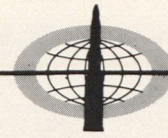


AUGUST 1966

Air Force/Space Digest



International

PUBLISHED FOR THE LEADERS OF THE FREE WORLD BY THE UNITED STATES AIR FORCE ASSOCIATION

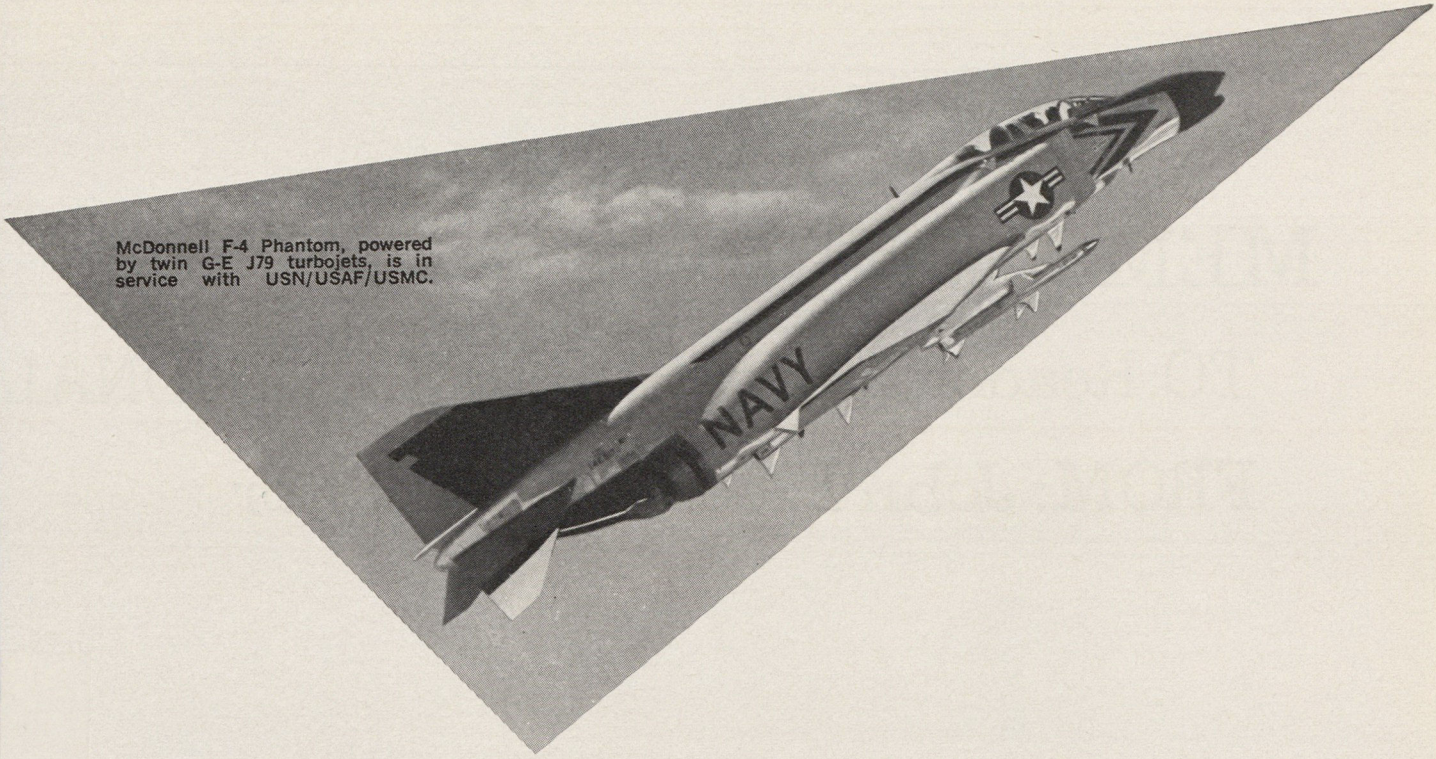


THE AIR WAR IN VIETNAM

Including special, on-the-scene reports on:

- The tactics and employment of airpower in the South.
- The interdiction campaign against the North.

And an assessment of the various uses of airpower, from intratheater airlift to reconnaissance and the B-52 bombings, by the men who fly the missions.

A black and white photograph of a McDonnell F-4 Phantom II fighter jet in flight, viewed from a high angle. The aircraft is white with dark markings, including the word "NAVY" on the side and a star insignia. It is carrying several missiles under its wings. The background is a dark, triangular shape, suggesting a stylized sky or a specific lighting effect.

McDonnell F-4 Phantom, powered
by twin G-E J79 turbojets, is in
service with USN/USAF/USMC.

***Nearly every fighter aircraft
can be powered by
General Electric jet engines***

... engines ranging from operationally proven designs to advanced concepts for future needs.

FLIGHT PROPULSION DIVISION

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205-15

LYNN, MASSACHUSETTS/CINCINNATI, OHIO

MEMORANDUM

TO: Readers of AF/SD INTERNATIONAL
FROM: John F. Loosbrock, Editor

Vietnam Report

We are quite conscious of the fact that among our 12,000 readers in some 53 countries there are many, perhaps most, who do not support the U.S. position in Vietnam. Not all Americans support it. Some are in active opposition. In this internationally oriented technological publication we make no effort to defend or to criticize from a policy point of view.

We do recognize, however, the worldwide interest in the Vietnam War. Not political interest alone, but professional and technical interest on the part of military men and other government and industry officials who are involved with the defenses of their own nation. Therefore, in this special issue, we examine in some depth the conflict now going on in Southeast Asia, with particular emphasis on the military airpower aspects.

Early in this year we sent our Technical Editor, J. S. Butz, Jr., to Vietnam, so that our readers could have the benefit of firsthand observation by a highly qualified expert. Mr. Butz is truly an expert in the field of aerospace activities.

First of all, he is not a journalist turned technical expert. He is an engineer turned journalist. He holds a degree in aeronautical engineering and, before entering the writing field, worked as an engineer for such companies as McDonnell, Martin, and Canadair. Before joining our staff as

Technical Editor he was a member of the editorial staff of "Aviation Week" for a number of years.

In all, Mr. Butz spent almost three months in Vietnam. He flew on missions with Forward Air Controllers and with pilots of attack bombers. He spent many days in the field with Army units—the 1st Infantry Division and the 1st Cavalry Division (Airmobile). He went out into the countryside and interviewed province chiefs. He spent as little time in Saigon as possible.

At all times, he had the special needs and interests of our readers in mind. This is why we feel that he presents a picture of the Vietnam War, both from the air and from the ground, that is not to be found in any other publication.

Of particular interest is Mr. Butz's article on bombing in North Vietnam. It was written, of course, before the attacks on fuel storage facilities had been authorized. In a way, this fact makes the article even more interesting and useful to serious students of war. (See "The Bombing Campaign in North Vietnam," page 22.)

We also believe you will find our specially drawn situation maps of great interest. These are as accurate and as up to date as we could possibly make them, using all sources, official and unofficial, that are available to us. We have had requests from government agencies for permission to reproduce them for official use because they are better than any available from any other source.

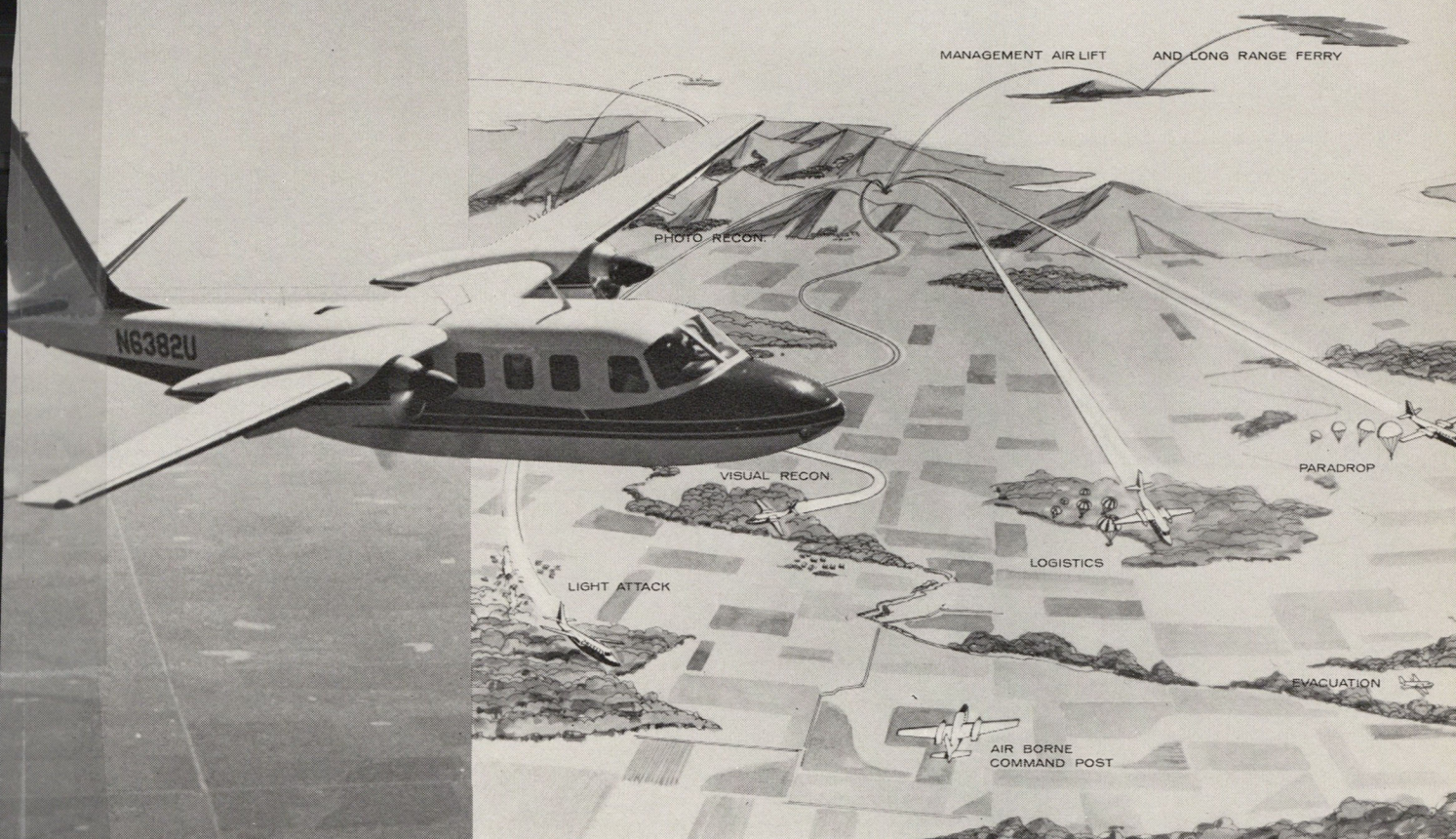
A unique appraisal of the air war in Vietnam is to be found beginning on page 32. This article is based on the personal comments of nine Air Force pilots, all of whom served in Vietnam. Every major area of Air Force activity is covered—from the B-52 raids to the helicopter air-rescue activity. It is a remarkably frank and analytical picture of air activity in Southeast Asia.

Paris Air Show

U.S. participation in 1967 at the 27th Salon International de l'Aeronautique et de l'Espace will be more extensive and better organized than in any previous year. The U.S. display, marking a cooperative effort on the part of the U.S. aerospace industry and the U.S. Government, will take notice of the fact that May 21, 1967, immediately preceding the opening of the Paris Show, is also the fortieth anniversary of the historic flight of Charles A. Lindbergh from New York to Paris. It is especially fitting that on that flight Lindbergh landed at Le Bourget Airport, site of the Paris Show. The U.S. display will dramatize the progress made in aerospace technology in the past 40 years, outline the present state of the art, and project future progress up to the year 2000. This magazine, of course, will keep our readers apprised of future developments concerning the Paris Air Show and will report on the Show itself in depth and in detail when it occurs.

