA reveal contents of the "Phillips Report" was House space committee member Rep. William Fitts Ryan, Democrat of New York.



On the Senate side, it was Sen. Walter Mondale, Democrat of Minnesota, space committee member, who first brought up the subject of the report in questioning of NASA witnesses.



report were somehow specifically connected with the Apollo disaster, which was not the case.

All of this could have been avoided in the first place by a candid admission all around that indeed such a report existed and that NASA was willing to reveal its contents in executive session with both the House and Senate space committees.

Mr. Webb would not have it that way. And it cost him and NASA dearly, as witness the House space committee's \$110 million in cuts of the Fiscal 1968 NASA budget—the largest slashes by the committee in several years. This action came after the completion of the Apollo investigation.

Space Capsules . . .

Research continues on the feasibility of jelled aviation jet fuel, considered by many experts as a major potential breakthrough in air safety. A Pratt & Whitney commercially certificated engine, the JT12 turbojet, has successfully run on jelled fuel in an eight-hour test in a program sponsored by the aerospace firm. A number of government agencies have been working on jelled-fuel research. The US Army is reported to be especially interested in jelled fuel for combat helicopters and reconnaissance aircraft as a result of experiences in the Vietnam War, where snipers and machine gunners have ignited the fuel tanks of low-flying aircraft.

The RAND Corporation (see "RAND, The Air Force's Original 'Think-Tank,'" AIR FORCE/SPACE DIGEST, May 1967) has a new Vice President. Dr. Marvin Stern, a former consultant to RAND and until recently President of Kearfott Systems Division of General Precision, Inc., and former Vice President, Research and Engineering, North American Aviation, Inc., has been named to the newly created post of Vice President for Programs of the Santa Monica, Calif., based research corporation. Dr. Stern has also served in the Department of Defense as Assistant Director, Strategic Weapons Office, and

later as Deputy Director of Defense Research and Engineering, Weapon Systems.

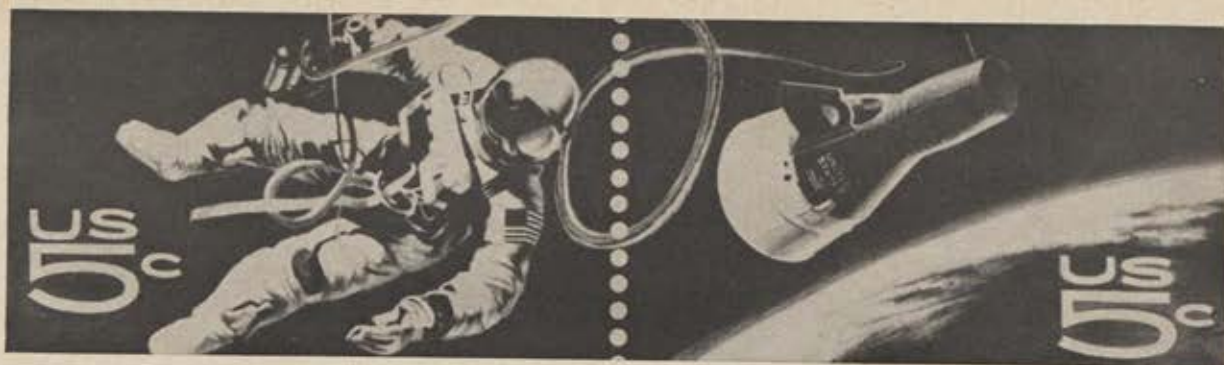
The Air Force has announced the addition of fifty more high schools around the country to its new Junior ROTC program (see "Air Force Junior ROTC: A Special Report," AIR FORCE/SPACE DIGEST, March 1967). The fifty new participating schools bring the national total of schools taking part in the Junior ROTC program to seventy. The program was authorized by Congress in the ROTC Vitalization Act of 1964.

The new schools are:

Salpointe High School, TUCSON, ARIZ.; Blytheville Senior High School, BLYTHEVILLE, ARK.; Texarkana Senior High School (also serving Washington High School), TEXARKANA, ARK.; Anderson Union High School, ANDERSON, CALIF.; Arcadia High School, ARCADIA, CALIF.; Compton Union High School, COMPTON, CALIF.; Black-Foxe School, LOS ANGELES, CALIF.; Oakdale Joint Union High School, OAKDALE, CALIF.; El Dorado High School, PLACENTIA, CALIF.; Moreno Valley High School, SUNNYMEAD, CALIF.; Central High School, AURORA, COLO.; Danbury High School, DANBURY, CONN.

Deland High School, DELAND, FLA.; Choctawhatchee Senior High School, FORT WALTON BEACH, FLA.; Bay County High School, PANAMA CITY, FLA.; Wayne County High School, JESUP, GA.; Annex-Champaign High School, CHAMPAIGN, ILL.; United Township High School, EAST MOLINE, ILL.; La Salle-Peru Township High School, LA SALLE, ILL.; Lincoln-Way High School, NEW LENOX, ILL.; Highland Senior High School, HIGHLAND, IND.; Danville High School, DANVILLE, KY.; Trinity High School, LOUISVILLE, KY.; S. D. Lee High School, COLUMBUS, MISS.

Southfield Senior High School, SOUTHFIELD, MICH.; Ruskin Senior High School, HICKMAN MILLS, MO.; Jefferson City Senior High School, JEFFERSON CITY, MO.; Bellevue Senior High School, BELLEVUE, NEB.; Clovis High School, CLOVIS, N. M.; Mayfield High School, LAS CRUCES, N. M.; Walter M. Williams High



—Wide World Photos

The Post Office Department has released the design of a new stamp marking American achievements in space. It is twice the size of the usual US horizontal commemorative issue. The stamp shows a space-walking astronaut linked to his spacecraft. A vertical perforation splits the twin-sized stamp into two five-cent stamps. According to the Post Office, this is the first twin-style stamp design ever produced by the United States, which should appeal to collectors. The new space stamps will go on sale for the first time on September 29, at NASA's Kennedy Space Center, Fla.

School, BURLINGTON, N. C.; Independence High School, CHARLOTTE, N. C.; Southern Wayne High School, DUDLEY, N. C.; West Carteret High School, MOREHEAD CITY, N. C.; James B. Dudley High School, GREENSBORO, N. C.; Kenmore High School, AKRON, OHIO; Walter E. Stebbins High School, DAYTON, OHIO; Sooner High School, BARTLESVILLE, OKLA.; Marshfield High School, COOS BAY, ORE.

Hopewell High School, ALIQUIPPA, PA.; North Allegheny Junior-Senior High School, PITTSBURGH, PA.; William Tennent High School, WARMINSTER, PA.; McClenaghan High School (also serving Wilson High School), FLORENCE, S. C.; Spartanburg High School, SPARTANBURG, S. C.; Lincoln High School, SUMTER, S. C.; Holy Cross High School, SAN ANTONIO, TEX.; Richfield High School, WACO, TEX.; Orem High School, OREM, UTAH; William Flemming High School, ROANOKE, VA.; J. M. Weatherwax High School, ABERDEEN, WASH.

Chief Master Sergeant John M. Hatcher—honored by the Air Force Association in 1964 as Tactical Air Command's "Outstanding Airman of 1964"—makes Air Force history this month as the first airman to receive a doctorate while on active duty. He received his Ph.D. in American history from the University of Cincinnati.

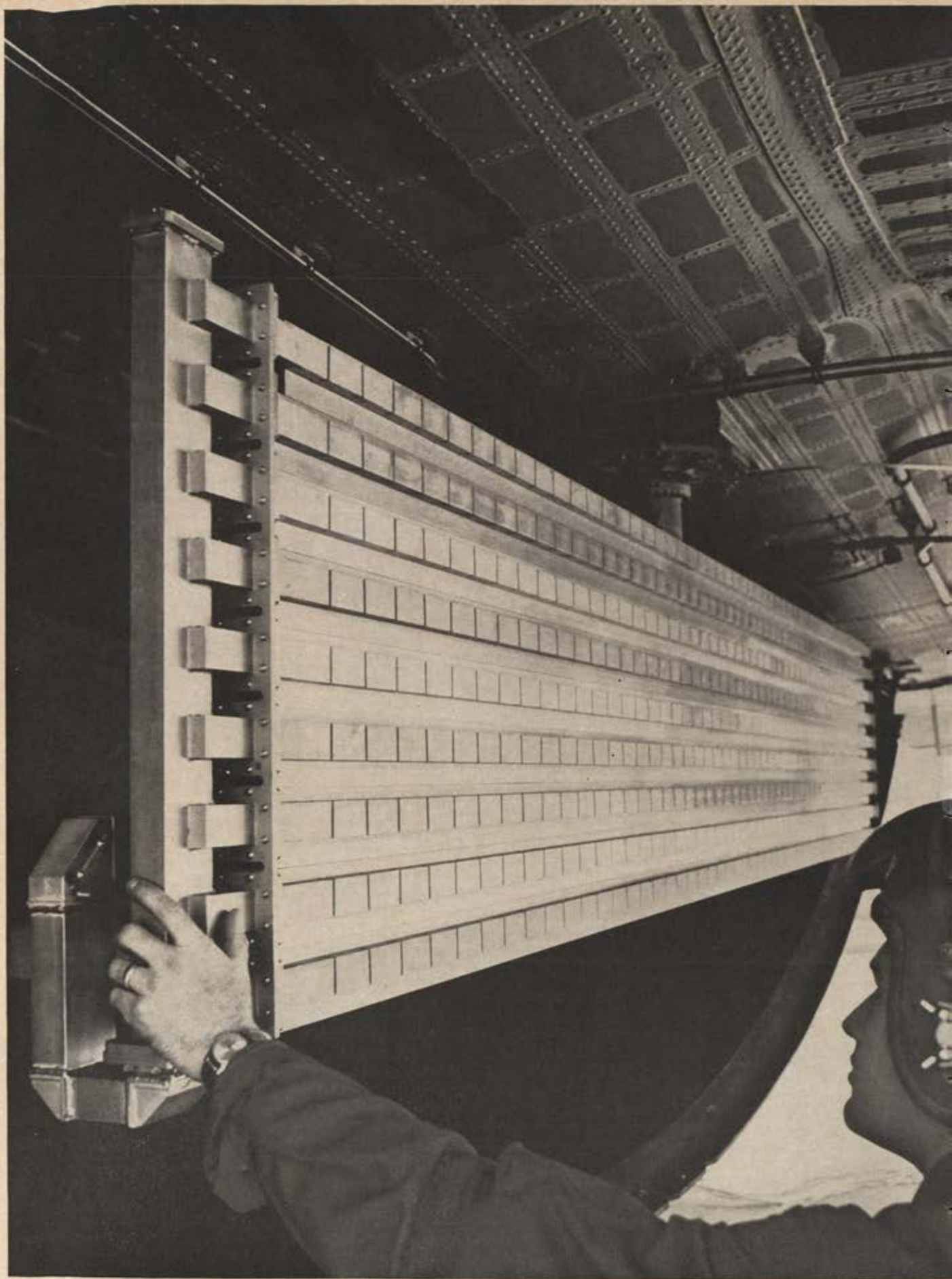
Currently assigned to Hq. US European Command at Stuttgart-Vaihingen, Germany, the forty-two-year-old Hatcher has, since his enlistment in the Air Force in 1943, been earning college credits in off-duty time for the past twenty years. He earned his Bachelor of Arts from the University of Omaha in 1962 under USAF's Operation Bootstrap program. In 1964, while stationed at Dyess AFB, Tex., he completed his requirements for his master's degree at Hardin-Simmons University, Abilene. That same year, with Air Force approval, he accepted a full tuition scholarship at the University of Cincinnati to work on his doctorate. His doctoral dissertation was on the career of the late Chief Justice Fred Vinson.

A sixteen-year-old reader of AIR FORCE/SPACE DIGEST, we are happy to report, has recently won a national competition in computer programming with a 148-page paper entitled "A Rendezvous and Docking Simulation from Liftoff to Splashdown." Richard

I. Baum, a senior at Abraham Lincoln High School in the Brighton Beach suburb of New York City, beat out nineteen other finalists in the competition sponsored by the Association for Educational Data Systems and won \$150 prize money. The twenty finalists were chosen from 500 entries.

Young Mr. Baum's mastery of computer techniques, extraordinary for his age, posed no special problem for the expert judging panel, but they did have a little trouble understanding the space side of his treatise. So they called in a physicist well versed in space technology to help them judge the student's paper. Mr. Baum plans a career in aeronautical engineering. He is the son of Maj. Abraham R. Baum, USAF (Ret.), now associated with the Graduate Division of the City University of New York as Assistant to the Business Manager.—END





Installed in the radome of an Air Force RC-121, new Westinghouse experimental overland radar antenna is made ready for actual flight tests.

**With this antenna
Westinghouse demonstrated
a significant breakthrough
in overland radar design.**

High-PRF* doppler radar has long been regarded by Westinghouse as the most effective system for tracking lower altitude targets against background signal clutter from the earth.

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Recently, Westinghouse met the challenge. Working with the Systems Engineering Group, Wright-Patterson Air Force Base, Westinghouse built and tested an antenna that practically eliminated side-lobe clutter.

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fact, every capability needed for our nation's airborne early warning and control systems.

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Although its main task continues to be the research, development, and production of defense and space systems, the aerospace industry has emerged into an even larger marketplace in which it is responding to the needs of the public sector for solutions to the burgeoning problems of urban design, education, pollution control, and information systems—among many others. It is vitally important that government take the broad view of the industry's capabilities in these areas and encourage the industry's efforts . . .

The Aerospace Industry and the Public Interest

BY KARL G. HARR, JR.

JUST AS the scope and complexities of our times increase, so do the pressures on us. If we accept, for example, [the idea] that technological advance is essential to the continued security and well-being of the American people, then we must recognize the need for ever-increasing creative genius as we push deeper and deeper into the unknown. If we [believe] that the nation must exploit its most advanced industrial and technological capabilities for social and environ-

mental improvement, then we must accept the need for greater imagination in devising ways and means of bringing this about. If we accept the proposition that keeping our particular free and open political and economic system working as best it can in the national interest provides the best hope available for the attainment of our objectives in the tumultuous and dynamic years ahead, then we must accept the need for a degree of soundness of judgment, depth of thought, and clarity of perception such as has never been called for before. . . .

I wouldn't trade the demands and opportunities of these times for those of any other. No engineer or scientist has ever been faced with such exhilarating challenges to his creative ability as are those who are facing them today. No architects, city planners, businessmen, sociologists, scholars, or politicians have been faced with such exhilarating challenges to their constructive imaginations as those of today. And no statesmen, either in government or out, have been faced with such exhilarating demands on their capacity to analyze and reason clearly as those faced with the task of keeping our system operating in today's and tomorrow's world. The only ones we can envy are those younger than [us] who will face the even greater challenges and opportunities of tomorrow.

Of course nobody today has all the answers as to how the system may best be kept operating on into the future. Yet we can certainly all agree that such





is the objective and that its attainment is vital, and perhaps we can agree on some of the key questions we should be asking.

Perhaps we can also accept the responsibility for the manner in which we approach the subject. If ever steady, sober dialogue was called for, it is in regard to this increasingly difficult problem. Emotionalism and slogans just won't do. The stakes are too high and the problems too hard. Also there are really no white hats and black hats involved. We're all in the same ball game, and we're all trying to make the system work as well as possible because it is our system, and we depend on it. So we cannot afford to let pollution of the intellectual air be added to our other pollution problems.

The aerospace industry provides a useful case study of the problem of keeping our system in balance. It itself is constantly changing at least as rapidly as any other major element of our system. It has an interface with the governmental part of the system that is unique both as to size, intimacy, and duration. Nevertheless, it also has moved deeply into the mainstream of the rest of the system, not only because of its traditional involvement in such rapidly expanding fields as commercial transportation and general aviation, but also because of its substantial beginnings of involvement in a wide new spectrum of varied commercial and socioeconomic activities. It is uniquely in the forefront of technological advance, and yet it is also identical with any other private in-

dustry in that it is directly and completely subject to the disciplines of corporate existence in the private economy. It must compete in the commercial marketplace for capital, resources, and talent.

In short, almost no element of our total system fails to interface, and interface importantly, with the aerospace industry.

For that reason, I submit, it is clearly in the public interest that the aerospace part of the system continue to function as well as possible in the years ahead. Many key elements of our system in fact literally depend upon the aerospace industry's continued successful fulfillment of its promise.

Why shouldn't it fulfill its promise? What stands in its way? I suggest really only one thing. A small black cloud on the horizon, no bigger than a man's hand, stems from the fact that as the business of "seeing the problem" gets more difficult, the easier it becomes to make a fatal mistake. It is getting easier and easier to stumble into error.

Lengthening lead times between cause and effect place an ever-greater premium on early recognition of emerging problems, and failure to recognize them early can put you quickly beyond the point of no return. This can be true of a company, of the industry, or of a relationship between the industry and another element of the system with which it significantly interfaces.

I might cite as an example of the latter danger a change in the nature of the aerospace industry which

must be understood by the government if the considerable relationship that exists between the two is to be soundly viewed. I refer to the degree in which the aerospace industry, really quite recently, has emerged into the total marketplace, the total world. This is a sign of the expanding role of technologically advanced equipment in the mainstream of life in the modern world. It is a very happy and positive development from the point of view of the industry and of the total system to which it contributes. It is also extremely beneficial to that portion of government which relies upon the industry for its defense and space equipment. Finally, it offers perhaps our society's best chances of finding adequate solutions to the principal environmental problems that beset our cities. But it must also be said that it changes the nature and scope of the contribution of the aerospace industry to the public interest. No longer confined to serving merely the narrower public interest of defense and space programs, the industry is rapidly becoming a major contributor to a much broader public interest, with even greater potentials clearly lying ahead.

If it ever was a captive industry, such is no longer the case, and all concerned are better off for that fact.

However, this is where the problem comes in, or might come in. For in the course of this considerable and rapid broadening of its base the industry is undergoing a very severe test. Failure to recognize the nature and degree of this strain could lead to the one kind of mistake that is most serious in today's context. Namely, the mistake of having one element of the system, in pursuit of its objectives, trespass so substantially on the vital interests of another element as to seriously or even fatally injure that other element and thus significantly damage the whole system.

This can happen if, for instance, the Air Force or the Department of Defense were to so tie the hands of industry as to cripple its ability to make its full contribution. It can happen specifically if, in order to carry their own interests to the absolute, they fail to allow for the needs of the industry to develop and sustain its broader capability for growth.

We know that they wouldn't want this to happen, any more than we in the industry desire to fall, for lack of judgment, vision, or perspective on our own part, into a rigid or dependent pattern which means we ourselves will have failed of our promise. However, it wouldn't take much of a miscalculation in "seeing the problem" or seeing it in time to effect such a result.

I cite this example merely as a suggestion of what could happen and as a prelude to the real job at hand, which is to start posing the hard questions.

These are not questions to which I have answers, nor are they rhetorical. I select them only as some of the real questions which we must try to answer as we go along if we are to keep the system operating in optimum or even adequate fashion:

- What are we really trying to do with our industrial capabilities in the public interest?
- How can we best make sure that ten years from now or twenty years from now we will have so enhanced our industrial capabilities that they can make

their optimum contribution to our enhanced national needs?

- How do we best get at the most advanced capabilities of industry, wherever found, for broadest application in the public interest?

- How do we make sure that the inevitable lengthening of lead times does not destroy innovation or block advance by locking us in one place too long?

- Finally, what steps can we take to best ensure that our continuing public dialogue and discussion will remain focused on those things most productive in terms of public interest?

Less directly involved, but perhaps equally important in the long run, are questions addressed to the future in terms of the people who will make that future. For instance:

- How do we make sure that we will continue to have an industry and an industry/government relationship of optimum attraction to young people?

- How do we best keep up individual motivation, not only at the top but from top to bottom?

- How do we avoid crippling rigidities by any element of the system, whether imposed upon itself or by another element of the system?

These, I suggest, somewhat at random perhaps, are the kind of questions that all of us should be asking and seeking the answers to. Sometimes we are so bound up in the vitally important technological problems that we forget the nontechnical side. We forget that perhaps the political science of the government/industry relationship is becoming as important as the technical and business know-how.

We are most acutely aware of these dangers in the aerospace industry, poised as we are, in most respects, in the vanguard of pioneering these questions; but we also feel they are pertinent to the whole of American industry, to the major problems that will face government, and in fact to the fundamental question as to whether our total system will continue to best serve the public interest.

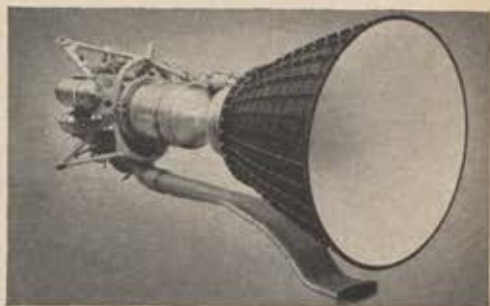
As the twig is bent the tree will grow, and, to some extent at least, we feel that the bending of the aerospace twig will presage the shape of the total industrial tree of the future. All of which points up the importance in our eyes of initiating a continuing dialogue involving all elements of the system to ensure the best chances of accomplishing what we all desire—to make the system work best for all in the public interest. It's our country, it's our system, and it's our future. In the nature of things, the job's going to be tougher and tougher as we move along. The answers will constantly change with the rapidly changing times, but the questions, if we pose the right ones, will endure.—END



Karl G. Harr, Jr., is president of the Aerospace Industries Association, a post he has held since 1963. He has spoken out often in recent months on the aerospace industry's potential contributions to solutions of problems in nonmilitary and nonspace fields. The above is excerpted from a recent speech by Mr. Harr at an Air Force Appreciation Day luncheon held in Tucson, Ariz., on March 10, 1967.

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The U. S. Air Force and NASA trusted Bell's Agena rocket engine on over 200 firings and refirings in space. It rewarded them with a 99.7% reliability record. The Agena engine helped establish the feasibility of rendezvous and docking . . . maneuvers on which the Apollo program hinges. It fired Astronauts Conrad and Gordon out to a world-record-high manned orbit of 850 miles . . . then returned them to their original 180 mile high orbit for re-entry to earth. Ranger (moon), Mariner (Venus and Mars) and Lunar Orbiter are three more of many vital and successful missions of the Agena engine. Today, Bell is developing the Lunar Module Ascent Engine, the rocket engine that will lift our astronauts off the moon on the first step of their journey back to earth. It is an engine with 3,500 pounds of Bell trust.



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Science—The Wellspring of Our Discontent

BY DR. WALTER ORR ROBERTS

President-elect of the American Association for the Advancement of Science

NEARLY every advance of science has two faces. One smiles on us and lifts the aspirations of man; the other scowls sternly on all future hopes. For the miracle of the modern automobile there is the rising scourge of air pollution that threatens to choke our Bosnywashes, our giant Boston-N. Y.-Washington megalopoli. The advance of urbanism, made possible by miracles of air conditioning and food transportation, brings us befouled rivers, vanishing privacy, and lives of strain and tension. For the miracles that atomic energy has wrought in medicine, industry, and power generation, there hangs over us the specter of nuclear war.

For, as Glenn Seaborg, [Chairman of the Atomic Energy Commission], has pointed out, "knowledge is born without moral properties. It is man who applies it according to his acquired patterns of behavior. . . . Man, not knowledge, is the cause of violence." And the power of science magnifies man's ability to achieve utopia or to destroy all that is civilized, or free, or beautiful. The examples are legion, and familiar to all of us.

Molecular biology, for example, offers exciting new prospects and, at the same time, serious moral problems. We can now begin to unfold something of the incredible workings of the purveyors of our genetic heritage; we also sense new hopes for cancer control, defective organ replacement, control of monogolism. But we can also see the shadowy portent of

Aldous Huxley's *Brave New World* of man-made, docile, semimorons for labor in semimoronic tasks, or of the replication of Einsteins or von Neumanns of the future, numberlessly and at will—but will it be for good or ill?

In my own field, the atmospheric sciences, we foresee bringing the entire globe under continuous weather observation by the mid-1970s—and at reasonable cost. And we envision, from this, vastly improved forecasting of storms, freezes, droughts, smog episodes—with attendant opportunities to avert disaster. But we can also see lurking in the beyond-knowledge of today an awesome potential weapon of war—the deliberate manipulation of weather for the benefit of the few and the powerful, to the detriment of the enemy, and perhaps of the bystanders as well. If such powers of weather control emerge—and this is not at all certain to be so—imagine the conflicts of purpose and interest even within a single nation, when the rains and the clouds and the clear days are influenced deliberately. Future work may even show us that unwittingly we have already begun affecting weather—with our jet airplane-induced cirrus blankets and our persistent continental hazes of man's making. . . .

Perhaps the most exciting still-dream-stage prospect involves the burgeoning of computer science. Our nation's largest and probably most rapidly growing industry is education. To my mind the greatest prospect for personalizing the educational process to

meet the individual needs of every student lies in the computer field, in related information storage, retrieval, and processing developments for education. But I suspect that nowhere in our whole science-based advance is there greater public fear and distrust than over the threat of the loss of human freedom to mechanization and regimentation through "do not spindle, fold, or mutilate." But like it or not, there will be giant strides in command and decision-making, automated and semiautomated—in war, economics, and other walks of life. We will likely know when the first intercontinental missile of World War III comes, should that happen, in a routine computerized check, on millisecond time scale, of the inventory of space debris; and the decision to retaliate, to enter total war, will probably be made on computer-based advice.

The Traits of Science

But I really want also to talk about something else having to do with the impact of science. I want to make a few observations about the way science is done, at least as I see it. It seems to me relevant to any discussion of the cultural impact of science or of the public understanding of science. Let me list, one after another, some of the salient traits of science and of the people who practice science.

- First, science is constantly, systematically, and inexorably revisionary. Science, by the rules of the game, is a self-correcting process and one that is self-destroying of its own errors. The rules of the game are essentially the same in every nation. It is the essence of the scientific way that none of the laws of science is sacred, but stands or falls by the degree to which it works, and by the effectiveness with which it simplifies the apparent complexity of what we see in the natural world about us. The examples of this are legion. One can trace, for example, the evolution of the notion of gravitation and of falling bodies through the work of Aristotle, who believed that heavier bodies have stronger force and fall faster—to the more general and illuminating discoveries of Galileo formulated in his early notions of acceleration, that called for light and heavy bodies to fall at the same rate, if irrelevant effects of air are discounted—to the views of Newton, who quantified and developed general laws of motion and of forces acting at a distance—down to Einstein with the magnificently general relativistic laws of falling bodies.

Here is the working of a self-revising science, which progressed over many, many years, steadily improving our ability to describe and to predict, with a minimum of *ad hoc* assumptions, what happens when bodies fall in space or in the atmosphere near the earth. It is characteristic of science that it pushes constantly into new and unfamiliar realms of experience, and that when it does so our older laws often prove inadequate and their predictions fail, requiring revisions. One of the prime joys of a scientist's life is to discover these inadequacies, and to develop the improvements that lead to more general laws.