☆☆☆

For any branch of military service



Here's the mission-ready Turbo Commander

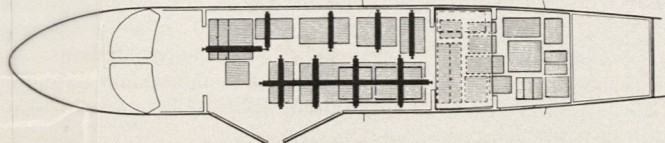
The Turbo Commander, a high performance 9000 lb. prop-jet originally designed for the corporate market and certified by the FAA, provides a vital dividend to the military. The expanded mission version of the aircraft cruises at 250 k and features a useful load of more than 4000 lbs. Fuel/payload trade-offs permit excellent flexibility in fulfilling tactical support, logistics and personnel carrier missions from paved depots to forward airstrips. With near STOL capability the Turbo Commander can clear a 50 ft. obstacle in 1740 feet from a standing start. It has fully reversible propellers and can utilize virtually any landing strip, anywhere.

Thus, the Turbo Commander is a natural for bridging the gap between single engine observation aircraft and 30,000-lb. transports. It's a versatile, practical and economical twin engine workhorse that's readily applicable to a multitude of missions. For complete details write *Aero Commander, Suite 810, Madison Bldg., Washington, D.C.*

TURBO COMMANDER

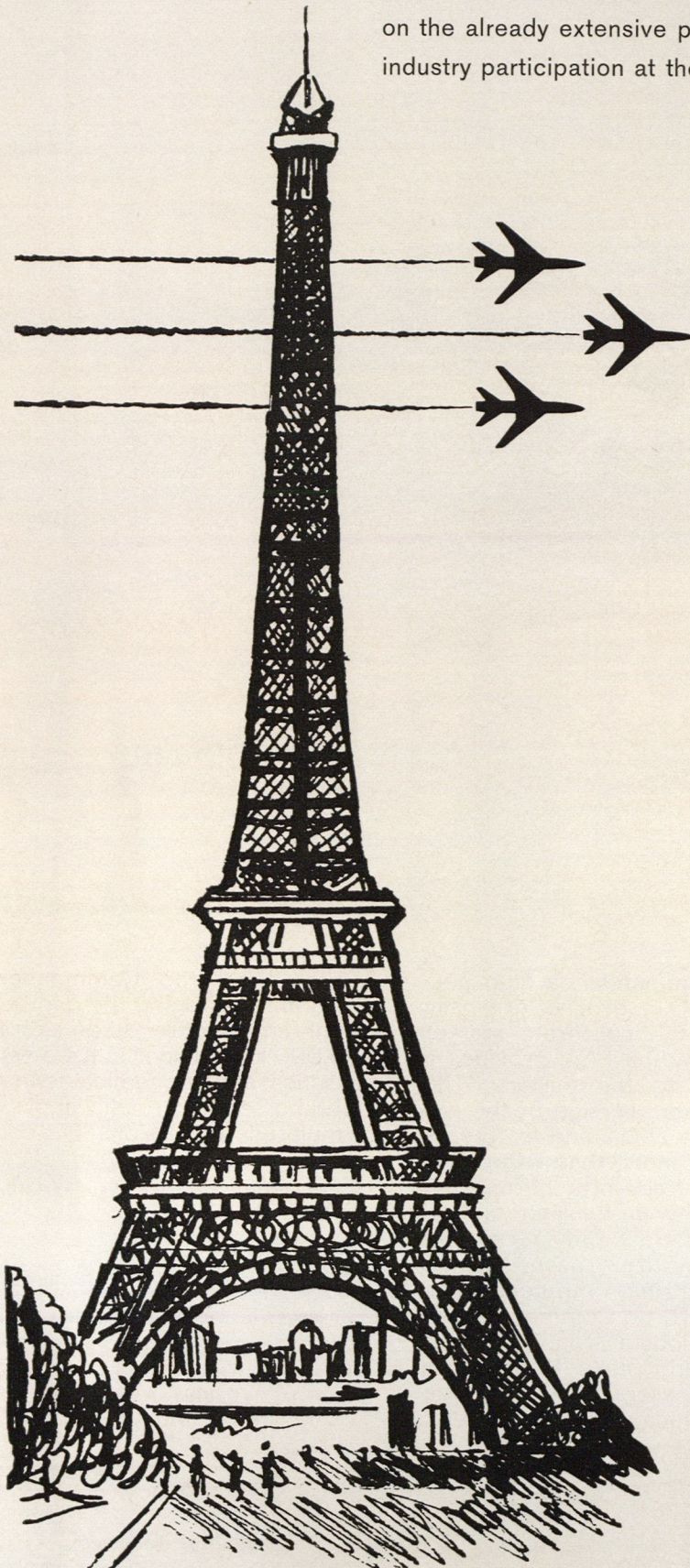
A PRODUCT OF ROCKWELL-STANDARD CORPORATION

AERO COMMANDER
INTERNATIONAL SALES DEPARTMENT
(Cable: AEROCOM)
BETHANY, OKLAHOMA, U.S.A.



TURBO COMMANDER... EASILY ACCESSIBLE CARGO SPACE, READILY CONVERTIBLE TO PERSONNEL TRANSPORT

For the first time, the U.S. Government and aerospace industry have joined forces to present what is hoped will be a U.S. exhibit unparalleled in the history of the Paris Air Show. The U.S. Pavilion will include a National Interagency Exhibit featuring American aeronautical and space achievements. Here is a report on the already extensive plans for U.S. Government and industry participation at the 1967 Paris Air Show....



U.S. Aerospace

Will 1967 be America's year to score as never before at the historic and prestigious International Air and Space Salon in Paris, France?

We've marked the target and started the countdown—and we're confident we'll orbit to unqualified success ten months from now.

For the first time, the U.S. Government and the American aerospace industry have joined forces to present in Paris the best the United States can produce in aeronautical and space equipment and technology.

The twenty-seventh biennial Paris Air Show will be held at Le Bourget Airport, May 26-June 4. It will open in the month of the fortieth anniversary of Charles A. Lindbergh's historic transatlantic flight from New York to Le Bourget on May 20-21, 1927.

The U.S. presentation will be called "In the Spirit of Lindbergh," commemorating the aviator's pioneering flight and demonstrating American aeronautical and space achievements carried on in the trail-blazing spirit that was part of it.

Among the "firsts" in the U.S. Government-industry presentation at the Paris Air Show will be:

- A U.S. Pavilion housing Government and industry aeronautical and space displays.
- A commercial, buyer-oriented U.S. exhibition, sponsored by the U.S. Department of Commerce, displaying the products of up to 50 aerospace components manufacturers.
- A U.S. National Interagency Exhibit, organized by the U.S. Department of Commerce, which will include major participation by the National Aeronautics and Space Administration (NASA), the Federal Aviation Agency (FAA), the Atomic Energy Commission (AEC), the Communications Satellite Corporation (COMSAT), and the En-

BY PAUL E. PAULY
Director, Office of International Trade Promotion
U.S. Department of Commerce
Chairman, Paris Air Show Interagency Committee

Plans for the 1967 Paris Air Show

Environmental Science Services Administration (ESSA), featuring advancements in scientific research and technology.

Here are some late developments in planning for the U.S. presentation:

The Department of Defense display will be held outdoors next to the U.S. Pavilion. It will feature space technology. Aircraft will be located in a separate area at Le Bourget.

The Commerce Department will begin soliciting aerospace components manufacturers in September for participation in the U.S. commercial exhibition. Industry booths will occupy 10,000 square feet (930 m²) of space in the U.S. Pavilion but separated from the U.S. Interagency Exhibition.

Appropriate institutional displays of aerospace hardware will be located in the Interagency Exhibition area. Space in this area also will be available on a limited basis to companies manufacturing equipment directly associated with NASA, AEC, FAA, ESSA, or COMSAT displays.

Why this intensive planning and many months of teamwork by U.S. agencies and the aerospace industry?

Since the first Paris Air Show at the Grand Palais in 1909, the event has displayed the best that aviation—and now aerospace—has to offer. The show marked the beginning of international cooperation in aviation.

Star attraction of the 1909 show was the aircraft flown that year by Louis Blériot across the English Channel from Calais to Dover—the first over-water flight in history.

The first jet engine was demonstrated at the Paris show in 1919.

The Paris Air Show became an institution. Except for the years of World Wars I and II, it was held at Grand Palais every two years through 1949. Outgrowing the Grand Palais, the show was moved to Orly Field in 1951

and to Le Bourget in 1953. The first rockets and spacecraft appeared at the show in 1959. A special hall was built to house them.

The first official U.S. participation in the Paris Air Show was in 1946 with a Department of Defense (DoD) display of two World War II B-29s and a few fighter aircraft. The DoD has taken part in every show since then. In 1963, NASA and FAA joined DoD with aerospace and aeronautical displays at the show.

For the 1965 show, Government and the aerospace industry undertook to coordinate their presentations. The AEC exhibited an orbiting nuclear reactor. The DoD displayed a walk-through model of the Titan II and the Atlas-Agena combination. The Commerce Department and DoD sponsored a Business Information Center at the show. Industry booked exhibit space directly from the show managers. Government and industry displays were located in separate areas.

Russia won attention at the 1965 show with a display of the Vostok capsule and the appearance of Yuri Gagarin, first man in space. The United States took the spotlight in the closing days of the show when Vice President Humphrey and Astronauts McDivitt and White and their wives arrived. The Astronauts brought with them their film on the walk in space, which brought U.S. participation in the show to a grand finale.

Soon after the 1965 show, we began planning for 1967. Our Paris Air Show Interagency Committee, chaired by Commerce, was formed in November. Members are representatives of the Departments of Defense, State, Commerce, the United States Information Agency (USIA), FAA, NASA, AEC, and the Smithsonian Institution.

Meetings with the American Aero-

space Industries Association and other industry groups began early this year. The committee invited M. Jacques Maillet, Commissioner General of the French Union Syndicale des Industries Aeronautiques et Spatiales, and Director Maurice Guilbot to come to this country to discuss U.S. space at the show. They flew to the U.S. in March and concluded an agreement with the U.S. Government for 40,000 square feet (3,720 m²) of space for the show. They also met with the Industry Advisory Committee under the aegis of Aerospace Industries Association.

Since then, plans have been coordinated between the Interagency Committee and aerospace industry representatives for the 1967 U.S. presentation.

Five major aerospace companies have offered the services of their exhibits, design, and public-relations specialists to assist in planning and coordinating with Government-industry presentation. They are the General Electric Company, Litton Industries, the Martin Company, The Boeing Company, and United Aircraft Corporation.

The Commerce Department's chief designer, Joseph Adams, went to Paris in May to arrange for the construction of a suitable temporary building for the U.S. Pavilion at Le Bourget.

The Government's show coordinator, A. Roe Preston of the Commerce Department's Office of International Trade Promotion, will leave for Paris in the fall "for the duration."

Early next year the Commerce Department will send a market development team and a commercial exhibition manager to Paris. They will develop sales prospects for the aerospace components manufacturers' products.

Target: For 1967, a U.S. presentation unparalleled in the history of the Paris Air Show. ☆☆☆

Letter from Washington

French President de Gaulle's visit to Moscow has stirred up wide speculation in the United States, and some apprehension. There is no heated debate, but much serious discussion about the future of NATO and the effect of de Gaulle's conduct on the Atlantic Alliance. President Johnson says the door is open for France, a friend and ally, to return to a leading role in NATO. There is no confidence that this will happen, but . . .

Is It Safe for NATO to Relax?

BY CLAUDE WITZE

Senior Editor

WASHINGTON, D. C., JUNE 27

As this issue goes to press, French President Charles de Gaulle is ending his visit to the Soviet Union. Many Americans are speculating about what he has been doing there, and some are upset by the possibilities. This country's abiding faith in the North Atlantic Treaty Organization is not seriously questioned by any important people. But it is obvious that NATO is being shaken while President de Gaulle is hailed at the Kremlin and permitted to witness a launching at Baikonur, the Soviet space-launching site.

In America everyone has seen satellites or space vehicles sent into space; many of our launchings are broadcast on television with full and detailed coverage for millions of viewers. This American audience would be shocked if the U.S. Government did these things in secrecy and then invited a guest from behind the Iron Curtain to witness the procedure.