It is because of this eternally revisionary nature that science is disruptive of the *status quo*. And the

accelerating pace of science hasn't made this any easier for society to absorb. Every year, the time from the development of a new basic principle to its working application grows shorter.

- A related trait of science is its destruction of idols, destruction of the gods that men live by. Science, being self-revising, has no absolute justice. It is not concerned with ultimate truths, but with useful, or simple, or aesthetically beautiful interrelationships among things apparently unconnected.

One example that comes to my mind is the notion in pre-Galilean times of the divinity and the perfection of the sun. This notion, much to the distress of the Church and of Galileo, could not be held on an absolute basis, and when the dogma of perfection of the sun was apparently contradicted by observations of sunspots and the obvious interpretation of those observations, something had to give. Galileo and the Church both suffered. But the new concept was far more useful, and ultimately simpler.

To live comfortably with science it is necessary to live with a dynamically changing system of concepts. It is necessary to live with enough conservatism to resist the easy abandonment of concepts, but enough flexibility to be able, when necessary, to switch rather than fight.

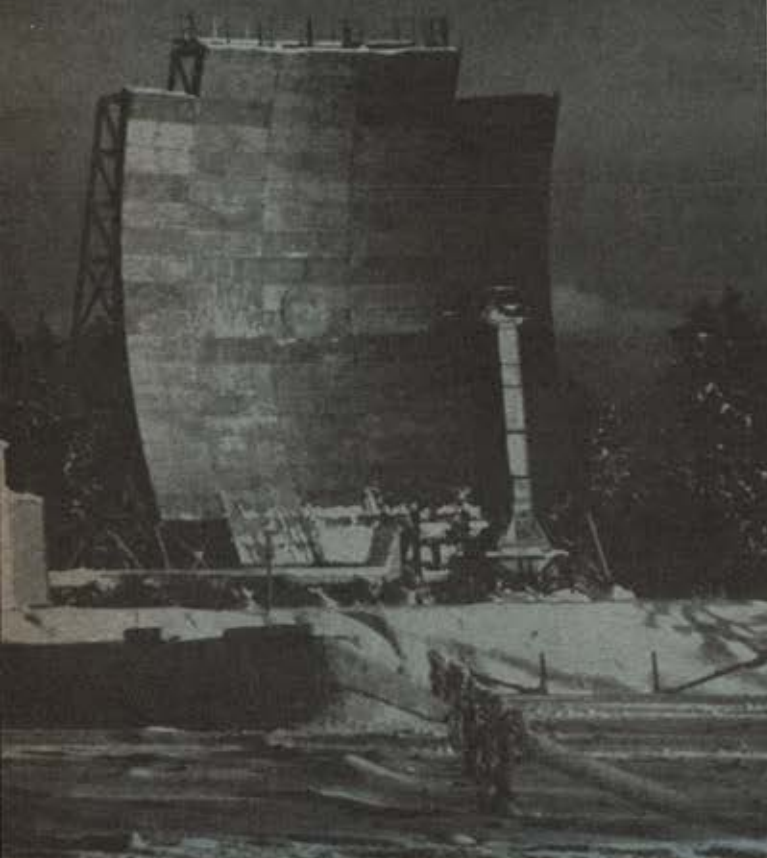
In this same way science forces us—through geology, astronomy, meteorology, and physics—to resign ourselves to making poetic or allegorical interpretations of the literal statements of our most respected cultural authorities—as for example the statements about the origin of the earth that are found in the Bible. There are so many examples of this—the genesis, the day the sun stood still, the parting of the Red Sea, and many others.

In the same way, science has a way of weakening old and respected bonds, like the bonds of family in Japanese and Chinese culture, teacher-student relationships when machines begin to teach, or the relationship of the boss and the employee in automated plants. Science tends to destroy witchcraft in Salem and white supremacy in Mississippi.

- Not only are the tenets of science constantly subject to challenge and to revision, but its prophets are under challenge too. For example, we have, many of us, observed and enjoyed the stimulating intellectual exchanges between George Gamow with his "big-bang theory" and Fred Hoyle with his continuous-creation theory of the origin of the universe. To a nonscientist this disagreement, however, can be a source of great distress. How can these two experts disagree on matters of exact science!

And we have seen how the law of conservation of mass had to be modified and become the law of conservation of mass-energy when the relativistic physics of Einstein emerged. But this revision of scientific "laws" often confuses the layman, who has been taught to think that scientific laws are of nature and not the whim of man. He can't understand why scientists should disagree. And I suspect that one of our big jobs is to make understandable to the general public the reasons why and the limits within which the prophets of science can disagree, argue, and take sides—and what is meant when a "law" is refined or abandoned.

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- Further, the findings of science have an embarrassing way of turning out to be relevant to the customs and to the civil laws of men—requiring those customs and laws also to be revised. For example, the growing knowledge of psychology has forced changes in the laws governing insanity and the rules regarding confinement of patients in mental hospitals. The development of tranquilizers and other drug therapy has even affected the customs of business management and the pulling power of the image of the uncompromisingly tough business executive. Likewise our rules of punishment and control for alcoholism, and the use of marijuana, tobacco, or LSD, sometimes require changes as a result of new scientific findings about the use of these substances. The advance of medical science can also bring us real embarrassment in these fields, because penal codes are often geared to a system far slower to adapt to change than fits the pace of science.

Changing Our Views

We are called upon to change even our notions about what is proper or best in the education and the discipline of our children, as we face new findings regarding the nature of intellectual growth, or the tender age of most productive personality development.

- Certainly, we have seen spectacular changes in the concept of private property and of national borders as we have moved into the space age. For example, at what height above a country is it perfectly all right to fly a satellite without consulting the country it flies over? At what height does it become an invasion to fly an airplane or a balloon? Camera-equipped military or civil satellites do not violate the territory of nations, but U-2 airplanes are quite another matter.

Who needs to be consulted, for example, before a single nation tests globe-circling "needles" put into the atmosphere to reflect radio signals? Very strong feelings arose about this matter just a few years ago in the International Astronomical Union.

How do we deal with the conflicts between the State of California and the State of Colorado over the water of the Colorado River? Colorado designed its contracts with California in the absence of secure knowledge about the science of hydrology and of river runoff. What are its obligations to live up to its prior contracts, if future science shows that they were based on very bad scientific reasoning and evidence?

Or cloud-seeding—whose water has been wrung out of a cloud on the western slope of Colorado's continental divide? Who assures the rancher of the Great Plains that he has not thereby faced a drier summer? Whose air is it that the mainland Chinese contaminate when they test A-bombs? Whose radio quiet is shattered by the generation of artificial Van Allen radiation belts? Whose right is it to fluoridate the water of a major city, or to generate radioiodine in the atmosphere?

- Moreover, the pace of technological advance gravely threatens the bountiful and restorative power of nature to resist modification. It takes just so many

years for a tin can to rust away or for a sand-born glass beer bottle to go again to sand. Polluted air from gigantic supercities can spread beyond the borders of whole states and cannot be rapidly enough cleansed by the rains and the winds and the curative breathing of plants. Fouled rivers, harbors, and beaches contaminate our food supplies, spread disease, violate the beauty of the out-of-doors, which the space age gives us ever more leisure to enjoy, could we but find it.

For these reasons many nonscientists would like moratoria placed on science for awhile—but this is almost certainly impossible. What are the alternatives?

- Another trait of science that leads to much hostility or misunderstanding by the nonscientist is the fact that science is practiced by a small elite. Worse yet, the scientists who make up this elite are hard for others to understand. They are obscure, if not threatening. These scientists have a special language, verbal and mathematical, all their own. They use common words in unfamiliar ways, and in strangely straitjacketed senses. When they speak about truth they are not speaking about absolute truth. And their language of mathematics is mixed up in ordinary sentences so that it often becomes difficult, abbreviated, and abstract for others to understand.

Too, this small scientific elite has cultural patterns discernibly different from those of the rest of society. For example, a good many scientists do their science for fun—while to much of the rest of the world it seems like expensive or almost capricious fun. It looks like fun with other people's money and lives.

Within this scientific elite uncertainty is a daily actuality, and sometimes scientists don't seem to others to be sufficiently worried by this uncertainty. To the outsider, they often look irresponsible. Their strange and inconstantly held concepts are to them matters of interest, like the plays of a chess game. Knocking down sacred principles is a matter of challenge and of satisfaction. They often deny familiar concepts for the sake of argument, without even believing the denial. Their reasons for rejecting concepts are often hard to explain to nonscientists. They seem frivolous, or authoritarian—as witness the great uproar about the almost universal scientific repudiation, a few years ago, of the popularly appealing concepts of Immanuel Velikovsky and his *Worlds in Collision*.

This whole business tends to breed among laymen suspicion and distrust of scientists. It sometimes leads to fears that the scientists are "mad," "irresponsible," "Red," or "far out."

And all of this would be a problem even if it were not also painfully true that scientists, in addition to being members of an intellectual elite, are also people. They have, alas, all of the foibles, jealousies, ambitions, and weaknesses of other people.

It is particularly unfortunate that an air of distrust of science and its practitioners occurs just at this juncture in time, when the universality of the language of science—the ability to communicate with each other possessed by scientists of all countries—offers the hope of bridging the deep political abysses between the East and the West.

And it is still worse because if ever in history we needed optimism, we today need the optimism of science. We need it to give us the courage to tackle creatively and forcefully the awesome problems pushed on us by the pace of science-based progress. Think, for example, of the world population explosion that will bring 400 million people in the United States by the year 2000, and that means that half of the earth's people will be of Oriental race in the not-so-distant future when world population reaches ten billion.

The problem is still further compounded by the fact that progress—and optimism—are desperately needed in the social sciences. But the social sciences are under even deeper suspicion than the physical sciences, even though they are identical with these in formal construction. Maybe the problem here is that they deal with our pocketbooks. Certainly they are like other aspects of science—revisionary and revolutionary—and this means that in economic, social, and behavioral science fields there are big revolutions and revisions ahead. In these fields of science we are much closer to our Dark Ages, and the changes may be sweeping. In the sciences that deal with men's interactions, we still have unburned witches to deal with. There are many wrong turns ahead, in these sciences—but it is an essential of science to blunder down some of these wrong turns, to develop and to test wrong hypotheses. That is the way we get ahead. And the social sciences must not be thrown down the drain because of some of the essential blundering that will make real progress possible.

The Social Sciences

We have somehow to surmount the quaint, almost anachronistic misconception—not only in the general public but often within the ranks of the physical scientists—that the social sciences differ essentially from the physical because here we are dealing with *man*.

- The trait that to me seems the most socially important about science, however, is that it is a major source of man's dissatisfaction with the world as it is—it is a wellspring of man's discontent with the *status quo*. The implicit promises of science and technology are the heart of the present rebellion of the underfed and the underclothed. They give a clear, achievable prospect of food and comfort for all, if only all the people on earth become sufficiently determined to use science and technology to this end. Moreover, our Telstars and our radios, our color movies and our magazines, give the poor nations a way to know how poor they really are.

Surely fifty years will see the harvest of the major fruits of science and engineering in the underdeveloped regions of the earth, whether we in America like it or not. If we stand in the way of this irresistible impact of science on the developing cultural patterns, we will be destroyed. If we ignore the approaching tides of progress, we may find ourselves a small island isolated in a vast hostile sea.

But above all else, the thing for us to realize about the scientific revolution is simply that *it is*

here. We are now deep into the age of science. It cannot be ignored. Jet airplanes circle the globe in hours. Images of wealth or poverty, or of a particular political ideology, flash into millions of homes everywhere, instantly. Weapon systems can eradicate hundreds of millions of lives in minutes, and we have not been the only nation diligently applying technological skills to the problem of how to design and manage such weapon systems. . . .

It is here! This age of science. And with it some of the most compelling ideas of mankind. The magnificent structure of the relativity theory of Einstein, a notion that has stirred the very foundations of our thinking, a creation of beauty that ranks with the greatest of Beethoven. Or the incredible principle of indeterminacy of Heisenberg, with its idea of the unavoidable uncertainty of definite knowledge about particular events in nature. This is a challenging notion that sets limits on the knowable.

Or the thrilling concept of the continuous creation of the universe, with its picture of stars and men coming and going through an infinite span of time—yet living always in a place in space that appears to its inhabitants but a few billion years old.

It is here, this age of science! And with it comes its promise of what the life of man can be, with food for all, with education, with human freedom, with a stable population. With this age of technology comes the realistic expectation that even the added billions can live in harmonious equilibrium with a natural environment of quality, and one that man can appreciate the more because he knows what a rare thing it is in the universe. For man life need not be nasty, brutish, short—but a life rich with peace of mind and rewarding leisure tasks, with comfort and health, and with a language that transcends political ideology.

But to bring to substance this great dream for humanity we must know that this is what we really want and be willing to work to achieve it. To a tragic degree we in the West have drifted, not so much for lack of willingness to pay the price, but for lack of knowing what it is that we really wanted—aside from factories, and a rise in the standard of living.

In our explosively changing world it is no longer sufficient to live with philosophies or religions simply handed down from an older generation. We must take up a vital, flexible, and ever-evolving concern about the nature and purpose of man, and about what constitutes a good life and a good society in the light of today's communications, population growth, races, political systems, weapons. We must exhibit a concern with philosophy that is geared to the chain-reacting growth of science, and that is consonant with the impact of science on man's changing conception of himself and his world.—END



Dr. Walter Orr Roberts is Director of the National Center for Atmospheric Research at Boulder, Colo. A noted solar astronomer, he is the President-elect of the American Association for the Advancement of Science. The above was excerpted from a longer article in the spring 1967 issue of The American Scholar and appears here with permission.



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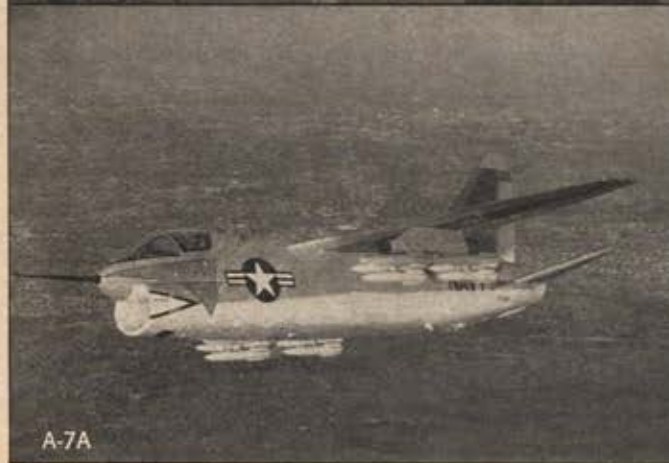
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"The link between the Wright brothers and today's astronauts" was one way he was described after his death April 25 at the age of 87. He was the nation's first military flyer . . . the first to fly combat, in the 1916 Punitive Expedition in Mexico . . . first to lead an all-American squadron into battle in World War I . . . first pilot to be Chief of the Army Air Corps . . . and first in the hearts of airmen the world over. He was a unique figure in the pages of Air Force history and lore . . .

AIR FORCE

JUNE, 1967

BENNIE FOULOIS—1879-1967

By Richard M. Skinner

MANAGING EDITOR, AIR FORCE/SPACE DIGEST

THE LINK between the Wright brothers and today's astronauts" was the way the newspapers described him after his death April 25 at the age of eighty-seven.

He was, of course, Maj. Gen. Benjamin Delahauf Foulois (Retired), pioneer airman and first pilot to become Chief of the Army Air Corps. Bennie Foulois.

He retired from military service in 1935—before most of the pilots now flying combat in Vietnam were even born. But Bennie Foulois never really left the Air Force. His career after "retirement" became one giant speaking tour—talking to audiences and individuals all over the world about airpower, its past, which he knew so well, and its future, which he foresaw with clarity.

From 1960 to 1964 alone he traveled more than a half million miles on Air Force speaking tours. It was in 1964 that General Foulois was given a solid gold Air Force Medal of Recognition, commemorating his more than half-century of "devoted service to the advancement of aviation." The medal, authorized by a Joint Resolution of the Eighty-eighth Congress, was presented by Deputy Secretary of Defense Cyrus R. Vance "on behalf of a grateful nation."

The nation had reason to be grateful to this man who was small of stature but had a huge zest for life and an overwhelming dedication to the cause of airpower. And it was the nation, represented by the community of those who love the sky, who said farewell to Bennie Foulois at the funeral service April 27 in the Base Chapel at Andrews AFB, outside Washington, D. C. General Foulois had made his home in a bachelor apartment at the base during the last six years of his life, since the death in 1961 of his wife, Elisabeth. He had been in poor health the last few months before his death.

The honorary pallbearers were all old friends, and Foulois would doubtless have approved the selection of Air Force Secretary Harold Brown; USAF Chief of



—Photo by Lloyd A. Borgus

A relaxed General Foulois, at home in his bachelor apartment at Andrews AFB, examines model of the Wright "Flyer" and talks about the early days of military flying.

Staff Gen. J. P. McConnell; retired former Chief of Staff Gen. Curtis E. LeMay; retired Gen. Carl "Tooney" Spaatz, first Chief of the independent USAF; former US Senator from Arizona Barry Goldwater, a major general in the Air Force Reserve; Capt. Eddie Rickenbacker, America's "ace of aces" in World War I and now retired from the presidency of Eastern Air Lines; retired Maj. Gen. Dale O. Smith, Executive Director of the Air Force Historical Foundation; and Col. W. B. Arnold, son of the late Gen. H. H. "Hap" Arnold, commander of the Army Air Forces in World War II and architect of today's global Air Force.

(Continued on following page)



In photo believed made at Fort Myer, Va., during the summer of 1909, Lieutenant Foulois, second from right, poses with (from left) Lt. Frank P. Lahm, Navy Lt. G. C. Sweet, Maj. C. McK. Saltzman, Maj. George O. Squier, Capt. Charles de F. Chandler, and 2d Lt. Frederic E. Humphreys. A few months later Wilbur Wright was to teach Humphreys and Lahm to fly. Lahm retired in 1941 as a brigadier general, died in 1963. Chandler was first officer in charge of Army aviation. Squier, as Chief Signal Officer, headed the US air arm in 1917-18.

The Air Force Association was represented at the funeral by Jack B. Gross, National Treasurer; George D. Hardy, National Director; James H. Straubel, Executive Director; and John O. Gray, Administrative Director.

General Foulois' body was taken, for burial, to Washington, Conn., the town where he was born on December 9, 1879. He grew up there and in July 1898, during the Spanish-American War, bicycled to New York City hoping to join either the Navy or merchant marine. But he became a private in the Army Engineers instead. He served with the engineers for a short time in Puerto Rico and then switched to the Infantry. He was sent to the Philippines and served in the Luzon, Panay, and Cebu campaigns and was promoted to sergeant.

He won a field commission to second lieutenant in February 1901, and five and a half years later, after mapping duty in Cuba, was promoted to first lieutenant. It apparently was at the Army Signal School, Fort Leavenworth, Kan., in 1908 that Foulois' interest in flying began. Some years later he was to write in *Airman Magazine*: "The faculty at the . . . School . . . apparently did not observe that my graduation thesis

on aeronautics was taken largely from the Holy Bible, Jules Verne, and Army field service regulations. They liked it, and as a result I was assigned to aviation duty at Fort Myer, Va., upon my graduation in June 1908."

That summer the Signal Corps contracted for a heavier-than-air flying machine and for a lighter-than-air ship or dirigible. Both craft were to be tested before acceptance. Foulois was picked to pilot the airship, which had been designed by Glenn Curtiss and Tom Baldwin. It was Foulois' first trip off the ground.

The year before, the Signal Corps had established an Aeronautical Division to "take charge of all matters pertaining to military ballooning, air machines, and all kindred subjects." Capt. Charles de F. Chandler was put in charge and was on hand, as was Foulois, in August 1908 when Orville and Wilbur Wright brought their plane to Fort Myer. It was their 1905 model, modified to carry two people. It also had a "more powerful powerplant"—30 hp.

The series of test flights with the "aeroplane" began September 3—a thrilling sight to the thousands of spectators who thronged Fort Myer, the Cape Kennedy of its day. Lieutenants Frank P. Lahm, Thomas E. Selfridge, and Foulois were all to work with the Wright brothers in testing the "Flyer." On September 17 the plane crashed, killing Selfridge, severely injuring Orville Wright, the pilot, and putting an end to the tests until the next year.

By June 1909, an improved version of the plane was ready, and on July 27 Orville, with Lahm as passenger, made the first official test flight. They set a "world record" of one hour, twelve minutes, forty seconds for a two-man flight. Three days later, on July 30, with Foulois as "navigator," Orville flew the machine cross-country in the final test of the series, to Alexandria, Va., five miles away, and back at an average speed of 42.5 mph. The following week the Army accepted the machine, which became "Aeroplane No. 1, Heavier-than-air Division, United States aerial fleet."

The Wrights agreed to teach two Army officers to fly. Lahm and Foulois were picked, but Foulois was sent instead to an international aeronautical congress



At Fort Sam Houston, Tex., in spring of 1910 Foulois had reason to seem serious. As a one-man air force with only 54 minutes of instruction, he had to teach himself to fly.



Foulois became a captain in 1915 and was named commander of the 1st Aero Squadron. The next spring he led the unit in action against Mexican revolutionary Pancho Villa.

in France. Lt. Frederic E. Humphreys became Foulois' replacement as a trainee, and he and Lahm were instructed by Wilbur Wright at College Park, Md., outside Washington. They soloed on October 26, 1909. Foulois returned in time to sit in with the new pilots before they won their wings, and Wilbur thoughtfully included Foulois in the lessons. By November 5 Foulois had completed fifty-four minutes of instruction and had flown as a passenger with Humphreys but had not yet made a landing or takeoff.

Foulois made sixty-one flights in the Army's only plane from March to September 1910 at Fort Sam Houston, near San Antonio, Tex.

Obligated to spend his own money to keep the aircraft in operation, he put wheels from an old cultivator on his "Flyer" to make takeoffs easier, devised the first aircraft seat belt, and experimented with aircraft radio. Here with his ground crew, Foulois is second from right.



The entire fledgling air force was nearly wiped out on November 5 when Lahm and Humphreys crashed. Neither was hurt, but soon afterward Lahm was transferred back to the Cavalry and Humphreys back to the Corps of Engineers, leaving Foulois with his fifty-four minutes, a wrecked plane, eight enlisted men, and a civilian mechanic—the whole active-duty air force.

Foulois soon got orders to take his command to Fort Sam Houston, Tex., for the winter. He arrived in February 1910, patched the plane up, and on March 2 made four flights, the last one ending with a damagingly heavy landing.

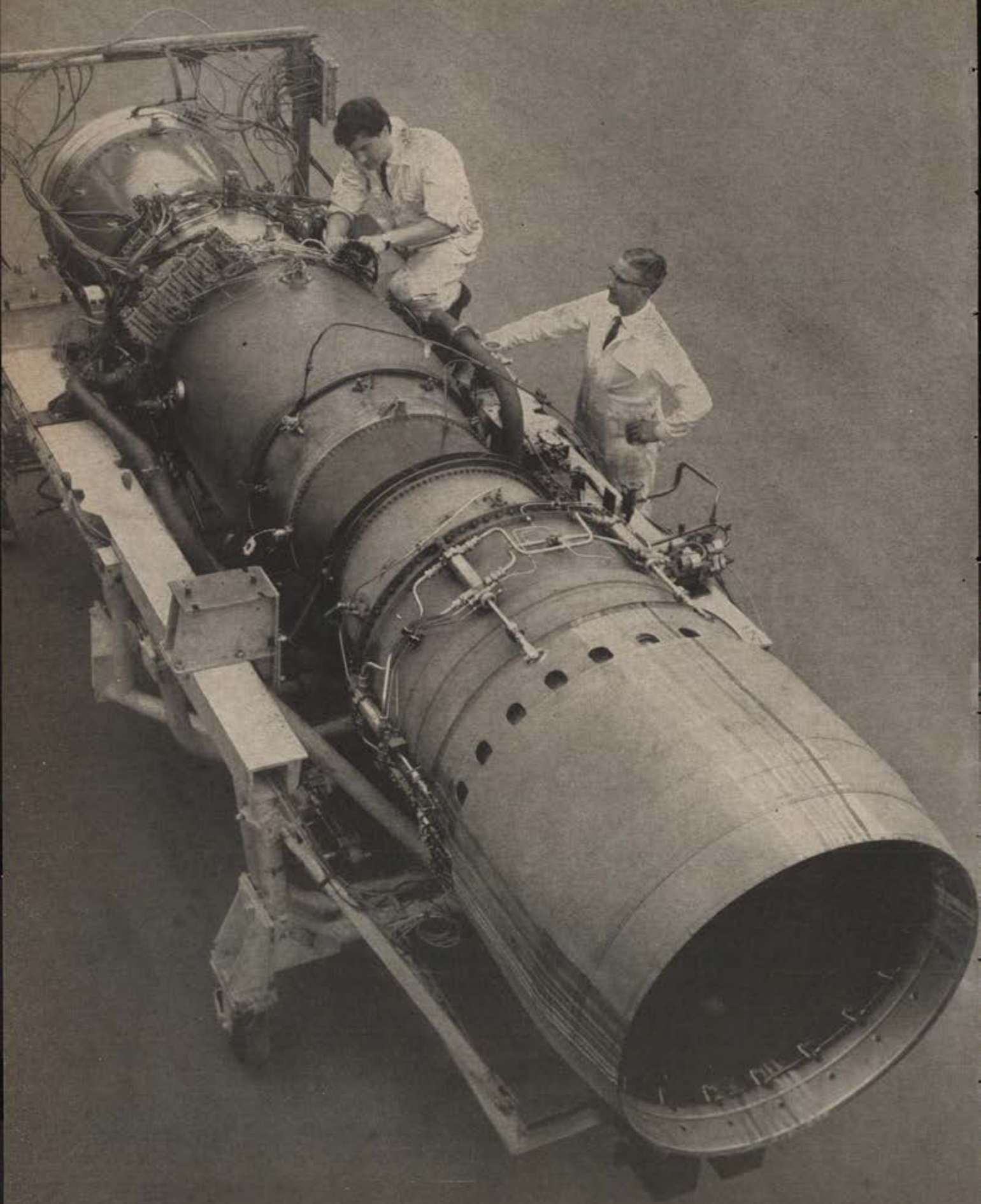
Again quoting Foulois: "We hauled the wreckage into the hangar and tried to puzzle out what had gone wrong in the landing. Finally I sat down and wrote a letter to the Wright brothers, telling them what I thought I had done, and they wrote back and told me what I ought to have done. That started my correspondence course with the Wright brothers, and I guess it made me the first correspondence-course airplane pilot in history."