It is reported that President Lyndon B. Johnson has written to President de Gaulle—the date was March 22—that the door is still open for France, “our old friend and ally,” to return to a leading role in Atlantic affairs. Within President Johnson’s “official family,” there is evidence that a difference of opinion exists about how America should react to de Gaulle’s recent behavior.

The U.S. Secretary of State, Dean Rusk, for example, is in favor of some cautious disarmament; he seems to

feel the trend is toward reduced tension. At the same time, he wants to keep the guard up. He says, “The problem for democracies is to avoid tempting thieves.”

Mr. Rusk’s Undersecretary of State, George W. Ball, is reputed to advocate a tougher approach; some of his recent testimony on the subject to Congress has been kept secret for “security reasons.”

Only a week ago, McGeorge Bundy, who recently left his post as a special assistant to the President at the White House, was asked by a Senate committee for his opinion on these matters. Mr. Bundy replied in strong language: “The present foreign policy of France is disappointing in its manners, costly in its pride, wasteful in its lost opportunities, irrelevant in much of its dramatics, and enduring in its fundamentals.”

Mr. Bundy said the French recognition of Red China was “a gesture with no practical result. And the present spectre of a deal with Moscow is sheer fantasy—as far beyond French power as it is contrary to French intentions.” He said further that France remains our ally and that no American should be anti-French.

From Moscow comes word that de Gaulle has told the Russians that France wants to break a “harmful spell” and that the French want to see “relaxation, harmony, and cooperation with the East European states.”

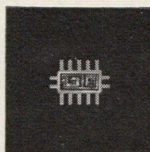
There is no record that anyone in

Washington is opposed to relaxation, harmony, and cooperation. But there also is a certain amount of apprehension about the long-range results of the de Gaulle visit to the U.S.S.R. Part of this feeling seems to come from the fact that communication between Washington and Paris already has been damaged. If it had not been damaged, it seems clear, Washington would know precisely what de Gaulle was going to do. Some Americans are upset by the thought that, only 22 years (Continued on page 11)



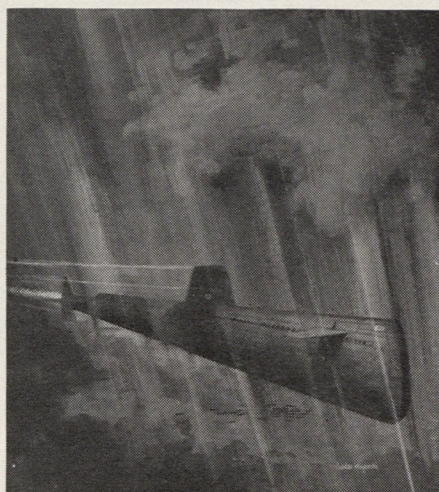
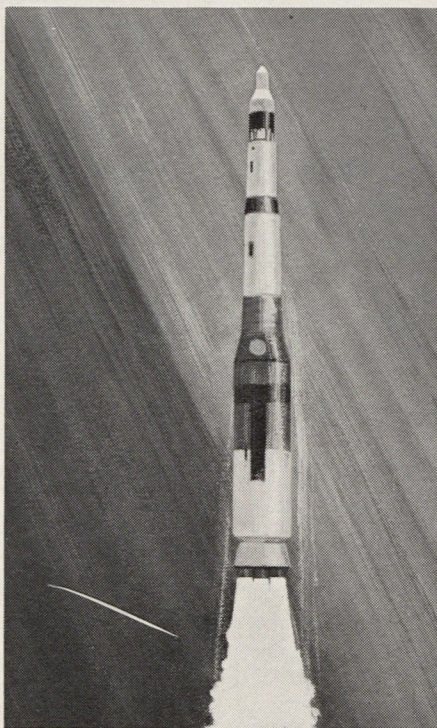
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“What’s your phone number—in case I need you again?”



A little

goes a long way



 This is an integrated electronic circuit shown at actual size.

Though tiny, it plays a big role in assuring reliability in electronic systems for aircraft, missiles, and submarines. And it also goes a long way in reducing cost, weight, and size. It does the same job as seven normal-sized vacuum tubes...as well as a host of resistors, diodes, and other devices.

The integrated circuit is the key to microelectronics, the technological revolution now sweeping the electronics industry. It has helped electronic

circuits to shrink to less than a quarter-millionth of their former size... while increasing systems reliability by a hundredfold.

North American Aviation/Automatics Division designed and built the

first successful microelectronics system using integrated circuits. It is proving itself in the Minuteman II missile.

Pioneering new technologies such as this is but one way North American Aviation contributes to scientific progress and security. It is designing, building, and testing the Apollo spacecraft in cooperation with NASA; and built the Mach 3 XB-70 aircraft, a vital contributor to the Free World's continuing leadership in aviation.

North American Aviation 

European Headquarters: North American Aviation S.A., 29 Rue de la Coulouvrenière, Geneva, Switzerland



PORTRAIT OF A THREE-TIME WINNER

For the third time in the past six years, Senior Editor Claude Witze of AIR FORCE/SPACE DIGEST has won the AVIATION/SPACE WRITERS ASSOCIATION annual award for **Best Writing and Reporting in Aviation/Space Magazines**. His winning article, "Let's Get Operational in Space" ran in the October 1965 issue of AIR FORCE/SPACE DIGEST. The 1966 award is one more milestone in an editorial career which spans more than thirty years, twenty of them in the aerospace field.

Veteran reporter Witze, who also won the James J. Strebis trophy in 1963 for **Best Aviation Writing in ANY Media**, is not the only prizewinning writer on the AIR FORCE/SPACE DIGEST staff. The Robert S. Ball Memorial Award for **Best Space Writing and Reporting in**

ANY Media went to Technical Editor J. S. "Sam" Butz, Jr. in 1963 and to Senior Editor William Leavitt in 1964. Leavitt also won the **Best Writing and Reporting in Aviation/Space Magazines** that same year.

With writers like these you would expect AIR FORCE/SPACE DIGEST to have more readers than any other aerospace publication. And it does. Our BPA audited circulation of 94,958 is still climbing.

Media leadership claims are often based on strange and wonderful devices. But most sophisticated marketing men still prefer to see their advertising in the publication with the best editorial staff and the largest number of readers in the field.

In other words, in AIR FORCE/SPACE DIGEST.

For a reprint of Mr. Witze's prizewinning article or for complete market and media information, call or write:

AIR FORCE/SPACE DIGEST

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

NEW YORK—CHICAGO—LOS ANGELES—SAN FRANCISCO—LONDON—PARIS—FRANKFORT—BRUSSELS

after General Eisenhower brilliantly carried out the invasion of the Normandy beaches, a French president should be unhappy with this country's role in the Atlantic Alliance.

President Johnson seems to accept French assurances that there will be no surprises from Moscow. But Mr. Johnson is surrounded by people, in his Administration and all across the country, who feel that the basic differences between the United States and Russia are not going to change. Talk of a détente is received with skepticism, except in limited circles.

After all, it seems reasonable that one of the things Russia has wanted ever since NATO was organized was to disorganize it. A weak NATO, it is presumed, will serve Russian purposes better than the strong one. For NATO is credited by most Americans with having saved the peace for a couple of decades.

The New York "Times" said in a recent editorial that there is a menace in de Gaulle's dialogue with Russia, because it could lead to a future alliance, particularly if Germany should become bellicose.

The newspaper went on to charge that the de Gaulle policy "divides the West, stirs military risks, encourages Soviet intrigue, and frustrates the Germans, creating the very dangers it is supposed to counter."

This matter of "Soviet intrigue" is one that fascinates and terrifies many Americans. A "Times" editor, writing from Paris, has pointed out that it is the Communist Party and not the Soviet Government that lays down Kremlin policy. Also, that it is the Russian secret police (K.G.B.) and military intelligence service (G.R.U.) that carry out the policy. These two services are far larger than the Soviet Foreign Ministry, and a high proportion of accredited Russian diplomats are not diplomats, but are from the ranks of the K.G.B. and G.R.U.

It is this sort of thing, the fact that Russian diplomats are professionals in charge of disrupting such things as NATO, that makes many Americans cautious. And it explains why they look with a cold eye on President de Gaulle's evident trust in the headquarters of Communism.

All of this does not mean that the United States does not accept changing conditions nor that it does not recognize the need for new and improved relations with our allies. Certainly the subject of the Atlantic Alliance is under close study. At least two committees of Congress are conducting investigations, and the State Department and the Defense Department work daily on the problem.

For example, Defense Secretary

Robert S. McNamara has announced that all U.S. Air Force units and air and ground munitions will be withdrawn from France during the next few months. Mr. McNamara said he did this "after consultation with my NATO allies," which probably means the nations other than France. His move was in response to the de Gaulle demands that U.S. forces be removed from France by April 1, 1967.

Mr. McNamara said the United States will withdraw 122 aircraft. They include two squadrons of C-130 transports and six squadrons of reconnaissance aircraft. The C-130s and their headquarters, that of the 322d Air Division, will be relocated in England. Sites are being sought for the reconnaissance units in other countries of Western Europe. The munitions that are essential to combat will be shifted to other NATO countries, most of them to Germany.

The Defense Secretary emphasized that U.S. capabilities in Europe will not be reduced by these moves. This fits firmly into the American concept that NATO is a defensive alliance and that all of its members must contribute to its capability. The conflict, as everyone knows, comes from the fact that nuclear bombs are here and that the "nuclear club" is growing. President de Gaulle is a member.

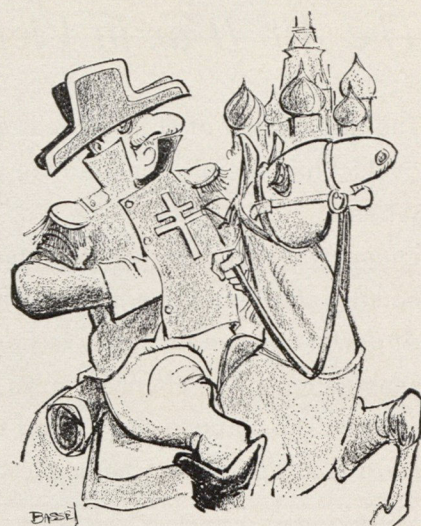
In the Congressional investigations, this subject comes up frequently. The most scholarly testimony is being given before the Subcommittee on National Security and International Operations of the Senate Committee on Government Operations. The chairman is Senator Henry M. Jackson of the state of Washington.

A top witness, in early May, was General Lauris Norstad. He has retired from the Air Force, after a long tenure as Supreme Allied Commander in Europe. The General said it is an error to blame de Gaulle for the entire NATO crisis. He said any public arguments between this country and France would be improper and ineffective.

General Norstad laid sound groundwork for Mr. McNamara's removal of Air Force units from France. He said that the expense and trouble of doing this would be small. Then he talked bluntly about nuclear weapons.

General Norstad said that "because these weapons have become a symbol of power, and thus of sovereignty, they have assumed an importance in policy discussions far beyond that to which they are entitled on a purely military basis."

General Norstad is not one of the Americans who ever thought highly of the proposed Multilateral Nuclear Fleet (MLF). He made this clear in his Washington statement by suggesting that



—Reprinted with permission of
Scripps-Howard Newspapers

Moscow Revisited

some nuclear weapons—part of the 5,000 Mr. McNamara says are in stock in Europe—"should be wholly committed to the alliance."

He pointed out that this would not require further nuclear proliferation, which everyone opposes, but instead would give the NATO Council greater authority and wider responsibility.

General Norstad also suggested, and this may come as a surprise to many Europeans, that a small executive group be set up, responsible to the NATO Council. The big job would be to decide when and where the nuclear weapons would be used. He proposed that the executive group include the United States, the United Kingdom, and France, as well as West Germany. Italy or a Scandinavian nation might also have a seat.

He said the Secretary General of NATO would preside and serve as a representative of the other nations.

"This formula," he continued, "while respecting the rights and responsibilities of each NATO member, would meet the need for collective political action in emergency." He said a solution to provide some form of political control for the use of nuclear weapons "by or on behalf of NATO could well be the most important single step toward reducing tensions, eliminating misunderstandings, within NATO."

There is no room here to review all of the varied opinions being expressed in Washington, D. C., and in the press. It must suffice to report that the Moscow meeting is being watched closely. There is no such thing as a debate under way about the NATO problem; it is not being discussed with the heat that is going into our agony over Vietnam. But the Atlantic Alliance has lost none of its priority so far as America is concerned.

☆☆☆

The Air War in Vietnam

The application of U.S. tactical airpower in the Vietnamese conflict has sharply changed the power balance in that bitter war. When tactical airpower was first deployed in earnest, the enemy was maneuvering in battalion-sized units all over the country and Viet Cong morale was at an all-time high. Airpower showed its ability to destroy Viet Cong jungle sanctuaries, blunt enemy attacks on outposts, and effectively support U.S. ground forces and their Vietnamese allies. Here is a report from the scene on . . .

Tactical Airpower in Vietnam... The Trial By Fire

BY J. S. BUTZ, JR.

Technical Editor

Tactical airpower, U.S. Air Force style, had its first fair chance to prove itself in a guerrilla war during the last year and a half in South Vietnam. The results have been so extremely impressive, in fact, that not even the most ardent airpower advocate could fully appreciate the degree of success unless he had been in the right spots in Vietnam and had actually witnessed the results.

The record clearly shows that tactical airpower was the decisive element which turned what at the beginning of 1965 was a nearly hopeless situation for the U.S. and South Vietnamese into a decidedly more hopeful one in 1966. At the new year in 1965, Viet Cong morale appeared to be at an all-time high. They were maneuvering in battalion-size units in every part of the country and were fighting with increasing audacity and staying power. Today, the future is comparatively bright, even though the war is far from over.

The bright spot on the horizon is that airpower has proved to be much

more effective against guerrillas than most people had dared hope. Airpower techniques demonstrated during 1965 are lightening the burden of the ground forces. The term "lighten" in this sense, of course, is relative. Ground fighting in the jungle and mud of Vietnam could never be termed a light task. The encouraging news is that airpower can give U.S. ground troops and edge over the VC that no army has ever enjoyed against a major guerrilla force.

A Decisive Edge

This edge is big and can be decisive. The greatly improved air capability has been due primarily to three factors—a big boost in strike aircraft strength, an improved command-and-control system, and a new awareness among ARVN (Army of the Republic of Vietnam) and U.S. Army commanders of the devastating power of tactical airpower in a guerrilla war. The strike aircraft inventory is 600 to 700 fighters

—jets and A-1s—compared to around 100 serviceable A-1s at the end of 1964. The command-and-control system was improved by increasing the number of Forward Air Controllers more than fourfold, by installing new communications gear, and by streamlining the request channels for close air support.

The significant contribution of airpower has not been the subject of deep reporting in the mass-circulation press. One example was the rash of derisive articles when the B-52 bombing operations was first announced. It was described as "swatting flies with sledgehammers," and was generally scoffed at as a completely illogical ploy by "warhawks" in the USAF.

It took a long time for the right word to get around and for the truth to appear in print. Some of the right word isn't out yet.

The first B-52 mission generally was regarded as a fiasco, because two of the big bombers were lost in a midair collision and a limited penetration of



High speed, enormous fire-power, and rapid arrival on the scene are the keys to effective application of tactical airpower. Above, an F-100 Supersabre pilot prepares to take off on a mission against a concentration of Viet Cong forces in the Mekong Delta area. This pilot's unit flew more than 3,000 sorties against the enemy during its combat tour in Vietnam.

the target area showed only a few VC bodies and some warm tea in a kitchen. However, two months after the raid, a U.S. ground force combed the target area and counted 400 bodies buried in tunnels.

Another example is the estimate of the Viet Cong killed by air. These estimates began to rise rapidly last year as the Air Force buildup hit its stride. By July, the estimates had risen to more than 12,000 killed by air in that month alone. At that rate the VC would be wiped out in a few months, which obviously was not going to be the case. Much more stringent rules for counting enemy dead were instituted, but not before the press had become properly confused on the subject and had written a number of scathing articles about Air Force operations in South Vietnam.

Airpower has now proved itself to be the key element in operating against classical guerrilla warfare, as defined by Mao Tse-tung and as carried out by the Viet Cong and their PAVN (North Vietnamese Army or People's Army of Vietnam) allies. Tactical aviation has proved effective against the Viet Cong when it operates in company groups, or smaller, with the objectives of terrorizing the countryside, controlling the population, collecting taxes, and recruiting soldiers. And tactical aviation, in the form of fixed-wing fighter-bombers has also been the decisive element in defeating the Viet Cong and PAVN when they attempt to fight pitched battles with battalion- and regimental-size forces.

Command-and-Control System

A centralized command-and-control system, especially tailored for the Vietnamese situation, has directed the air strikes. Setting up and manning the system has been primarily a USAF responsibility. It closely follows established USAF Tactical Air Command doctrine for control of tactical air in a theater of operations.

All strike aircraft—United States Navy, United States Marine Corps, VNAF (Vietnamese Air Force), and USAF—are under the control of a single Tactical Air Control Center (TACC) in Saigon. Targets are fed into the TACC by ground commanders in the four Corps areas, and then aircraft are assigned to targets by the TACC, which keeps an up-to-date situation report on the number of aircraft immediately available and the priority of targets throughout the entire theater.

The one exception to these procedures is during U.S. Marine Corps ground actions when a certain number of Marine aircraft are placed under the direct control of the Marine ground commander. This benefits the Marines but cuts down on the number of aircraft available for what may be high-priority targets elsewhere.

Most of the targets at the TACC are preplanned at least a day ahead to support ground sweeps and other operations. This allows airpower priorities and allocations to be discussed at some length by air and ground commanders. This discussion is easy, for the communications now are excellent. However, the prime objective of the TACC operation is to provide fast response in emergencies, when ground

troops have been ambushed or suddenly attacked by superior forces.

Response time is very rapid. In many cases fighters are on the scene in less than 15 minutes after the request is made. The fast response has been possible primarily by diverting aircraft that are already in the air and headed for lower-priority targets. In the III Corps area, around Saigon, where the distances are relatively short and there is a great deal of strike aircraft traffic, an average of five minutes' response to ground emergencies has been achieved over a period of several months.

The centralized control system has another flexibility feature which has been used to great advantage. In cases of large ground actions it is possible to immediately divert essentially all of the strike aircraft in South Vietnam into an emergency area and keep them there.

The Strike Force

Thus far, the command-and-control system has worked well and has not fallen down seriously in any instance. Many ground commanders are enthusiastic about it. With the system, the

A major factor in the success of U.S. tactical airpower has been the Forward Air Controller (FAC), who flies daily observation missions in the light Cessna O-1E to ferret out guerrilla positions. This FAC is flying over jungle in a coordinated operation with U.S. Army forces.



relatively moderate strike force is able to provide effective and immediate air support for more than 750,000 U.S. and South Vietnamese soldiers over a narrow country more than 500 miles (805 km) long.

One basic element of the command-and-control system was designed to protect civilians to the greatest extent possible and still allow airpower to be applied fully against the Viet Cong. The heart of this technique is that control over all air strikes has been given to the local Vietnamese. The Vietnamese province chief, usually an ARVN lieutenant colonel, must approve every air strike in his province. Every target must be verified before it is struck. Leaflets are dropped all over the province explaining what targets will be hit. If changes in the bombing rules are to be made, new leaflets are dropped well ahead of time, warning civilians to get out of the area. As the province chief is responsible for the political as well as the military situation in his area, he has a vital interest in protecting civilians from the war and winning them to the Government's side.

In addition, Forward Air Controllers (FACs) assist the province chief in verifying targets and directing strike aircraft precisely to the targets. (See "Forward Air Controllers—They Pinpoint the Targets," page 22, in the July 1966 issue of AF/SD INTERNATIONAL.)

The record of airpower in combating high-intensity guerrilla war makes it obvious that aviation also will have a key role to play as the level of activity drops back to the stage of terrorism by individuals and very small groups. Aviation will be able to provide an umbrella under which local police, political officers, and economic advisers can proceed with the final stages of pacification, the establishment of a stable economy, and the setting up of a government truly responsive to the people.

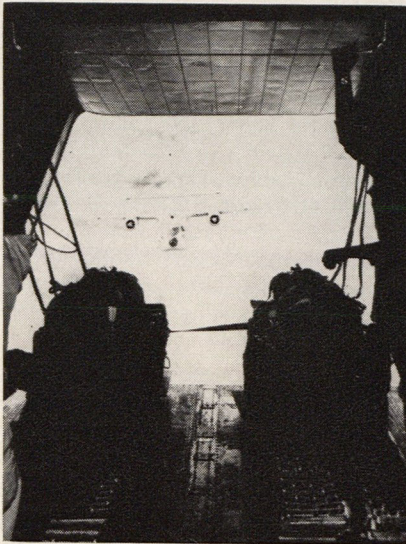
Denying VC Sanctuaries

An essential factor in the ultimate defeat of the Viet Cong is to deny them the mountain and jungle sanctuaries spread throughout South Vietnam. These have been used for two decades or more to operate hospitals; rest troops; build weapons; store ammunition and food; and train terrorists, political cadres, and troops. The Boeing B-52 bomber has shown during the past year that it is by far the most effective means of destroying these heavily fortified "safe areas" and driving the Communists out of them.

The B-52 raids began in June 1965. By the first anniversary of the Super-



The U.S. Air Force's F-5 Freedom Fighter, shown here en route to strike targets in North Vietnam, has shown its mettle in the Southeast Asian war. The test program, in which the F-5's combat capability was examined, was nicknamed Skoshi Tiger.



Many remote Government outposts in Vietnam can be reached safely only by air, and a major tool in the air resupply job is the C-123. Crewmen await drop orders.



One way to hurt the enemy is to rob him of concealment during his night attacks. Above, a C-123 airman drops flares over embattled outposts, aiding ground forces.

fortress raids, in June 1966, Strategic Air Command B-52s had flown more than 350 strikes, placing more than 70,000 tons of bombs accurately on Communist "safe areas." Missions were flown in all four of the Corps areas, and a few raids were made north of the Demilitarized Zone, but most were directed against the most famous Viet Cong redoubts, the Iron Triangle and War Zone D, near Saigon.

A number of other operations have been indispensable in USAF's good showing against the guerrillas. They include:

• **Intratheater Airlift**—The USAF maintains the largest airlift within

Vietnam that has ever been sustained by the U.S. military.

• **Flare Drop**—One of the most effective techniques in thwarting VC night attacks has been the dropping of flares from transport aircraft. They can circle a besieged outpost for hours and drop hundreds of flares, if necessary, to turn night into day and expose the attackers to ground observation long before they get into the defensive perimeters.

• **Defoliation and Crop Destruction**—Spraying of chemicals to kill foliage and reduce cover along roads and in VC strongholds has become a major (Continued on page 17)

Shown in this specially prepared map are the major landmarks of the Vietnamese War, including potential targets in North Vietnam: (electric power and industry) Hanoi, Haiphong, Viet Tri, Bac Giang, Nam Dinh, Hon Gai, and Vinh; (electric power) Na Ngan, Ta Sa, Lao Cai, Thac Ba, Uong Bi, and Ban Thach; (industrial) Tinh Tuc, Bac Can, Phu Tho, Lam Thao, Thai Binh, Ham Rong, Co Dinh, and Ben Thuy. The arrows trace the Ho Chi Minh supply trail in the west and the sea infiltration routes in the east. The U.S. Seventh Fleet, which is on "Yankee Station" just above the 17th Parallel, which divides North from South Vietnam, includes the aircraft carriers of Task Force 77.





USAF activity. Chemicals are also used to kill crops in VC-controlled areas. In the course of these "Ranch Hand" spraying operations, which are conducted at about a 50-foot (15.3 m) altitude, the aircraft are hit many times by small-arms fire.

Ground Army—Guerrilla Ratio

In practical terms, the ability of tactical aviation to be decisive against guerrilla activity means there can be a revision of the old military axiom that guerrillas or partisans must be outnumbered by about ten to one before they can be defeated by a ground army. If air is exploited fully, victory can be achieved with a much smaller ratio of friendly to Viet Cong troops.

It is difficult to play this numbers game with any degree of accuracy. The troop ratio needed for victory is quite sensitive to the success of the pacification program, winning the population to the Government's side, and the military's success in keeping the VC cleared from heavily populated districts. In any event, airpower is going to keep the troop ratio far below ten to one, with a material saving in blood to South Vietnam, the United States, and their fighting allies—Australia, New Zealand, and South Korea.