Foulois persevered, and between March and September he made sixty-one flights. He was to be the Army's only pilot and the Wright "Flyer" the Army's only plane until 1911. (Today that aircraft is on display in Washington's Smithsonian Institution.) During those days Foulois had only \$150 allocated him for fuel and repairs for four months. To keep flying he spent some \$300 of his own money while at the Texas base.

He experimented constantly, improving both his own proficiency and the equipment. He improvised the first aircraft seat belt, and put wheels on his battered aircraft to make the machine independent of the old monorail catapult system. In 1910 he experimented with aircraft radio and the next year built a set that he used while patrolling the Mexican border.

Mexico was to be the scene of his first (and the nation's first) use of aircraft in a military campaign. World War I had begun in 1914, and the US quickly took a more serious view of aviation than before. In 1915 Foulois, by now a captain, became commander of the 1st Aero Squadron at Fort Sill, Okla. The unit returned to Fort Sam Houston in November, but the next spring it was ordered to Columbus, N. M., where seventeen Americans had been killed on March 9 when the Mexican revolutionary leader Pancho Villa

(Continued on page 90)



Rolls-Royce Spey power for American Combat Aircraft



Pictured here under preparation for test running is the supersonic Spey-25 turbofan with fully variable afterburning.

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plans to use a variant of the Spey to power USAF Ling-Temco-Vought A-7D close support aircraft. The Spey turbofan for the A-7D will be jointly developed and produced by the Allison Division of the General Motors Corporation and Rolls-Royce and for this application will be known as the USAF TF-41-A-1.

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When the US entered World War I Foulois was quickly promoted to brigadier general. Here he is shown with General Pershing at Issoudon, the French base where thousands of American cadets began their training for combat.



Foulois reached the summit of his military career in 1931 when he was named Chief of the Air Corps. He served in this post through 1935, but even after retirement never really left Air Force circles.

had raided the outpost. Brig. Gen. John J. Pershing was ordered to organize a punitive expedition of 15,000 men and pursue Villa into Mexico. Foulois and his force of ten pilots and eight planes were to support the operation.

The aircraft were used for reconnaissance and to deliver messages, and later Pershing was to be quoted as saying that one airplane had been worth a regiment of cavalry to him. But, on balance, the 1st Aero Squadron's operations in Mexico were a near-fiasco, with the underpowered planes unable to get across the 10,000-foot mountains or to operate effectively in the high winds, dust, and snowstorms they encountered. At one point Foulois himself was arrested and jailed after landing at Chihuahua City to deliver dispatches to the American consul. He was released when the local Mexican commander intervened.

America's entry into World War I soon overshadowed the operations along the Mexican border. Foulois was promoted to major in June 1917, and the next month he became a temporary brigadier general. He went to France in October, in charge of maintenance, organization, and operation of all US Air Service equipment and people. The following month he was named Chief of Air Service for the American Expedi-

tionary Force. He led the first all-American squadron that took part in dogfights over the German lines.

In May 1918 Foulois was named Chief of Air Service for the First Army, and in August became Assistant Chief of Air Service, Zone of the Advanced AEF. In October, the month before the Armistice, he held the same title for the Services of Supply in France. After the war ended he attended the Center of Artillery Studies at Trèves (Trier), Germany, in the spring of 1919, returning home to the US in July for duty with the Director of Air Service. His rank reverted to major.

After service as assistant air attaché to The Hague and Berlin, he was promoted to lieutenant colonel in February 1923, and in June 1925 completed the Command and General Staff School at Fort Leavenworth. He was assigned as Commanding Officer of Mitchel Field, N. Y., from July 1925 to December 1927.

Jumped two grades to brigadier general that same month, he was reassigned as Assistant to the Chief of the Air Corps, and in June 1929 was sent to his duty station at Wright Field, Ohio, as Chief of the Materiel Division. He returned to Washington the next year, and in May 1931 commanded Air Corps exercises that covered the entire northeast part of the US, involving a total—incredible for those days—of some 800 transport, fighter, and hospital aircraft, and designed to demonstrate the great potential of the airplane as a military weapon. For his role in this exercise Foulois received the Mackay Trophy.

Foulois was named to succeed Maj. Gen. James E. Fechet as Chief of the Air Corps on December 19, 1931, and was promoted to major general. He was to serve for four years, until his retirement the last day of 1935. These were the years when the young air force was struggling for identity, a battle dating back to Billy Mitchell (who had been court-martialed in 1925 for his outspoken views on airpower), and look-



Even at 83 Foulois never lost interest. Here, in 1962, he examines Mercury capsule model at Arnold Engineering Development Center, Tenn., with (left) air pioneer Arnold Krogstad and AEDC commander Maj. Gen. William Rogers.



General Foulois was a regular figure at Air Force and AFA gatherings. Here, at Hill AFB, Utah, January 3, 1964, as guest of honor at a dining-in, he receives giant "Silver Wings" from Maj. Gen. Don Coupland, Commander, Ogden Air Materiel Area. Looking on are (left) Col. E. G. Prohaska, Deputy Commander, Ogden AMA; and Charles M. LeMay, Commander of AFA's Utah Wing.

ing ahead to the 1947 establishment of the United States Air Force as a separate service.

The "hot new planes" of the early '30s were the Boeing B-9 and the Martin B-10. The B-10 was an all-metal, two-engine monoplane, able to fly more than 200 mph and climb to 28,000 feet. Its cockpits were enclosed and the landing gear could be retracted. Lt. Col. Henry H. Arnold led a flight of ten of these machines, with thirty officers and enlisted men, on an 8,290-mile trip from Seattle to Alaska and back in July and August 1934, testing the idea of reinforcing outlying possessions by air.

The success of this and similar exercises led Foulois and other Air Corps leaders to press for the development of even larger and more powerful bombers. The climate was right for the new Boeing design, No. 299, which was to be redesignated XB-17 and nicknamed

Flying Fortress. The new bomber began its test flights in 1935 and flew its way straight into history.

The new life that began for Foulois after retirement saw him never far from his wide circle of Air Force friends. For many years he headed the Air Force Historical Foundation. He made dozens and dozens of speeches each year. In December 1963 he became the sixth member named to the National Aviation Hall of Fame at Dayton. In 1965 he was inducted into the Primus Club, a group of aerospace pioneers that includes jet pilots and astronauts—men who have been first. The inclusion of Foulois was inevitable.

His friends, gathered for the funeral service at Andrews, said farewell to the dapper little man with the lively sense of humor and the boundless energy—the man who had been the nation's first military flyer.—END

General Foulois is laid to rest at his hometown, Washington, Conn., on April 28, 1967.

Earlier, funeral services had been held at Andrews AFB, Md. During the graveside ceremony in Connecticut, a "missing buddy" formation of F-101s flew overhead in USAF's final tribute to beloved Bennie Foulois.





THE BULLETIN BOARD

News and Comment about Air Force People...

By Jackson V. Rambeau

AFA DIRECTOR OF
MILITARY RELATIONS

H. R. 2

WASHINGTON, D. C., MAY 16

With the Senate Armed Services Committee expected to take up H. R. 2, the Reserve Forces Bill of Rights, before the end of May, there were indications that the Secretary of Defense has modified his earlier opposition to some of the bill's provisions.

At presstime, we understand DoD's views on the bill include the following points:

It fully supports Title II, which would provide federal retirement benefits for National Guard technicians.

The major point of difference centers on the provision in H. R. 2 which calls for maintaining a minimum average strength in the Reserve and Guard. DoD objects to a strength floor on the grounds that it could force retention of units for which no requirement exists in JCS war plans. As we noted last month, the White House and Pentagon feel so strongly about this point that a presidential veto of H. R. 2 could result if it isn't changed. For that reason, we believe the Senate committee will rewrite that portion.

DoD is also against setting up a new Assistant Secretary of Defense for Reserve Affairs and for changing the composition and duties of the Reserve Forces Policy Board, both contained in the bill. It recently appointed an Army major general as Deputy for Reserve Affairs in the Office of the Assistant Secretary of Defense for Manpower to give

more stature to that job, and besides DoD insists that all its Assistant Secretaries are held responsible for total forces management, including active and reserve.

DoD has no objection to provisions in the bill which would set up a Reserve Bureau in the Air Force and Army, but it doesn't like the requirement that the Chief and Deputy of such Bureaus must be selected from general officers not on active duty.

Unit vacancy promotions for officers in the Air Force Reserve and ANG are supported by DoD. We understand the Senate is likely to renew this authority for only two years. From data we have seen, it will require at least three years of unit vacancy promotion authority to overcome present staffing problems and bring up capable officers to prepare them for command assignments.

Final action by the Senate on H. R. 2 could be taken in June.

Career Motivation

A new "systems approach" to Air Force personnel problems was outlined by Dr. Eugene V. Ferraro, Deputy Undersecretary for Manpower, at a USAF-wide career motivation conference hosted by TAC at Langley AFB, Va., early in May.

In a speech keynoting the conference, Dr. Ferraro discussed six project areas being pursued by the Air Staff to



Capt. Larry B. Mason, thirty-one, of Everton, Mo., is awarded the Kolligian Trophy for 1966 and the Air Force Cross, USAF's second highest award for heroism, by Gen. J. P. McConnell, USAF Chief of Staff. On a combat mission in Vietnam, he successfully landed his battle-crippled B-57 Canberra bomber after he discovered his navigator was too badly wounded to eject. Captain Mason, released from active duty in August, now serves in the Michigan ANG.



Capt. (Dr.) Clifford J. Buckley, thirty, receives the Malcolm C. Grow Award as the USAF Flight Surgeon of the Year, presented by Gen. Bruce K. Holloway, USAF Vice Chief of Staff. The award, sponsored by the Society of USAF Flight Surgeons, is presented annually to the flight surgeon or medical officer making the greatest contribution to effectiveness of a flying organization. Captain Buckley is now assigned to Hq. ARRS, Orlando AFB, Fla.



Edmonds

Akin

Brendle

Casbarian

Forney

Hall

Strait

improve personnel management and particularly to stimulate motivation and retention.

The six cover officer and airmen career development programs, the civilian/military manpower mix, research in personnel factors, educational technology to improve training, and management of Reserve Forces personnel.

The fact that the retention rate of first-term airmen has dropped from twenty-nine percent in 1964 to 15.9 percent this year makes it apparent, he said, that "we are not doing the right things now to motivate our enlisted people to a career in the Air Force."

A statutory promotion program for airmen—initially recommended by AFA's Airmen's Council—is under consideration in the Pentagon, Dr. Ferraro said.

In officer programs, he explained, "the objective is to prepare a management program which will more effectively identify Air Force requirements for the types and numbers of career officers needed to attain present, near-term, and long-range goals. . . ."

"The Air Force today, as in the past, is pilot-oriented," he noted. "But over the last decade the percentage of pilots in our officer force has decreased. . . . Our policies concerning selection of officers for assignment and promotion will be reviewed in the light of changing trends and emphasis. We shall isolate policies and procedures which tend to discourage critically needed specialists from considering Air Force careers. . . ."

Motivation and retention is a part of the civilian as well as military side of Air Force personnel, he said. He stressed that USAF must "incorporate our civilian population into a total manpower and personnel system so that their education and training, their assignment and promotion, their motivation and retention receive the same caliber of constant attention which we give to our military personnel."

Studies are under way to classify all jobs in the Air Force in a continuum from "most military" to "least military," he said, to permit smooth shifts between military and civilian personnel.

Although the Air Force has established a reputation for excellent personnel research capabilities, "perhaps our research effort has become too academic, too divorced from the real world, for its product to be infused into real world problems. . . . What we need is better communication—an organization and procedure that will strengthen the linkage between researchers and those who must apply the results."

He acknowledged USAF's leadership in exploring edu-

cational technology in training programs, but suggested that the Air Force may be spending too much time training those first-term airmen who do not reenlist.

On the subject of the Reserve Forces, he referred to the RAND Corporation survey of roles and missions. "How do we make certain," he said, "that the Reserve, which has so much strategic value, continues to be responsive to changing needs?"

We expect later this month to interview Dr. Ferraro on results of his first year in the Air Force manpower post and prospects for the immediate future. The exclusive interview is scheduled for publication in the July issue of AIR FORCE/SPACE DIGEST.

Guard, Reserve Councils Named

AFA President Bob Smart has appointed the following to AFA Councils (*see cuts, above and below*):

Air National Guard—Chairman, Brig. Gen. GEORGE W. EDMONDS, Deputy AG for Air, California ANG, Sacramento; Brig. Gen. ROBERT W. AKIN, Adjutant General of Tennessee, Nashville; 1st Lt. CECIL G. BRENDLE, Alabama ANG, Montgomery; Capt. HARVEY T. CASBARIAN, JR., Maryland ANG, Baltimore; Col. DONALD W. FORNEY, Iowa ANG, Sioux City; Capt. ROBERT R. HALL, Maine ANG, Dow AFB; and Maj. Gen. DONALD J. STRAIT, Asst. C/S for Air, New Jersey ANG, McGuire AFB.

Air Force Reserve—Chairman, Maj. Gen. R. E. L. EATON, USAF (Ret.), Washington, D. C.; Col. CHARLES L. COLLINS, Hanscom Field, Mass.; Brig. Gens. JOHN W. HOFF, Bakalar AFB, Ind.; and JOSEPH J. LINGLE, Milwaukee, Wis.; Capt. EDMUND X. LOUGHRAN, Hamilton AFB, Calif.; Brig. Gen. TOM E. MARCHBANKS, JR., Kelly AFB, Tex.; and Capt. WILLIAM C. RAPP, Niagara Falls, N. Y.