Perhaps the most telling point in proving the claim that tactical aviation is now the decisive arm in anti-guerrilla warfare is that the Army ground troops most heavily engaged in fighting the Viet Cong are outspoken supporters of fixed-wing tactical airpower in general, and the service provided them by the Air Force in particular.

In addition to the many official commendations from high-level Army field commanders, spot checking with junior officers and enlisted men from the 1st Cavalry, 1st Infantry Division, and the 173d Airborne Brigade indicates that all combat ranks share the enthusiasm for heavy tactical air strikes, and the Air Force's performance in delivering them. Some soldiers are intensely serious on the subject. One Special Forces sergeant at Cha La, an outpost

in the IV Corps Area, said "... we'd all be dead without the Air Force."

Such statements must be viewed in perspective. Few, if any, of the Army people have changed their minds fundamentally about the need for increasing the mobility of troops in every possible way, including the mass use

of helicopters. Few have changed their views about the use of armed helicopters and increasing the firepower of their units in every way possible.

Many of them, however, have changed their minds about the need
(Continued on following page)



A vital reason for the low death rate of wounded allied personnel in the Vietnamese War has been speedy air evacuation to rear areas where adequate medical attention is available. Above, wounded Marines are tended by USAF male nurse aboard aircraft carrying them to Da Nang Air Base hospital, where best available care will be given.

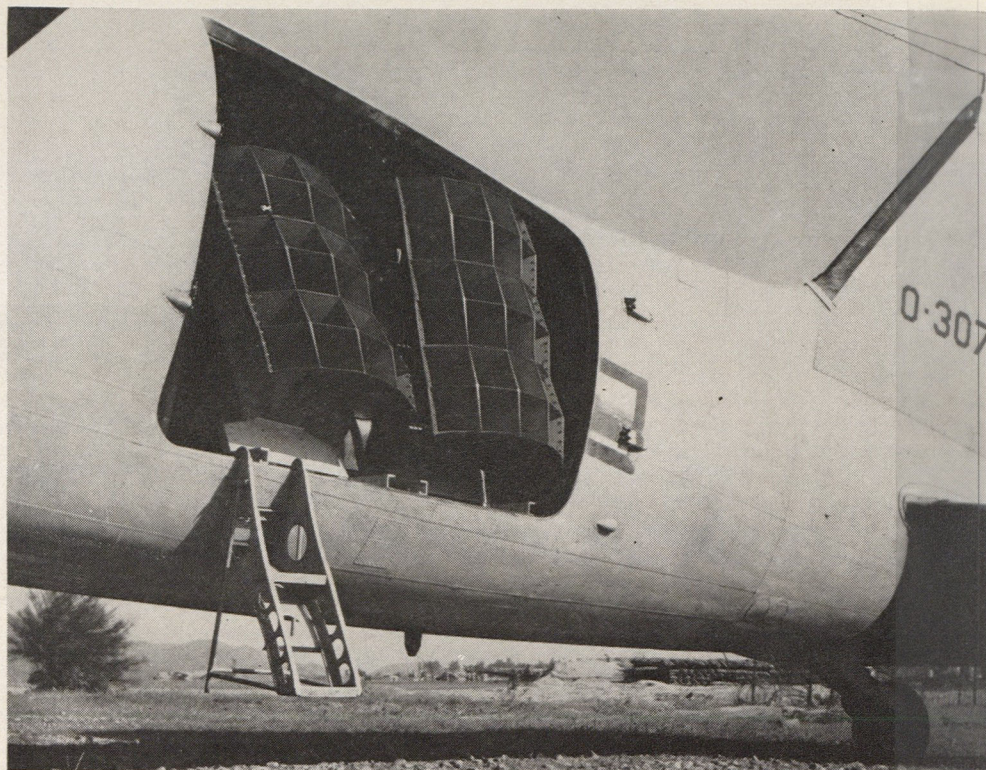


Airpower in Vietnam has given infantry an edge no army in history has ever had in fighting guerrilla forces. This photo of an F-100 in action against the Viet Cong, in support of ground troops, shows the power that can be deployed even in jungle areas. Troops in the field have unanimously praised airpower contribution to their mission.

This war situation map of South Vietnam shows the provinces, major cities and communities, sites of major engagements, and locations of Air Force and allied bases. Dark shading indicates Viet Cong concentrations and controlled areas, with their major bases in Zones "C" and "D." The areas controlled by the South Vietnamese Government and Americans are shaded in red. Because Viet Cong controls much of countryside, making highway and rail travel difficult, the principal transport burden is carried by aircraft.

Psychological warfare is used extensively in South Vietnam and among the techniques employed is warning of civilians to avoid areas expected to come under allied attack.

Similarly, Viet Cong forces are often urged to surrender. This C-47, equipped with an array of powerful loudspeakers, is used for broadcasts over areas controlled by Viet Cong guerrillas.



for fixed-wing tactical aviation. Most now consider it a vital, indispensable requirement for fighting large VC and PAVN units.

In simplified terms, the two principal drawbacks to the air-cavalry concept which have emerged so far in the Vietnamese fighting are:

- Armed helicopters have only

enough firepower to influence small unit actions.

- Improved mobility provided by the helicopters usually has not been adequate to bring the VC to battle on the Army's terms.

The Viet Cong still are able to use the tactics which have brought them success in the past. In most instances,

they are mobile enough, marching under the jungle canopy and at night, to avoid battle if they desire. Usually they fight only when they have massed troops and outnumber their opponent in the local area. They still rehearse an attack for days, if possible, and wait until conditions are strongly in
(Continued on page 21)



Although it was originally designed as a high-performance fighter-interceptor for air defense, the F-104 has been used successfully in Vietnam to strike enemy ground forces, as well as fly air cover for fighter-bombers attacking North Vietnamese targets. This F-104 pulls up sharply after bombing a Viet Cong encampment in the Da Nang area.



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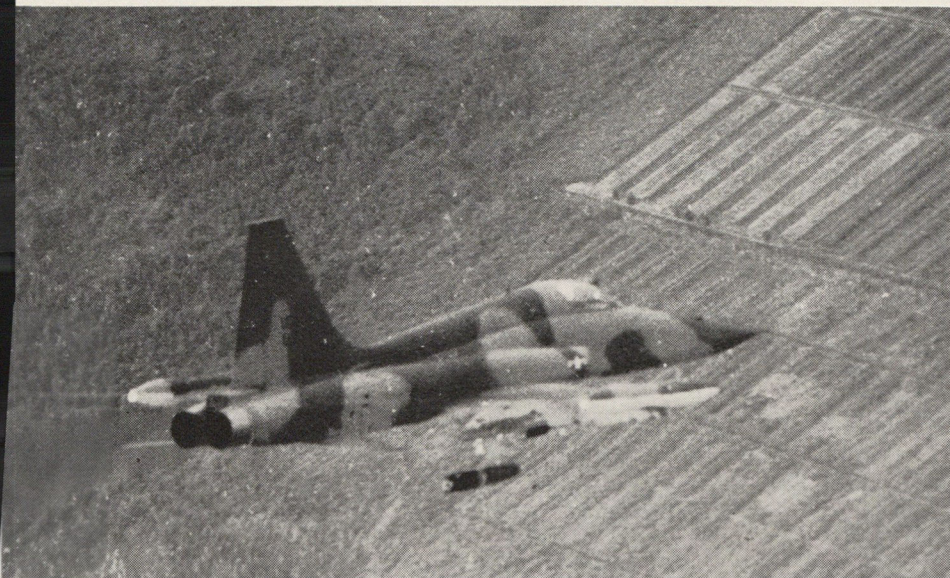


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At the time this photograph was made, F-5s had flown 4,000 combat hours in the Vietnamese conflict, from October 1965 through May 1966. Having shown their capabilities in both the "in-country war" in South Vietnam, and over North Vietnam, F-5s are now permanently assigned to the war, augmenting the force of other aircraft brought in by the U.S.

their favor—for example, during bad flying weather or when strong patrols are out from an outpost. Ambush of relief forces, whether they are going to the aid of outposts in trucks or in helicopters, remains a key VC tactic.

Improved mobility of U.S. and South Vietnamese forces using helicopters and ground vehicles has not been able to overcome these VC tactics.

In the future, as experience grows and intelligence on enemy activity improves, it is undoubtedly going to be possible to exploit the mobility of air cavalry to greater advantage. However, it does not appear there will be any substitute for the heavy firepower of fixed-wing tactical aviation, either in the defense of outposts during rescue of ambushed units, or in the timely destruction of large enemy groups forced to fight by mobile troops.

Considering the performance projected for the next generation of rotary-wing aircraft, such as the AAFSS (Advanced Aerial Fire Support System) being built by Lockheed Aircraft Corporation, it is possible to improve substantially the armament payload being carried by armed helicopters. Consequently, they will be useful in a wider variety of situations. But it is not foreseeable that fixed-wing fighter-bombers can be dispensed with in large unit engagements, either in guerrilla wars or in more sophisticated combat.

Unfortunately, the tactical air controversy is far from over. It rages on, especially outside Vietnam, just as it did before tactical airpower, Air Force style, was committed in earnest early in 1965. Army enthusiasm for USAF control of tactical aviation does not extend far above the fighting units.

Some influential U.S. Army generals contend that the proper place for close air support always has been, is now, and always will be under the direction and control of the ground commander. Here the basic argument is that aviation can never be "fully responsive" to the needs of the ground troops without this command structure.

The last year and a half hasn't gone perfectly by any means, but the main USAF objectives have been exceeded. Improvements are being made rapidly, and air effectiveness during 1966 is sure to be raised considerably. When the final history of the Vietnamese War is written, however, 1965 will stand apart as the year in which airpower, Air Force style, was brought into an antiguerrilla war in earnest for the first time, and is proving to be the decisive arm. ☆☆☆

An Air Force C-130 performs large service as troop carrier in U.S. Army search and destroy mission. During operation pictured, aircraft, in first 12 hours of airlift, delivered more than 1,800 U.S. Army 1st Infantry Division troops and some 390 tons (353 mt) of equipment to a dirt landing strip 40 miles (64 km) from Saigon.



The Air War in Vietnam

Airpower, as it is being used in the bombing campaign against North Vietnam, is involved in a radical experiment in the use of force. The main objective is to persuade the Hanoi Government, with an extremely restrained bombing effort, to come to the conference table. But even this partial effort is hurting the enemy's war effort. What bothers U.S. pilots is lack of public understanding that, if permitted, airpower could knock North Vietnam out of the war in a matter of days . . .

The Bombing Campaign in North Vietnam

BY J. S. BUTZ, JR.

Technical Editor

Just before this magazine was printed, and after this article had been written, U. S. aircraft began bombing fuel storage areas near Hanoi and Haiphong. While significant, the new targets do not represent a basic departure from the U. S. policy of restrained military action as outlined in this article.—THE EDITORS

To the men of the United States Air Force actually flying the air missions over North Vietnam, the strikes are more of an elaborate exercise in restraint than a valid test of the military effectiveness of modern airpower.

Airpower is still striking lightly at the North Vietnamese. The targets being hit are still the least lucrative ones available—military barracks and camps, which the enemy was abandoning anyway, plus railroads, roads, bridges, and other installations on the lines of communication, which can easily be repaired. The directions from Washington are very explicit and often preclude both the use of sound combat tactics and sufficient aircraft to assure the complete destruction of targets.

The military objective hasn't changed since the air war started more than a year ago. The objective is to conduct a restrained harassment of North Vietnam, one which will convince the Hanoi Government of two things—first, that it cannot expect an untouched sanctuary from which to conduct aggression; and second, that Hanoi would not want to have the full weight of U.S. airpower directed against its country.

The major political objective of the air war is more ambitious. President

Johnson has made it abundantly clear that the U.S. wants the bombing to bring Hanoi to the conference table and to cease its military adventures on the Indo-Chinese peninsula—in South Vietnam, Laos, Cambodia, and Thailand.

The opposition is tough. Antiaircraft fire in most areas is described as heavier than that in the Korean War, and in some locations equal to any concentration encountered in World War II. During 1965, around 170 Air Force and Navy planes were lost to enemy action out of an attack force which has been kept at a constant strength of about 300 airplanes.

The cost of the airpower experiment in North Vietnam obviously is high. Not only U.S. aircraft and men are endangered. Belief in the value of airpower could also be hurt by this partial effort. This is what worries the pilots who take the physical risks in Vietnam.

No matter what their opinions of the restrictive bombings, they are most concerned that people in the U.S. and the rest of the world—including Hanoi—do not understand that the present bombing campaign against North Vietnam is a radical experiment in persuasion. They feel it should be obvious,

but apparently isn't to many, that airpower, if ordered to do so, could effectively put North Vietnam out of the war in a matter of days. This could be done by using conventional bombs to destroy sources of supply rather than merely hitting the routes by which supplies move to the front. There is no suggestion that nuclear weapons should be employed or that centers of population should be attacked.

The targets would be the port complex at Haiphong and the petroleum storage dumps, warehouses, factories, and power stations crowded into the Red River valley around Hanoi. This area is small, falling roughly into a circle with a 30-mile (48 km) radius, with Hanoi in the center. Contrary to popular opinion, North Vietnam is much more vulnerable to air attack than a modern industrial nation which has a large source of skilled labor and a big, diversified factory system. North Vietnam depends heavily on outside supplies to remain a viable military power. Its masses of people, who are so effective in performing manual labor such as rapid repairs for the lines of communication, are not equipped to support themselves in a modern war.

Other aspects of the air war in the North are not as obvious. First, the



During the lull in the bombing, the North Vietnamese stockpiled large quantities of supplies in storage areas near Dien Bien Phu and repaired the concrete runway at the modern airfield serving the city. Since the resumption of the bombing at the end of January, USAF fighter-bombers have struck the storage sites and the airfield repeatedly, cratering the runway and cutting roads. Located about 185 miles (298 km) west-northwest of Hanoi, Dien Bien Phu is the major city in this mountainous section of North Vietnam.

harassment of the North Vietnamese by bombing their roads and interdicting their lines of communication is only a partial effort. Not enough aircraft have been committed to keep all of the main roads cut.

No one claims that it would ever be possible to stop all supply movements from North to South Vietnam. No interdiction program has ever been leakproof. Certainly this is not to be expected in an area that has an abundance of pack animals and human porters and that is laced with hidden trails and waterways.

However, an interdiction program can be much more effective than one might expect. To begin with, the North Vietnamese need roads and trucks. If you can drive the enemy off the roads and stop his trucks, you have handed him a serious defeat. Supplying major army units solely by human porter is a major handicap. Just the number of porters required is staggering, even for a guerrilla army the size of the Viet Cong and for regiments that travel as lightly as do PAVN (People's Army of Vietnam) units in South Vietnam.

To illustrate, using extremely conservative estimates, it would take slightly more than 800 trucks to handle the logistics requirements of the

170,000-man VC/PAVN army in South Vietnam. This is assuming that the entire army consumes about the same amount of supplies in a day as one U.S. division, and almost cutting in half the probable distance those supplies have to be transported.

But if human porters have to be used exclusively, the problem changes radically. One- and two-man A-frames are used by coolies in Indo-China for such tasks. Giving them the benefit of the doubt, each man can carry 100 pounds (45 kg) for 20 miles (32 km) each day. Assuming the same very conservative requirement, 250,000 porters would be required to transport the supplies, if that were the only means available. Since the above estimate of the total VC/PAVN supply requirement is very low and the work assumed possible by each porter is high, it is more likely that a total porter force of half a million or more would be required. Even then it would be difficult to keep enough supplies moving to back large-unit actions, and the Communists would be forced to restrict their activities in the South.

Obviously, the North Vietnamese want to use trucks, not porters. They will fight hard to keep using them, and will be seriously hurt if they cannot.

This is the reasoning behind the U.S. decision to harass their lines of communication. There is validity in this reasoning, and there is a possibility that such harassment can pay large dividends. Even though the air strikes on the North can be characterized as a partial effort, they have not been wasted and have hurt the North Vietnamese war effort. It becomes a matter of judgment as to whether this limited military harassment can ever have a major impact on the conduct of the war.

Strikes Against Transportation

The air strikes have been directed against the three types of heavy transportation that are available to the North Vietnamese because they must fall back on porters and pack animals. Rail traffic has been curtailed substantially. The country has three major rail lines. One runs south out of Hanoi to the South Vietnamese border, and most of this line has been kept out of commission. The other two run from Hanoi to China, one to the northeast and the other to the northwest. They have been bombed but not for long enough to keep both closed all of the

(Continued on following page)

time. The Air Force cut rail lines more than 285 times in 1965, and the Navy probably had about the same performance.

River and sea transportation has also been hit. Potentially this is a highly productive means of transport for the North Vietnamese. It is estimated that there are more than 50,000 sampans on the rivers and coastal waters of North and South Vietnam. Many of these carry substantially larger loads than a truck and are motor-driven with good cruising speeds. It is difficult to tell friend from foe, and stopping all illicit traffic is impossible. Patrolling of these waters by the U.S. and South Vietnamese navies has been increasing substantially. The U.S. Navy officially reports that this patrolling—Operation Market Time—is quite effective, and that the Communists do not move a large percentage of their supplies by this means. This judgment is disputed, however, by many in South Vietnam, who say that even if you stopped all of the road traffic, the Communists could get all they need by boat.

Most of the USAF pilots participating in the air strikes agree with the Navy that trucks carry the bulk of the supplies south. The Air Force points out that the "rather frantic" efforts Hanoi makes to keep the roads repaired is a good indicator of their importance.

The problem is that interdicting a road system is one of the most difficult tasks a tactical air force has to perform. It takes many airplanes and repeated attacks. When the enemy has manpower to repair roads, build alternate routes, and camouflage truck parks, maintenance facilities, and fuel

dumps, the aircraft requirement rises substantially.

The Road-Interdiction Campaign

A road-interdiction campaign is built around two types of attacks. One is armed reconnaissance strikes by fighters against the traffic on the roads; the other is against the roads themselves. Initially, the road system is examined methodically to locate the "choke" points. These are stretches of roads which, if taken out, cannot easily be bypassed, creating traffic bottlenecks. A typical choke point is a bridge over a fast-running river with high banks, a river that is not easily forded or spanned by pontoon bridges. A choke point can also be a stretch of mountainside road which, if cratered by bombs or wiped out by bomb-caused landslides, cannot be easily rebuilt or bypassed.

USAF reconnaissance of the supply roadnet from North to South Vietnam has located about 60 such choke points. Since the North Vietnamese are putting great effort into repairing roads and bridges, these choke points must be hit every two days if the roadnet is to be effectively kept closed. The North Vietnamese are able to get traffic moving through damaged choke points in an average of forty-eight hours.

Pilots report that it takes at least 12 airplanes to have an 85-percent probability of heavily damaging a point target such as a bridge or a road point which is defended by antiaircraft. With the type of airplanes being used to hit the North, this means more than 70

750-pound (340 kg) bombs. The basic load of the Republic F-105 Thunderchief is six 750s, and the McDonnell F-4C Phantom II carries eight 750s. These two aircraft are the mainstays of the attack force. Consequently, 30 choke points must be hit every day by 12 airplanes, calling for 360 sorties a day.

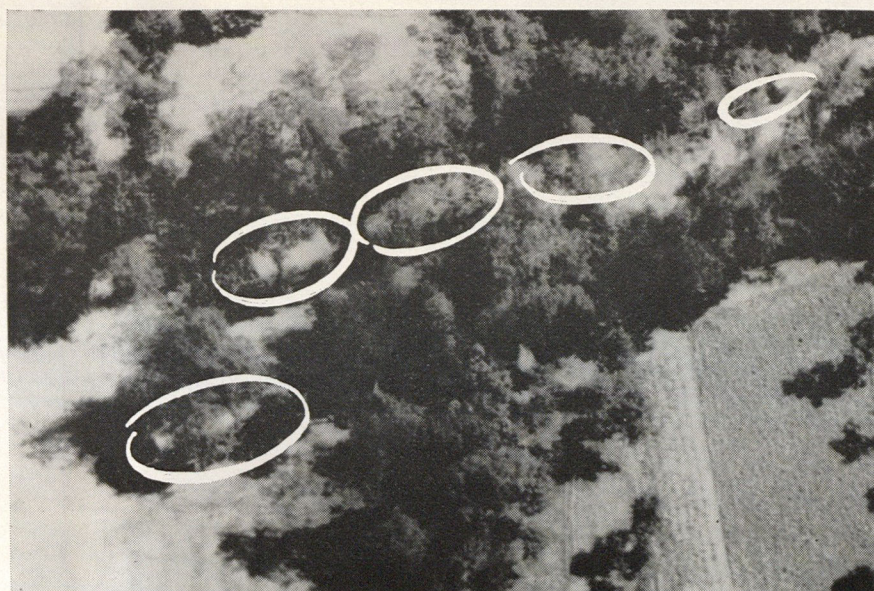
There is more to the problem. Armed reconnaissance is needed to attack traffic, hunt out motor parks, harry work parties, and generally keep the system off balance. Conservatively, at least 100 sorties daily would be needed for this job. Armed reconnaissance in this area is a considerable task, for the lines of supply from North to South Vietnam, including secondary roads and visible trails, add up to more than 7,000 nautical miles. This compares to a roadnet 3,260 miles long which had to be interdicted in Korea, and a system of 2,900 nautical miles in Italy in World War II.

The total requirement for interdicting the road system, therefore, runs to 450 or 500 sorties per day. The total strike force is about 300 Air Force and Navy aircraft, and it is doubtful that more than 85 percent of these complex aircraft are available on any given day or that they could maintain a usage rate of much more than one sortie per day. The total number of sorties available, then, probably is slightly less than 250—about half of the requirement.

From these rough numbers it appears that the air effort would have to be doubled to deny the North Vietnamese the use of their roads and incapacitate the bulk of their 15,000 trucks. Even then it would be a long, difficult campaign. The Communists have already set up a sort of "segmented" system in which supplies are moved principally in short hauls, between choke points. There is much loading and unloading of goods, with storage near vulnerable points which are likely to be bombed out. When repairs are completed, a maximum effort is made to rush the supplies a short distance beyond the critical area to another storage point. Sometimes porters and animals are used to bypass the bombed points. This "segmented" system is working well, and it would take some time to defeat it, even if the necessary number of aircraft became available.

Ironically, such a full-blown effort against the lines of communication would require more aircraft and more time than following the militarily more attractive plan of knocking out the complex in the Red River valley near Hanoi. The supply and industrial complex probably could be reduced to ineffectiveness in a couple of weeks of

(Continued on page 26)



The circles in this photo indicate trucks camouflaged by the North Vietnamese. Wide use of camouflage, curtailment of daylight travel, and damage to the roads obviously have impeded the North Vietnamese supply operation. However, a much greater effort would be necessary to choke off the bulk of the supplies now being sent to the South.



AIR WAR IN THE NORTH . . . War situation map shows how USAF and Navy bomber strikes are being directed against the North Vietnamese transportation network—highways, bridges, railroads, and waterways—used by the North Vietnamese to funnel hundreds of tons of supplies a day to the South. The bulk of this materiel is carried by truck, making the road-interdiction campaign a high-priority matter. The best targets are "choke points," stretches of roadway which, if cut, cannot easily be bypassed, thus creating traffic bottlenecks. Bridges make especially good choke points when they are over fast-running rivers that cannot easily be forded or spanned by pontoon bridges. Last year USAF destroyed more than 300 bridges in North Vietnam. One of the toughest bridges has been the giant span at Thanh Hoa, a vital junction for traffic between Hanoi and the major staging area at Vinh. This bridge, exceptionally well built and heavily defended, has so far resisted destruction

by USAF and Navy aircraft. Railroads have also been bombed, with some resulting curtailment of traffic along North Vietnam's three major rail lines—one from the northwest, out of China; a second from the northeast, also from China; and the third, southward from Hanoi to the border of South Vietnam. Red "bomb blasts" on the map above indicate the road and rail areas or military installations near towns that have been hardest hit. Shaded "safe areas" around the North Vietnamese capital city of Hanoi and the port of Haiphong had been hit only occasionally and then on special orders from the Joint Chiefs of Staff, before the series of attacks began, late in June, against fuel depots and storage areas. These raids against North Vietnamese fuel supplies were designed to further hamper the movement of men and materiel to the Viet Cong. The cost of this "out-country" war is high. In 1965 about 170 USAF and Navy aircraft were lost, primarily to antiaircraft fire.

good weather, using the 300-aircraft force now available.