Selected Tenure Bill

Selected extended tenure—a plan to permit a small number of qualified officers and airmen scheduled for retirement to remain in their jobs for full careers, but without further prospect of promotion—is the subject of a bill introduced in Congress by Rep. Durward Hall (R-Mo.) late in April.

The plan, originated by AFA's Retired Council, is similar to that proposed by Thomas D. Morris, Assistant Sec-

(Continued on page 96)



Eaton

Collins

Hoff

Lingle

Loughran

Marchbanks

Rapp

AFA Military Group Life Insurance Plan Continues Unrestricted Coverage; Fifth Consecutive Annual Dividend Is Distributed to 1966 Policyholders

By Richmond M. Keeney
AFA Insurance Director

AFA marked the sixth full year of its Military Group Life Insurance program by distribution last month of its fifth consecutive annual dividend, a distribution to 1966 policyholders which totaled approximately \$190,000.

At the same time, policyholders were informed in the 1966 annual report that the plan continues to provide unrestricted coverage to all participating personnel without geographical or wartime duty limitations.

This is consistent with AFA's stated purpose of providing full security and a needed service to all Air Force people through the Military Group Life Insurance program, and other programs such as Flight Pay Insurance, which the Association pioneered.

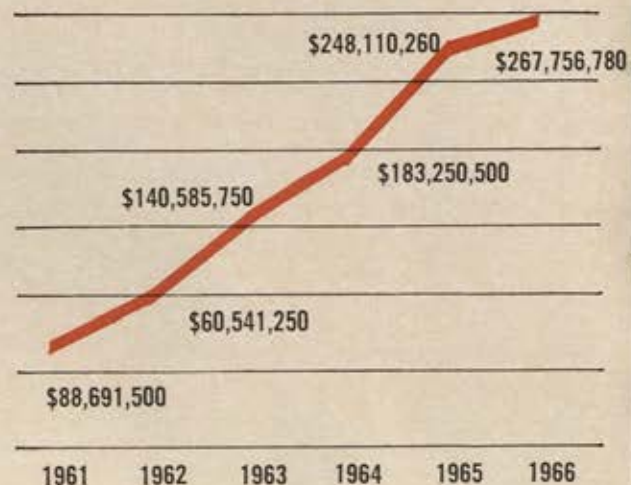
Both unrestricted coverage and payment of a dividend to 1966 policyholders were safely possible even though benefit payments in 1966 reached an all-time high of \$1,157,000, substantially higher than those of 1965 and nearly double 1964's level.

First established in the Fall of 1960, AFA Military Group Life Insurance has demonstrated a pattern of steady growth and strong acceptance among Air Force personnel (as shown in the accompanying graphs). This continued growth, together with conservative management and underwriting practice, is, of course, the best assurance that AFA's present policy of unrestricted coverage can be continued.

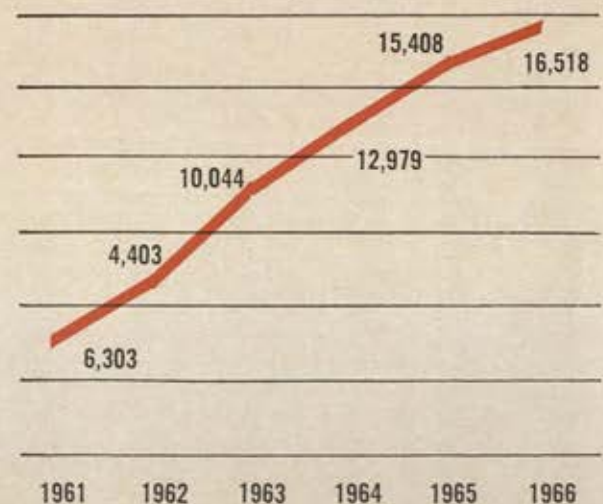
All Air Force personnel on active duty, and in the Air National Guard and Air Force Ready Reserve programs, are eligible to apply for AFA Military Group Life Insurance.

SIX-YEAR RECORD OF GROWTH

Insurance in Force



Policyholders



AFA Military Group Life Insurance

PROTECTION YOU CAN DEPEND ON!

BENEFIT SCHEDULE		
Age	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.

NO HAZARDOUS DUTY RESTRICTIONS! There is no war clause, combat zone waiting period, other hazardous duty restriction or geographical limitation on AFA Military Group Life Insurance coverage. Protection is identical everywhere in the world.

LOW PREMIUM RATE! The premium rate for this complete coverage is still only \$10 per month whether or not you are on flying status.

\$12,500 EXTRA ACCIDENTAL DEATH BENEFIT! An additional benefit of \$12,500 is paid for accidental deaths, even those caused by aviation accidents, except when the insured is serving as pilot or crew member of the aircraft involved.

OTHER MAJOR BENEFITS!

Net cost reduced by dividends for 5 consecutive years!

Full choice of settlement options!

Waiver of premium for disability up to Age 60!

Keep your coverage at the low, group rate (up to Age 65) if you leave the service.

ELIGIBILITY! All active-duty personnel of the United States Air Force (under Age 60) and all members of the Air Force Ready Reserve and Air National Guard (under Age 50) are eligible, provided they are now or become members of the Air Force Association. No special medical examination is required.

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.

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.

AFA MILITARY GROUP LIFE INSURANCE (UNDERWRITTEN BY UNITED OF OMAHA)

RANK (please print) _____ NAME _____ SERVICE NUMBER _____

MAILING ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

DATE OF BIRTH _____

BENEFICIARY _____ RELATIONSHIP _____

This insurance is available only to AFA members:

- ☐ I enclose \$7 for annual AFA membership dues (includes subscription (\$6) to AIR FORCE/SPACE DIGEST).
- ☐ I am an AFA member.

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

Signature of Applicant _____

Date _____

Application must be accompanied by check or money order. Send remittance to:
INSURANCE DIVISION, AFA, 1750 PENNSYLVANIA AVE., N.W., WASHINGTON, D.C. 20006

Please indicate below the form of payment you elect:

☐ Monthly government allotment (I enclose \$20 to cover the period necessary for my allotment to be processed.)

☐ Quarterly (I enclose \$30)

☐ Semi-annually (I enclose \$60)

☐ Annually (I enclose \$120)

Category of eligibility (please check appropriate box)

☐ Active Duty, Air Force

☐ Ready Reserve, Air Force

☐ Air National Guard

retary of Defense for Manpower, at the Manpower Symposium in San Francisco in March, in suggesting formation of a "Defense Executive Corps" from selected officers who would otherwise be forced into retirement after twenty or more years of service.

"Many retirees," Mr. Hall said, "are failing to find jobs which even partially utilize the skills and experience they have gained at great cost to the government. . . . The services logically should be able to utilize the skills of their retiring personnel better than most other employers."

He explained that the program could save taxpayers as much as \$437 million annually, because the serviceman who continues in his job would otherwise be drawing retirement pay while the government would have to pay full salary to his replacement.

The individual, in turn, could count on a permanent assignment. The bill stipulates that, unless he consents, he may not be transferred, so long as the position exists at that station.

Under terms of the bill, the Secretary of each military department would designate the positions which can be filled by officers, warrant officers, or enlisted men under the selected tenure program. They would not include any

nold Air Society awards were presented to the following:

Gen. Howell M. Estes, Commander of the Military Air-lift Command, received the Gen. H. H. Arnold Trophy for outstanding contributions to military aviation and aerospace programs.

The John Fitzgerald Kennedy Trophy was awarded to Lt. Gen. Leighton I. Davis, Commander of AFSC's National Range Division, for outstanding contributions to aerospace flight.

Maj. Gen. Jewell C. Maxwell, Director of the Super-



Jan Siewert, a senior at Florida State University, Tallahassee, was named "Little General" of the Arnold Air Society's Angel Flight for 1967-68. Chosen for academic standing, Angel Flight activities, poise, and beauty, Jan is also president of her sorority.

sonic Transport Development Program, was presented the Eugene M. Zuckert Trophy for outstanding contributions to military professionalism.

Howard W. Johnson, President of the Massachusetts Institute of Technology, received the Gen. Muir S. Fairchild Trophy for contributions to aerospace education.

The Gen. Hoyt S. Vandenberg Trophy for outstanding aerospace developments in the field of science went to Brig. Gen. Lee V. Gossick, Commander of AFSC's Arnold Engineering Development Center.

Edwin A. Link of the Link Group of General Precision was awarded the Paul T. Johns Trophy for civilian achievement in aeronautics and astronautics.

Medal of Honor winner Maj. Bernard F. Fisher was named the Society's Man of the Year, and Capt. David P. Westenbarger of the Aerospace Rescue and Recovery Service received the Aviator's Valor Award.

Ronald B. Keys of Kansas State University was selected as the nation's most outstanding Air Force ROTC cadet.

PARTING SHOTS—Rep. L. Mendel Rivers (D.-S. C.) has introduced a bill (H. R. 8197) to boost military base pay by 5.6 percent across the board for all grades. The bill is a military counterpart to the 4.5 percent civilian pay raise proposed by President Johnson, effective October 1. The military raise is greater because it applies only to base pay. On over-all pay, the two will come out the same. . . . AFA President Bob Smart was scheduled to retire from the Air Force Reserve on May 24 in the grade of brigadier general. He has served in a mobilization assignment as Military Assistant to the Secretary of the Air Force.

USAF Chief Master Sergeant Paul W. Airey has accepted an invitation to serve as Adviser to AFA's Airmen's Council, and will sit with them at their next meeting in Washington in July. . . . Apparently many Title III retirees are not yet aware that the new military medicare act eliminated the former provision requiring eight years of active duty to qualify. . . . Regular captains who are twice passed over



Lt. Col. Jack Tippet, AFRes, right, named "Top Magazine Cartoonist of the Year" by the National Cartoonists Society, receives plaque at NCS awards dinner from Milton Caniff, AFA Board Director and creator of "Steve Canyon." Colonel Tippet, whose work has appeared frequently in this magazine, as well as in *Look*, *Saturday Evening Post*, *New Yorker*, *This Week*, and other leading national publications holds a mobilization assignment as Art Director of *The Airman*, USAF's official magazine. A B-24 pilot in the South Pacific in World War II, Colonel Tippet flew jet fighters for two years during the Korean War.

position which is, or could better be, filled by a civilian employee.

The bill sets a limit of five percent of all personnel on active duty who may fill selected tenure posts, of which no more than one percent can be selected in any one year. Once appointed, the individual may serve until age sixty-five if he remains physically qualified, or he may retire—except in national emergency—at any time upon thirty days' notice.

Arnold Air Society Conclave

Air Force ROTC Cadet Richard Wainscott of the University of Florida will be National Commander of the Arnold Air Society for the 1967-68 school year.

Named "Little General" to command the 3,000-member Angel Flight, coed auxiliary of the Arnold Air Society, is Jan Siewert of Florida State University (see cut).

These appointments were made at the Society's tenth annual Conclave in Miami, Fla., April 23-26. Major Ar-

for promotion may be retained on active duty, Hq. USAF told major commands in a recent message. The action resulted when AFA forwarded to Dr. Ferraro a letter from a regular captain, a pilot in Vietnam, who said he was being forced out, though Reserve captains in the same situation could be extended. We couldn't see why a Regular should be penalized under the policy; USAF agreed. Policy applies only during Vietnam emergency.

SENIOR STAFF CHANGES (For last-minute changes, see "Aerospace World," page 26.) . . . B/G John W. Baer, from Ass't DCS/O to Ass't to Cmdr., TAC, Langley AFB, Va. . . . B/G Jack Bollerud, from Acting Dir. of Space Medicine, NASA, Washington, D. C., to DCS/Bioastronautics and Medicine, AFSC, Andrews AFB, Md. . . . M/G Charles R. Bond, Jr., from Dep. Cmdr., 7th AF/13th AF (Thailand), PACAF, to Cmdr., 12th AF, TAC, Waco, Tex., replacing M/G Henry G. Thorne, Jr. . . . B/G John A. Brooks, III, from Ass't C/S, UN Cmd/US Forces, Korea, PACOM, to Executive Dir., Technical & Logistics Services, DSA, Washington, D. C.

Dr. Kenneth S. W. Champion, from Supervisory Research Physicist (Physics of Atmosphere), to Chief, Atmospheric Structure Branch, Upper Atmosphere Physics Laboratory, AF Cambridge Research Laboratories, AFSC . . . M/G Joseph J. Cody, Jr., from DCS/Systems, to C/S, AFSC, Andrews AFB, Md. . . . M/G William E. Creer, from Cmdr., 17th Strategic Aerospace Div., SAC, Whiteman AFB, Mo., to Dep. Cmdr., National War College, Ft. Lesley J. McNair, Washington, D. C.

M/G Marvin C. Demler, from Dir. of Laboratories, AFSC, with additional duty as Cmdr., RTD, to Cmdr., RTD, AFSC, Bolling AFB, D. C. . . . B/G Robert J. Dixon, from Cmdr., 45th Air Div., SAC, Loring AFB, Me., to Ass't DCS/P for Military Personnel and Cmdr., USAF Military Personnel Center, Randolph AFB, Tex., replacing M/G George B. Greene, Jr. . . . B/G Joseph N. Donovan, from Cmdr., 838th Air Div., TAC, Forbes AFB, Kan., to Cmdr., Tactical Airlift Center, TAC, Pope AFB, N. C. . . . B/G Richard N. Ellis, from Dir., Personnel & Support Operations, AFLC, Wright-Patterson AFB, Ohio, to Dep. Cmdr., 3d AF, USAFE, South Ruislip, England.