Thus, the two major options for future expansion of the war are (1) to do a complete job on the lines of communication, or (2) to attack the Red River supply complex. The pilots in Vietnam would like to see an end to false hopes that bombing by itself could ever end the war. No air interdiction campaign can be successful unless accompanied by hard pressure from ground forces to make the enemy "fire out" and use his supplies. Otherwise, even a slow trickle of supplies can be stockpiled to the point that occasional offenses are possible.

The pilots also believe that the present system of using leaflets to warn civilians to get out of target areas can continue to be effective in minimizing casualties if the decision is made to intensify the war. Bombing by tactical fighters has proven to be of the true pinpoint variety, and it can be used against factories and supply dumps without hitting adjacent areas.

Tactics and Technology

In the area of tactics and technology, the U.S. has registered a number of sound accomplishments against a well-armed and determined enemy.

Probably most important, in the first combat encounters between Soviet missiles and U.S. aircraft, the aircraft won hands down. A special team of USAF pilots is credited with fathering a "breakthrough" in flight tactics and electronics, which give aircraft an excellent chance for evasion when engaged by SA-2 surface-to-air missiles.

U.S. aircraft have performed well in virtually all situations, and some electronic air-to-ground weapon-delivery systems have been excellent, allowing precision low-level bombing to be done in bad weather. Workable tactics and countermeasures have evolved rapidly to counteract radar-directed antiaircraft cannon as well as SAMs.

One tactic developed in Vietnam has unexpectedly improved weapon-delivery accuracy. When the fighters started to receive heavy ground fire, they began to salvo their bombs, releasing all of them at one time instead of releasing only one in each pass, to reduce exposure to ground fire. Salvoing raised the probability of damage from a given bomb load and materially lowered the antiaircraft effectiveness.

When this increased damage probability is coupled with the fact that F-105s and F-4s can carry approximately four times the bomb load of a Korean-type fighter, then the effectiveness of a modern tactical-fighter force begins to come into focus. In other words, the 300-aircraft force now avail-



Only five buildings remain in a section of a storage area near Dien Bien Phu which once had 27 structures. Air Force F-105s made repeated attacks, destroying 229 buildings in the large storage area, near a railroad running between Hanoi and Communist China.

able for North Vietnamese action probably is more effective than the 1,100 to 1,200 tactical aircraft used in Korea.

Much also is being learned about the performance of the USAF aircraft and their systems. The F-4C has shown a much better air-to-air capability than the F-105, but the F-105's central air data computer and the electronics system tying it to the radar have proved to be more versatile than the weapon-delivery system in the F-4C. Consequently, the Thunderchief is demonstrating better accuracy in toss bombing, and it also can operate at low level in bad weather.

The toss-bombing system has worked well against bridges and other point targets. The all-weather feature has been used in more than 30 percent of the F-105 missions against the North. If there is a prominent landmark a known distance and direction from the target, it can be picked up by the pilot on radar and then the central air data computer will put the aircraft on the proper heading, pull up, and release the bomb at the proper instant so that it will be lobbed over to the target.

If the pilot is flying just below a low cloud deck and spots a target, he has only to roll the aircraft over, place his sight on the target, and the computer will take control of his dive, release the weapons properly, and make the pullout.

It appears that this combat-proven system now will be adapted to the F-4.

Enemy Antiaircraft Defenses

Varying assessments of the effectiveness of the antiaircraft defenses of North Vietnam bring to mind the adage that what you see depends on where you sit. Some headline writers in the United States have called the Soviet SA-2 missile "SAM the Sham." Report-

ers have made much of the fact that more than 150 SA-2s were fired against U.S. aircraft in the last six months of 1965 and that they brought down only ten planes—five USAF and five Navy. This kill ratio of less than 6.6 percent is far below that generally credited in U.S. Department of Defense air-war studies to ten- to 15-year-old, beam-rider, line-of-sight missiles such as the SA-2 and the Nike-Ajax. Reporters quickly pointed out that the Secretary of Defense would have to change his calculations, that such theoretical air-war studies had been generally discredited, and that manned aircraft had moved back into a position of dominance.

Unfortunately, it isn't going to be quite that easy. The contest between aircraft and defensive missiles is far from over, and the aircraft is not a sure winner, especially in a war of attrition such as we are choosing to fight in North Vietnam.

Pilots who man the cockpits over the North obviously see the Communist antiaircraft defenses from a different angle, and they are understandably more concerned about it than the average observer. Pilots report that there still is considerable "apprehension" about the SA-2. The U.S. has learned a great deal about the system, and it is generally regarded as a pretty good weapon, more effective than has been indicated in North Vietnam.

The pilots' main concern is the way that the SA-2 greatly increases the effectiveness of the automatic AA weapons. Before the SAMs became active in June 1965, bombing in the North was relatively easy because the pilots had the sky to themselves above 20,000 feet (6,100 m) and were relatively safe from all types of fire, even though the 85-mm guns can reach to 35,000 feet (10,670 m). They dove down in the actual attack onto the target,

but this was their only exposure to heavy fire.

The SA-2 is a dangerous high-altitude weapon, and the basic evasive tactic is to dive abruptly from it. If the missile already is close, this maneuver may be too quick for the missile to follow. If the missile has just been launched, or if its radar is tracking prior to firing, the dive may take the aircraft below the radar beams, at least far enough into the ground clutter so that the radar becomes ineffective.

Consequently, the SA-2 has driven the strike aircraft down to levels where the 85-mm guns are highly effective and the 57-mm and the 37-mm weapons can also be employed. Large numbers of these guns are in use. The North Vietnamese have become highly skilled at rapidly moving and camouflaging both the missiles and guns. Thus, the patterns of anti-aircraft fire across the country change very quickly. Any pilot who gets in the middle of

a concentration has a high probability of being hit. And it is not always easy to determine how a concentration is laid out.

Electronic Countermeasures and Modern Missiles

The most vital elements of the air war in the North—electronic countermeasures (ECM) and the deployment of more modern missiles—are classified. This could lead to faulty conclusions about future prospects for anyone not privy to these secrets.

The radar and missile literature of the past 20 years offers a good clue to what is going on, however. A complex electronic contest is in progress. The U.S. is trying to jam and fool the enemy radar warning net in North Vietnam and the radars which control the SAMs and the 85-mm and many 57-mm cannon. The North Vietnamese are trying to jam and fool the electronic equipment aboard U.S. strike aircraft,

especially those with all-weather bombing systems, such as USAF's Douglas RB-66 and the Navy's Grumman A-6. The efforts of both sides depend heavily upon successful electronic intelligence (ELINT) as to the particular patterns of emissions and the various operational tactics being employed by the enemy. A number of aircraft, as well as ground stations, perform the ELINT function for the U.S., trying to keep "real-time" tabs on what the radar warning net and the missile radars are up to. One aircraft playing a major role is the Lockheed EC-121 Warning Star, which was scheduled to be phased out of service a few years ago.

The electronic war is a never-ending contest because of the large number of possibilities for altering equipment and varying ELINT, jamming, and deception techniques. Human skill and experience still count heavily in this war. Possibly this accounts for the fact
(Continued on following page)

APPLYING VIETNAM LESSONS TO COMBAT AIRCRAFT DESIGNS FOR THE 1970s

Brigadier General George Simler, who was Deputy Commander for Operations, Seventh Air Force, in Vietnam for a year and is now Deputy Director of Plans in the Office of the Air Force's Deputy Chief of Staff for Plans and Operations, developed some positive ideas about how the war experience in Vietnam should be applied in selecting new aircraft designs for the 1970s. In an interview with AF/SD INTERNATIONAL, he spoke of these ideas and outlined in broad terms the performance characteristics he considers essential.

To begin with, he does not believe it is either practical or economical to build a single all-purpose tactical aircraft. He thinks four separate aircraft are required to properly modernize the USAF force for the 1970s. All these aircraft should have two engines. The most striking war evidence on aircraft vulnerability is that twin-engine aircraft are much less vulnerable than those with only one engine. But this "probably should be obvious anyway," he adds.

The first type of tactical aircraft and the one that will be needed in largest numbers is a day fighter-bomber or strike fighter capable of carrying heavy munitions, General Simler thinks. It would be twin-jet powered and capable of high subsonic speeds when fully loaded. The high cruise speed is necessary to get a short reaction time. According to both Army and Air Force people, this is the most important requirement for close air support—to get heavy firepower to ground units when they need it, not 30 minutes later. Suggestions that another piston-driven aircraft of the A-1 Skyraider type would be ideal are rejected by most people in Vietnam because its cruise speed would be too low.

Payload/range is the next most important requirement in General Simler's opinion. The aircraft should be able to carry at least 10,000 pounds (4,535 kg) of bombs over short ranges. To keep vulnerability low against automatic weapons, the critical components and accessories should be grouped above the engines and armored. The pilot's position should also be armored. The aircraft also should have self-sealing tanks and no wet wing or bladder tanks. It should be armed with a Vulcan cannon of the type on the F-105. Thunderchief pilots report that this gun, mounted along the aircraft's center line, has enabled them to

achieve fantastic accuracies in combat strafing. They guarantee that they can bag any target they can aim at.

Such an aircraft need not have all-weather capability. It would be sufficient to equip it with an F-105-type dive/toss bombing system with one improvement—laser ranging. A more accurate range-measuring device would materially improve the accuracy of the current system.

On the key question of whether this aircraft should have any air-to-air capability, General Simler is about halfway between extreme positions for and against. He wants it to have a large amount of excess thrust, which will give it a very high acceleration and a brief supersonic dash. The objective is to be able to escape from, but not fight, high-performance fighters. This tactical fighter would be the backbone of the force in all foreseeable types of wars, including the ones now being fought in North and South Vietnam.

The second type needed, according to General Simler, is an all-weather tactical bomber equipped with sophisticated electronic gear and capable of both toss bombing and level bombing.

The third type would be a high-performance fighter capable of winning air superiority. The day that the MIG-17s rose from North Vietnamese airfields and downed two F-105s, while the Thunderchiefs were still loaded with bombs and highly vulnerable, made a lasting impression on the USAF. Today, a "combat air patrol" of aircraft rigged for air-to-air combat is located above all fighter strikes. MIGs have the potential of seriously hurting the U.S. strike force in a surprise attack if not opposed by air-to-air fighters which can react quickly. To handle this sort of threat in the 1970s, General Simler believes we should have an air-superiority fighter whose design has not been compromised to give it a bombing capability.

The fourth type would be the COIN (counterinsurgency) aircraft (a LARA, or Light Armed Reconnaissance Aircraft) for Forward Air Controllers. It would give them greater speed and twin-engine reliability, plus some of the firepower they badly need. (See "Forward Air Controllers—They Pinpoint the Targets," page 22 of the July issue of AF/SD INTERNATIONAL.)

that pilots report some missile and radar-controlled AA batteries as being much better than others in North Vietnam.

Another major uncertainty in the AA picture is the possibility of the Soviets supplying a missile which is effective at low altitudes. Such a missile would have an on-board guidance system and would not have to be directed all the way to the target by radar beams from the launch site. The U.S. Army's Hawk has such a self-contained guidance system. It has proved quite effective against low-flying drones and is a vast improvement over such beam-rider missiles as the Nike for low-level defense. The Soviet SA-3 is credited with a "Hawk-type" guidance, and it has been in service for several years.