B/G Raymond A. Gilbert, from Dep. Dir. of Laboratories, to Dir. of Laboratories, AFSC, with no change in additional duty as Vice Cmdr., RTD . . . M/G Harry E. Goldsworthy, from Dir. of Production & Programming, Hq. USAF, Washington, D. C., to Cmdr., ASD, AFSC, Wright-Patterson AFB, Ohio . . . M/G Jamie Gough, from DCS/O, USAFE, to Chief, MAAG, Bonn, Germany . . . M/G Gordon M. Graham, from Vice Cmdr., 7th AF, PACAF, to Cmdr., 9th AF, TAC, Shaw AFB, S. C., replacing M/G Donald O. Darrow . . . M/G George B. Greene, Jr., from Ass't DCS/P for Military Personnel and Cmdr., USAF Military Personnel Center, Randolph AFB, Tex., to Cmdr., Lackland Military Training Center, ATC, Lackland AFB, Tex., replacing B/G Frank P. Wood.

Harry M. Hughes, from Supervisory Mathematical Statistician, to Chief, Data Processing Section, Biometrics Branch, Aerospace Medical Research Div., USAF School of Aviation Medicine, AFSC . . . B/G William A. Hunter, from Dep. Dir., Military Assistance, USEUCOM, to SACEUR Representative to Joint Strategic Target Planning Staff with duty station, Offutt AFB, Neb. . . . M/G Thomas S. Jeffrey, Jr., from Dir., Aircraft & Missiles, OASD (I&L), to Dir. of Production & Programming, Hq. USAF, replacing M/G Harry E. Goldsworthy.

B/G David C. Jones, from C/S, to DCS/O, USAFE, Wiesbaden, Germany, replacing M/G Jamie Gough . . . B/G Leo A. Kiley, from Cmdr., AF Missile Development Center, AFSC, Holloman AFB, N. M., to Dir. of Science and Technology, DCS/R&D, Hq. USAF, replacing B/G Edward B. Giller . . . B/G Howard E. Kreidler, from Vice Cmdr., 21st AF, MAC, McGuire AFB, N. J., to Dep. Dir., J-3, Hq. US Strike Command, MacDill AFB, Fla. . . . B/G William B. Kyes, from C/S, 15th AF, SAC, March AFB, Calif., to Chief, National Strategic Target List Div., Joint Strategic Target Planning Staff, Hq. SAC, Offutt AFB, Neb. . . . B/G David I. Liebman, from Military Ass't to Ass't Secretary of Defense (Public Affairs), OSD, to Dep. Dir. for Plans, J-3, USEUCOM.

B/G James O. Lindberg, from Dep. Chief, Army & Air Force

New Vice Commander of the Seventh Air Force in Vietnam is Maj. Gen. Robert F. Worley, former DCS/Operations at Hq. TAC, Langley AFB, Va. He succeeds Maj. Gen. Gordon M. Graham, who takes over command of TAC's Ninth Air Force at Shaw AFB, S. C.



Exchange Service, New York, N. Y., to Dir. of Procurement Policy, DCS/S&L, Hq. USAF, replacing B/G Robert J. Meyer . . . M/G William C. Lindley, Jr., from DCS/O, ATC, Randolph AFB, Tex., to Dep. Cmdr., 7th AF/13th AF (Thailand), PACAF, replacing M/G Charles R. Bond, Jr. . . . B/G John L. Locke, from Chief, Air Section, MAAG, Tehran, Iran, to DCS/Tech. Training, ATC, Randolph AFB, Tex. . . . B/G Andrew S. Low, Jr., from Chief, AF Sect., JUSMMAT, Turkey, to Ass't for Logistics Planning, DCS/S&L, Hq. USAF, replacing M/G Timothy F. O'Keefe . . . M/G James C. McGehee, from Chief, MAAG, Rome, Italy, to Cmdr., Keesler Technical Training Center, ATC, Keesler AFB, Miss. . . . B/G Edward A. McGough, III, from Dir., Combat Operations, 7th AF, PACAF, Saigon, Vietnam, to Dep. Dir. of Aerospace Programs, DCS/P&R, Hq. USAF.

Karl R. Merrill, from Management Engineering Officer, to Chief, Industrial Management Ofc., Directorate of Operations, Hq. AFLC . . . B/G Robert J. Meyer, from Dir. of Procurement Policy, DCS/S&L, Hq. USAF, to Dir., Aircraft & Missiles, OASD (I&L), replacing M/G Thomas S. Jeffrey, Jr. . . . M/G Dwight O. Monteith, from Project Mgr., Project CLOUD GAP, US Arms Control & Disarmament Agency, Washington, D. C., to Cmdr., Lowry Technical Training Center, ATC, Lowry AFB, Colo. . . . M/G Timothy F. O'Keefe, from Ass't for Logistics Planning, DCS/S&L, Hq. USAF, to Vice Cmdr., 5th AF, PACAF, Fuchu AS, Japan . . . M/G Norman S. Orwat, from Executive to SACEUR, SHAPE, Casteau, Belgium, to Dep. Dir. for Plans, J-5, The Joint Staff, Ofc., JCS, Washington, D. C. . . . B/G Richard D. Reinhold, from Dep. Dir. of Plans, DCS/R&D, Hq. USAF, to Dep. C/S to US Rep., NATO Mil. Comm., Belgium . . . Aristides Sarris, from Logistics Systems Specialist, to Ass't to the Dir., Directorate of Plans & Programs, AFLC.

B/G Richard F. Shaefer, from Dep. Cmdr., 3d AF, USAFE, South Ruislip, England, to C/S, USAFE, Wiesbaden, Germany, replacing B/G David C. Jones. . . . B/G Pinkham Smith, from Cmdr., 314th Air Div., Seoul, Korea, to Vice Cmdr., Hq. 21st AF, MAC, McGuire AFB, N. J., replacing B/G Howard E. Kreidler . . . M/G Robert W. Strong, Jr., from C/S, 8th AF, SAC, Westover AFB, Mass., to Dep. Dir. for Inspection Services, OASD (Administration), Washington, D. C. . . . B/G Carlos M. Talbott, from Dir., Tactical Air Control Center, 7th AF, PACAF, Saigon, Vietnam, to C/S, US Taiwan Defense Cmdr., replacing B/G Tarleton H. Watkins . . . M/G Emmett M. Tally, Jr., from Dir. of Supply, AFLC, Wright-Patterson AFB, Ohio, to Cmdr., Defense Industrial Supply Center (DSA), Philadelphia, Pa.

M/G Henry G. Thorne, Jr., from Cmdr., 12th AF, TAC, Waco, Tex., to Vice Cmdr., CAC, Robins AFB, Ga. . . . B/G Morgan S. Tyler, Jr., from Cmdr., 4252d Strategic Wg., SAC, to Cmdr., 817th Air Div., SAC, Pease AFB, N. H. . . . B/G Frank P. Wood, from Cmdr., Lackland Military Training Center, ATC, Lackland AFB, Tex., to Chief, MAAG, Italy, replacing M/G James C. McGehee . . . M/G Robert F. Worley, from DCS/O, Hq. TAC, Langley AFB, Va., to Vice Cmdr., 7th AF, Saigon, Vietnam, replacing M/G Gordon M. Graham.

RETIREMENTS: M/G Lloyd P. Hopwood, B/G William J. Meng.—END

CHAPTER OF THE MONTH

Mt. Clemens, Mich., Chapter, cited for consistent and extremely effective programming in support of the Air Force Association mission.

AFA's Mt. Clemens, Mich., Chapter, one of the Association's most effective Chapters in telling the Air Force and the aerospace story to its community, recently sponsored its first aerospace education seminar for the local and state educators and interested AFA members and members of the local community.

Held at Selfridge AFB, in the base theater and Vandenberg Service Club, the one-day program opened with a coffee hour, during which early registrants were treated to a concert by the South Lake High School Choir from St. Clair Shores.

William Leavitt, Senior Editor (Science and Education), AIR FORCE/SPACE DIGEST, Washington, D.C., delivered the keynote address, and also moderated a Vietnam Symposium during the morning session.

Panelists included the following Vietnam returnees: Maj. Philip A. Goetzmann, USA, 3d Bn., 28th Artillery Group, and Maj. Richard J. Montgomery, 94th Fighter-Interceptor Sq. (ADC), both of whom are stationed at Selfridge AFB; Maj. William C. Christman, 379th Bomb Wg. (H) (SAC), Wurtsmith AFB; and Lt. Keith E. Johnson, 34th Air Div., Custer AFS.

One of the outstanding features of the morning session was a briefing on

the responsibilities of the Air Force Systems Command, presented by Lt. Col. Francis R. MacKenzie, Ass't Chief, Presentation Div., Office of Information, Hq. AFSC, Andrews AFB, outside Washington, D. C.

The afternoon session consisted of two presentations, "Pterodactyls and Aerospace Power," presented by John V. Sorenson, Ass't Dep. Chief of Staff Aerospace Education, National Hq., (Continued on page 100)



At a recent dinner-dance sponsored by AFA's San Bernardino Chapter, Richard Dawson, left, the RAF Corporal on the "Hogan's Heroes" TV series, entertains San Bernardino Chapter President Charles Brown; A1C James T. Wold, Norton AFB Airman of the Year; Eddie Meador, co-captain of the Los Angeles Rams; and TSgt. Carliss T. Caudill, Norton AFB NCO of the Year. Mr. Meador was guest speaker, and Wold and Caudill were honored guests at the affair. Maj. Gen. John McCoy, Commander of Ballistic Systems Division; Col. Joseph A. Stuart, Jr., Vice Commander, 63d Military Airlift Wing; San Bernardino Mayor Al Ballard; and San Bernardino Chamber of Commerce President Edward Jacobson made presentations and awards to other airmen and noncommissioned officers.



Brig. Gen. R. C. Richardson, III, right, Deputy Commander, Field Command, DASA, greets Barry Goldwater on his arrival in Albuquerque to address the Albuquerque AFA Chapter's Awards Banquet. Also on hand were Col. Ralph Garman, left, Commander, Air Force Special Weapons Center, and Maj. Gen. Dan Hooks, USAF (Ret.), Chapter head.



Discussing plans at a recent Southeastern Regional Meeting in Warner Robins, Ga., are from left, Lester C. Curl, Florida State AFA President; E. J. DeVane, Florida West Coast Chapter President; Martin H. Harris, Southeast Regional Vice President; Ed Barker, Middle Georgia Chapter President; and George Cornish, Georgia State President.

AFA's 1967 AEROSPACE BRIEFINGS & DISPLAYS

September 11-12-13 • Sheraton-Park Hotel • Washington, D.C.

AFA's 1967 Aerospace Development Briefings and Displays will be the largest since the concept was pioneered by the Association four years ago. More than fifty major aerospace and defense companies will display their latest hardware and make formal presentations to escorted audiences of top US military and government personnel, and military officers and educators from some sixty nations.

In addition to the three exhibit halls that AFA has filled with company briefings and displays in previous years, most of the space in the Sheraton Hall Ballroom has already been assigned for the '67 event. Some 75,000 square feet of floor space will be occupied by this year's Briefings and Displays.

Attendance at the 1966 event was just under 4,000 and was the largest to date, according to an audit by an independent CPA firm. The quality of attendance was tops, also. Vice President Hubert H. Humphrey officially opened the Briefings and Displays and personally attended six of the company presentations. He was accompanied by Secretary of the Air Force Harold Brown; Chairman of the Atomic Energy Commission, Dr. Glenn T. Seaborg; Administrator of the Federal Aviation Agency, Gen. William F. McKee, USAF (Ret.); Deputy Administrator of the National Aeronautics and Space Administration, Dr. Robert C. Seamans; US Air Force Chief of Staff, Gen. John P. McConnell; and Executive Secretary of the National Aeronautics and Space Council, Dr. Edward C. Welsh. The Vice President stated that the exhibits were as "outstanding a display of technological progress as has been available anywhere at any time."

The combination of formal company presentations with the display of the latest aerospace hardware affords the attendee a unique opportunity to be updated in a few hours at a single location on many advanced developments, techniques, and concepts.

This year, those attending the morning briefings will be escorted to their chosen group of company presentations. In the afternoons, each attendee may select any of the fifty or more briefings offered. Fifteen minutes will be allocated to each briefing session—ten minutes for the company presentation, three minutes for questions and answers, and two minutes for movement to the next briefing location.

As in the past, AFA's Annual Fall Meeting features the Aerospace Briefings and Displays, the Aerospace Education Seminar, and the Air Force Anniversary Dinner Dance.

**PLAN NOW TO ATTEND
AFA'S ANNUAL FALL MEETING!**



Vice President Humphrey and his party being briefed on the lifting body by a representative of the Martin Co.

Rep. L. Mendel Rivers (left), Chairman of the House Armed Services Committee, getting briefed on the lifting body.



Civil Air Patrol, Ellington AFB, Tex.; and "The Development and Utilization of Space Technology," presented by Harrison Allen, Jr., Technology Utilization Engineer, NASA's Lewis Research Center, Cleveland, Ohio, respectively.

Jess Larson, current Chairman of the Board and AFA's National President at the time of the Seminar, was the featured speaker at the evening banquet.

Mr. Larson's speech, entitled "AFA's Past Is Prologue," was in keeping with the Seminar's theme—"Aerospace Looks to the Future on AFA's 21st Anniversary."

Other participants included: Marjorie O. Hunt, Mt. Clemens Chapter President and the individual most responsible for this program and for the outstanding success the Chapter has attained during the past few years; Col. Kenneth E. Rosebush, Commander, 1st Fighter Wg., Selfridge AFB; and Chaplain (Lt. Col.) Lawrence E. Saul, Selfridge AFB. The following Chapter officers also participated in the program: C. K. Vogt, George W. Priehs, and Frank W. Berdan.

The Mt. Clemens Chapter has established an excellent relationship with both the civilian and business communities of Mt. Clemens and the military community at Selfridge. This, plus the enthusiasm motivated by the Chapter President and her staff of Chapter officers, combines to make for a very successful and effective AFA Chapter supporting the Air Force and the AFA mission. Congratulations to the Chapter and its officers—we look forward to even



Fort Worth, Tex., Chapter President Dan Bannister, right, presents an AFA watch to SSgt. David H. Daveney, Carswell AFB's "Airman of the Year." The presentation was made at a recent Chapter banquet.

more effective programs in the coming year.

• • •

Are our faces red? Unfortunately yes. Due to an inadvertent but honest human error, the membership of a newly organized and chartered chapter was omitted when tabulating the Twentieth Anniversary Membership Drive totals for the Southeast Region. AFA's Southeast Region did attain its target in the Drive, and in doing so joins the Northwest Region, the five State Organizations, and twenty-five chapters that did such an outstanding job in attaining their targets.

Our sincere apologies to Southeast Regional Vice President Martin H. Harris and his entire Region for our error, and our enthusiastic congratulations for an excellent job of membership recruiting.

• • •

More than 100 persons from Texas, New Mexico, and Oklahoma attended the Annual Meeting of AFA's South-

west Region, which was recently held in Amarillo, Tex.

Jess Larson, in one of his last appearances before an AFA unit as AFA's National President before being elected Chairman of the Board at the AFA National Convention in San Francisco, was the featured speaker at a luncheon in the Amarillo AFB NCO Open Mess. In his address, Mr. Larson praised American pilots in the Vietnam War as "second to none in history." He also urged the AFA members to help tell the Vietnam story to the American public.

After the luncheon, Bob Izzard, local television personality and Vice President of the Amarillo Chapter, narrated films he took while on a recent tour of Vietnam. Other speakers included Maj. Gen. Loren G. McCollom, Amarillo Technical Training Center Commander, and Amarillo Mayor F. V. Wallace. During the meeting, Mayor Wallace presented an AFA plaque to MSgt. Francis H.



Head-table guests and officials at the recent organizational meeting of the Fairbanks Midnight Sun, Alaska, Chapter included Dr. William R. Wood, left, President of the University of Alaska; Col. Robert W. Newell, center, Chief of Staff, Alaskan Air Command; and Frank Danner, Midnight Sun Chapter President.



During the meeting of AFA's Southwest Region, Jess Larson, left, then AFA President and present Chairman of the Board, presents a citation to Joe Mason, Amarillo Chapter President, designating the Texas Panhandle Chapter as "Unit of the Month."

Guess, Amarillo AFB's 1967 Airman of the Year. CMSgt. Jose M. Galdiano, Amarillo AFB's 1966 Airman of the Year, served as master of ceremonies.

Haskell Martin, Southwest Regional Vice President at the time of the meeting, presided. Other AFA officers who attended included: Jesse J. Walden, Jr., current Southwest Regional Vice President; and AFA State Presidents Sam Agee of New Mexico, John Badger of Oklahoma, and Sam E. Keith, Jr., of Texas.

AFA's Tucson, Ariz., Chapter recently sponsored its **Seventh Annual Air Force Appreciation Luncheon**.

The Luncheon, an annual event opening the three-day **Aerospace and Arizona Days** celebration, was attended by more than 500 citizens of Tucson and other parts of the state, who gathered to show their appreciation to the dedicated personnel of the United States Air Force "for their contribution to the peace and welfare of our country, their impact on every aspect of the state and their every contribution to living in Tucson."

Guest speakers at the Luncheon were Karl G. Harr, Jr., President of the Aerospace Industries Association, Washington, D.C., and Barry M. Goldwater, former US Senator, an AFA Life Member and an Air Force Reserve major general. Hugh W. Stewart, Tucson Chapter President, presided at the Luncheon.

The other two days of the celebration consisted of an Open House and Air Show at Davis-Monthan AFB.

CROSS COUNTRY . . . Maj. Gen. Rollen Anthis, Commander, Headquarters Command, Bolling AFB, was the featured speaker at a recent meeting of the Arlington, Va., Chapter . . . AFA's Air Force Academy Outstanding Squadron Dinner and AFA Committee Meetings, Colorado Springs, Colo., June 2-3 . . . Texas State AFA Convention, Austin, June 16-17 . . . New York State AFA Convention, Plattsburgh, July 1 . . . Beaver County, Pa., Chapter Air Fair, Beaver County Airport, July 8-9 . . . AFA's Annual Fall Meeting, Washington, D.C., September 11-13 . . . Alabama State Convention, Montgomery, September 23 . . . California State AFA Convention, San Diego, October 13-15 . . . Ohio State AFA Convention, Akron, November 11 . . . Pennsylvania State AFA Convention, Erie, November 11 . . . Florida State AFA Convention, Orlando, November 18.

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Objectives

• The Association provides an organization through which free men may unite to fulfill the responsibilities imposed by the impact of aerospace technology on modern society; to support armed strength adequate to maintain the security and peace of the United States and the free world; to educate themselves and the public at large in the development of adequate aerospace power for the betterment of all mankind; and to help develop friendly relations among free nations, based on respect for the principles of freedom and equal rights to all mankind.

Membership

Active Members: US citizens who support the aims and objectives of the Air Force Association, and who are not on active duty with any branch of the United States armed forces—\$7 per year.

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State Contacts

Following each state contact's name and address are the names of the localities in which AFA Chapters are located. Information regarding these Chapters, or any phase of AFA's activities within the state, may be obtained from the state contact.

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

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

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

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

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

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Alcohol, drugs, venereal disease, arrest or confinement.

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

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

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

Primary duty requiring parachute jumping.

Voluntary suspension from flying.

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

RATE TABLE—AFA FLIGHT PAY INSURANCE

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

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

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

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

NEW AFA FLIGHT PAY INSURANCE PREMIUMS

(AS A % OF ANNUAL
FLIGHT PAY)

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

AIR FORCE ASSOCIATION FLIGHT PAY PROTECTION PLAN

Exclusively for AFA Members—Underwritten by Mutual of Omaha

6-67

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

Serial Number.....

Address.....

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

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

I enclose:

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

☐ \$..... annual premium

This insurance is available only to AFA members.

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

☐ I am an AFA member

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

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

APPLICATION MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER

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

Bob Stevens'

"There I was..."

In the old-timers' air war in Europe it was noisy, crowded, and very often hot—conditions which, except for the high metal content of the atmosphere, their colleagues on the Aleutian chain would have welcomed . . .

The weather wasn't bad, really--
it was just plain lousy!



and **COLD?** well, you've
heard of the brass monkey...



Vegetation was "sparse"...



THANKS FOR THE ABOVE
IDEAS TO COL. C.V. GLINES
PAO, ALASKAN COMMAND

Bob Stevens

and you couldn't call your
off-duty time exactly
"riotous" -

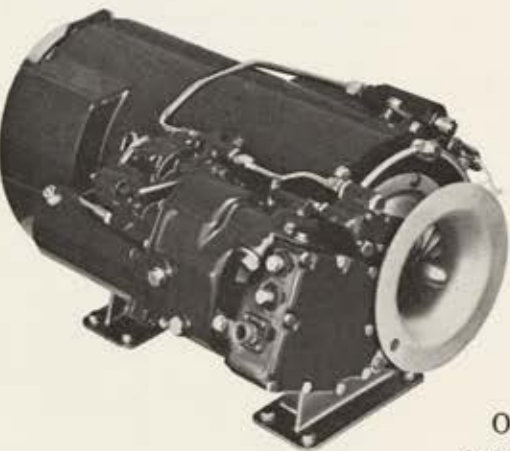


The best jet fuel starters come from the leading maker of small gas turbine engines.

It takes the kind of experience Garrett-AiResearch has to produce a superior starter of this type. We've made over 12,000 small gas turbines since 1947; built over 50,000 jet engine starters to date, and are accumulating experience at the rate of over 20,000 starts per day. Total starts are now in excess of 30 million.

Now, from Garrett-AiResearch know-how, comes a Jet Fuel Starter (JFS) that is a self-sufficient gas turbine/starter combination which is mounted directly on the main engine. It operates on the airplane's own fuel, eliminating ground starting equipment and costly starter cartridges.

This proven Jet Fuel Starter incorporates full containment—an AiResearch feature which assures aircraft and personnel safety. The starter has the ability to contain *internally* all fragments of a maximum energy hub burst of any of



the turbine wheels, up to their maximum operating speed. This feature offers full protection under abnormal conditions, including overspeed, overtemperature, and blade failure.

Existing AiResearch JFS designs are optimized to handle any given engine starting requirement with only minor modification, and are packaged to fit every major military or commercial jet engine in use today, within present envelope configurations.

Our Jet Fuel Starter has already successfully started the J57, TF30 and CJ805 engines.

For further information on the AiResearch Jet Fuel Starter, write: AiResearch Manufacturing Division, 402 South 36th Street, Phoenix, Arizona 85034.

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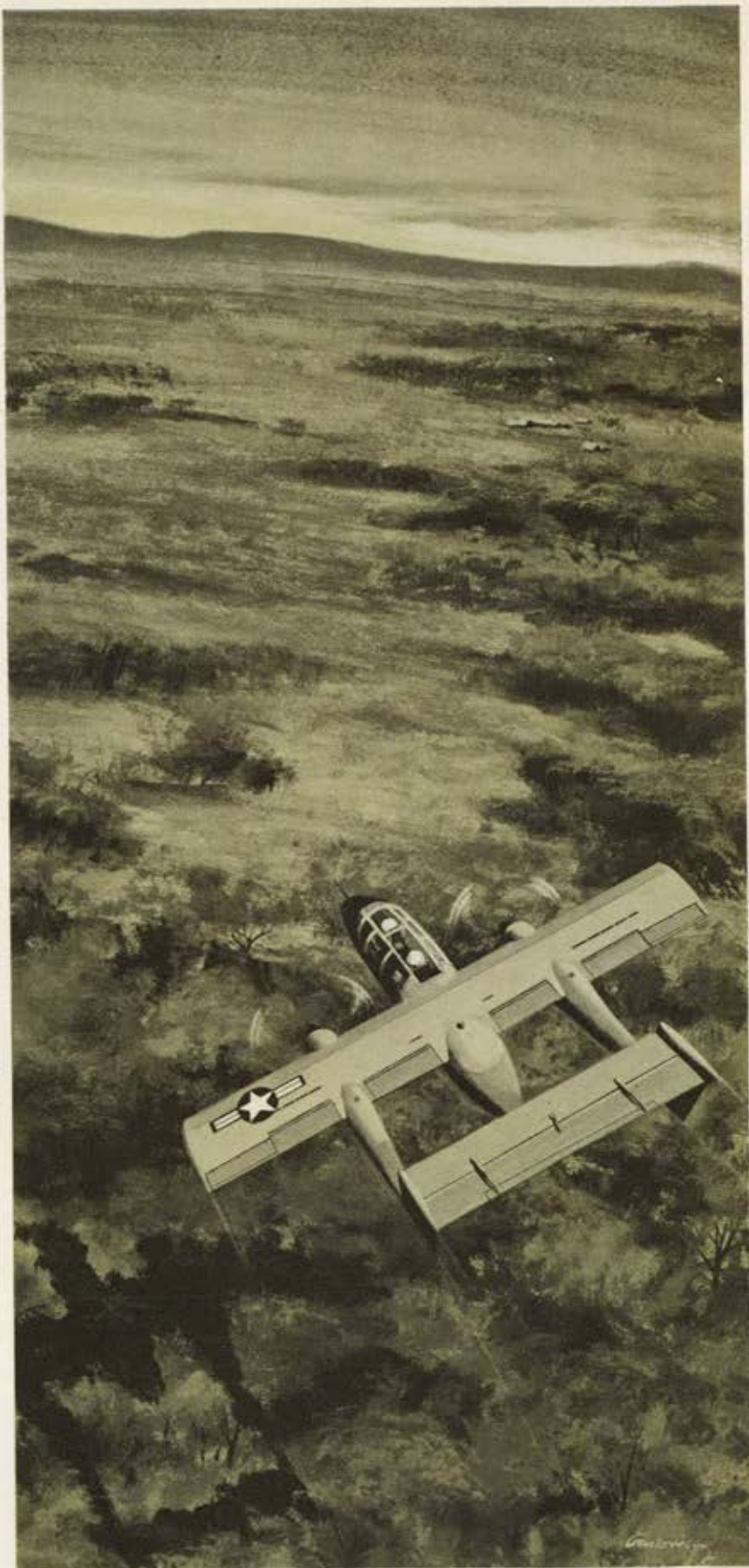


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He won't. When you're in his back yard, you're on your own. You'd better know where you're going . . . and which way to high-tail-it home. That means accurate, reliable heading information regardless of eye-sagging high-G turns, twisting-turning evasive action, hard rolling pullouts and jinking on and off the target. These stringent requirements call for a compass system like Sperry's AN/ASN-75 which has been selected as the primary heading reference source aboard the OV-10A COIN aircraft. The AN/ASN-75 is a particularly rugged yet remarkably precise development of the famed Gyrosyn® series. With an accuracy of $\pm \frac{1}{2}$ degree, the entire AN/ASN-75 weighs only 9.3 lbs. and occupies a minimum of valuable space.

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**Don't expect your enemy to set up
navaids for you.**