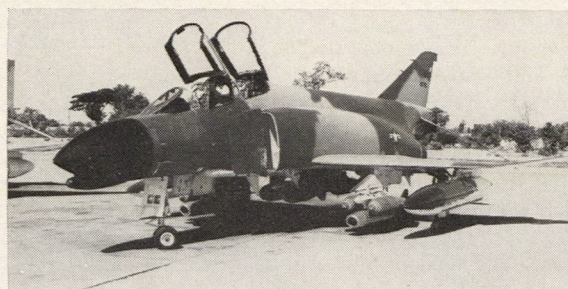
North Vietnamese skill and audacity has increased immeasurably in camouflage, and in setting and baiting flak traps with trucks and other fat targets. In return, U.S. flyers have become adept at killing gun positions by misleading the gunners into turning away from the aircraft that fires on them. However, the flak positions have become so thick that most USAF officers believe that flak suppression is a losing proposition. They conclude that the highest effectiveness—that is, the highest percentage of bombs on target and the lowest aircraft losses—is achieved by leaving the gun position alone and putting the entire effort on the target. The Navy disagrees with this premise in many cases and will put a substantial portion of an attacking force into flak suppression around the target. The evolution of tactics is far from over, and it probably will be necessary to devise completely new methods of suppressing flak, possibly including World War II-type mass fighter sweeps as opposed to the current tactic of attacking targets with small groups of aircraft—usually well under 20.

In the final analysis, then, the North Vietnamese anti-aircraft system is quite effective now, and it could be upgraded rapidly and significantly. The Soviet SA-3 could be brought in, in the near future. And the Soviets have many cards they could play in the electronic war, such as the introduction of higher-frequency radar and other new equipment. Or the Soviets could simply increase the number of radar-controlled cannon being supplied. Any of these moves could increase the effectiveness of the anti-aircraft defenses. These possibilities act as an effective damper on over-optimism for the pilots and operational commanders.

There is still another view of the air war and the anti-aircraft situation which involves the attrition problem. In long-



Caught in the open, a string of trucks waiting to cross a river in North Vietnam is photographed by an RF-101. The traffic jam is caused by a makeshift ferry being used to bypass a bombed-out highway bridge. The bridge was a typical choke-point target in the interdiction campaign. Since the North Vietnamese are putting great effort into building bypasses such as the one above, these targets must be hit every few days to be kept closed.



McDonnell F-4 Phantom II at left is carrying its "basic" load for strikes on the North. That is, eight 750-pound (340 kg) bombs and two external fuel tanks. This aircraft also carries two camera pods.

term air operations the attrition rate is extremely critical. Even though the loss rate in North Vietnam is currently quite low, a small increase could lead to serious questions about continuing the strikes. And heavy aircraft losses could bring disaster.

In 1965 in North Vietnam the U.S. flew about 26,000 sorties and lost 170 airplanes to enemy action for an attrition rate of only about two-thirds of one percent. Over the year even this low rate cost more than half of the total aircraft committed, which was a fairly constant force of 300 strike fighters. But the year's total aircraft losses connected with the attacks on the North could be much closer to 300 than to 170.

U.S. policy for reporting the air war

against Vietnam was changed during the early months of 1966. The number of aircraft sorties flown are no longer revealed. Only the number of missions is published and the number of sorties per mission is unknown. Consequently, the loss rate cannot be calculated.

The total losses of aircraft still is given, however, and on this basis the cost to the U.S. is rising. During the first five months of 1966, more than 90 aircraft were downed over North Vietnam. If this continues, the losses for the year will be more than 220.

In the future, if the number of sorties is doubled to increase pressure on the lines of communication, or for any other purpose, the statistics show that the yearly loss would be 340

(Continued on page 31)

MOST AERIAL RECONNAISSANCE PHOTOS OF SOUTHEAST ASIA ARE TAKEN WITH HYCON CAMERAS

In the USAF RF-4C Phantom's reconnaissance nose, our
KS-72 aerial camera system is
STANDARD

- * In the forward oblique station
- * In the split vertical station
- * In the vertical station

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our KA-55 panoramic camera system is
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In the USAF RF-101 Voodoo's reconnaissance nose, our
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- * In the forward oblique station
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Our field service engineers service what we sell.

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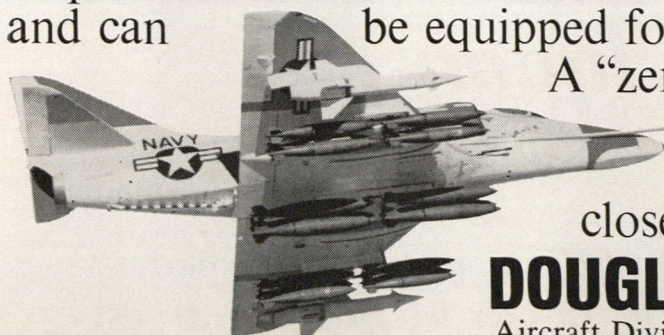
*P.S. We consider attitude and ability, not race, creed,
color, national origin, sex or age in our hiring practices.*



Strike, strike!

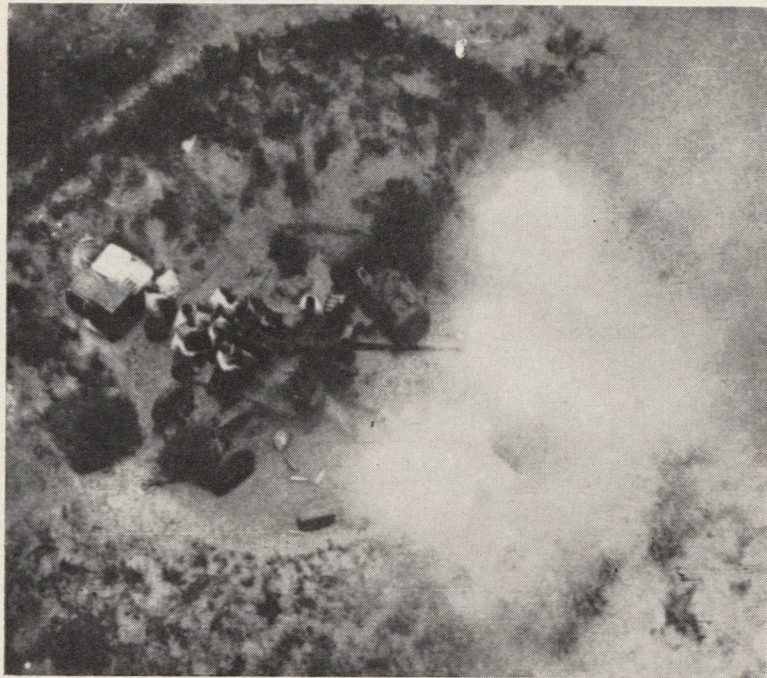
Viet Nam proves the Douglas Skyhawk to be as fierce as the hawk in its element. The Skyhawk remains unmatched in its class for flexibility and for cost/effectiveness in carrying heavy armament on long missions. It's a tough bird, too. In the critically important combat elements of high total sorties and high sortie rate, low loss rate and low maintenance cost, the Skyhawk has established an enviable record. And no Skyhawk has been retired from fatigue or by damage from excessive g-forces. Skyhawk is qualified for Short Airfield Tactical System (SATS) operations and can be equipped for sod field capability.

A "zero-zero" Escapac seat is standard. Yet Skyhawk costs less than comparable close-support jets.



DOUGLAS SKYHAWK

Aircraft Division, Long Beach, California, U.S.A.

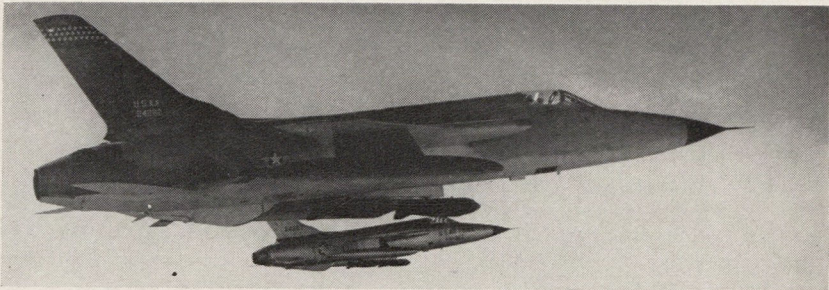


Communist AA gunners blaze away at U.S. planes attacking river crossing west of Thanh Hoa. These sites are sometimes made to look like villages because U.S. policy is to avoid villages unless heavy fire is received from them. The 57-mm cannon above is manually controlled. Many are radar-guided.



A hornet's nest of 57-mm cannon is shown above clustered around a generator van and a command post. A Soviet-made Firecan radar is partially visible at the lower left 200 feet (61 m) from site.

Two Air Force/Republic F-105 Thunderchiefs head toward military targets in North Vietnam. The basic load used in North Vietnam by the F-105s is six 750-pound (340 kg) bombs and two external fuel tanks. The aircraft in photo are carrying only four of the bombs—apparently on a very long-range mission.



aircraft, even under current methods of counting, if the anti-aircraft defenses continue their present performance. If the Soviets and the North Vietnamese could increase the effectiveness of the anti-aircraft system to bring the attrition rate up to two percent or even 1.5 percent, then yearly losses would soar—up to 500 or more. Domestic political pressure for stopping the attacks unquestionably would become very strong. Such an increase in effectiveness does not appear to be out of reason. One possibility is that the missile kill rate could go up to about 15 percent with the introduction of the SA-3. (This is still far below the kill rate of 50 percent or better credited to such missiles in DoD studies.) And the Soviets might choose to raise the missile firing rate about four times, from the current rate of about 300 per year to 1,200 per year. This alone could account for 180 aircraft. A number of methods appear open to the Soviets to bring the North Vietnamese anti-aircraft defenses up to

about ten percent of the efficiency that has been attributed to such modern defenses in studies of nuclear wars. In nuclear engagements extremely heavy aircraft losses are considered acceptable because the strike aircraft carry such formidable weapons, and the action is expected to be short. In an air war of attrition it would be impossible to continue with a loss rate of five percent or so, which is about ten percent of what is attributed to modern anti-aircraft defenses in most nuclear studies. The fact that only a small change in anti-aircraft efficiency would boost the attrition to an unacceptable figure acts as a damper for overconfidence among top-level Air Force planners. It is a telling argument for relaxing target restrictions so that, in effect, the North Vietnam war-supporting capability can be destroyed before the U.S. runs out of airplanes. The most prevalent USAF view is that the air war in the North will remain tough. The introduction of new

equipment could materially affect the outcome, but in the long run, human courage, skill, and tactical innovation probably will be just as important. President Johnson will undoubtedly continue his policies of restrained use of U.S. military power in an effort to seek an honorable settlement in Southeast Asia. The present version of this policy has not achieved the desired political results, and, unless the Hanoi Government is being hurt far more than is now evident, the policy probably isn't going to work. Regardless of what adjustments, what increases in pressure are made, the restricted use of airpower will remain an experiment. The costs are sure to be high and the results uncertain. The USAF and the Navy are going to be hard pressed to make the experiment pay dividends. Hopefully, the true nature of the experiment will become better understood by the public so that false hopes are not created and so that airpower does not receive an undeserved black eye. ☆☆☆

Vietnam Symposium

Probably the most complete and accurate report on combat air operations in Vietnam was presented by nine Air Force pilots, just back from Vietnam missions, at the Air Force Association's 1966 Convention in Dallas, Texas. Their personal accounts of the action—the successes, the acts of heroism, and the flaws—proved to the overflow audience an inescapable fact . . .

Airpower: The Essential Element in Vietnam

A SPECIAL REPORT

From the daily headlines, reflecting as they do the contradictions of debate and diluted by the requirements of news evaluation at deadline, it is almost impossible to get a balanced and accurate picture of what airpower is doing in Vietnam.

For example, the first Boeing B-52 Stratofort raid, in June 1965, was called an expensive way to uproot trees. Later, this magazine's correspondent reported there were 400 Viet Cong casualties from this raid.

There have been stories discounting USAF's role in close air support, even charges that USAF is not doing a good job. There have been criticisms

of equipment from people who never saw it in action.

Possibly the most complete and accurate report to date on the war in Vietnam was given by nine veterans of that operation at the Vietnam Air War Symposium on March 25, a highlight of the U.S. Air Force Association's 20th Anniversary National Convention at Dallas, Texas.

The participants in this Symposium were not high military officers, Congressmen, or newspaper reporters.

There were six captains, two majors, and a lieutenant colonel, all in Air Force blue, from the working Air Force, the men who fly the missions.

They were presented with great pride by the only general officer on the platform, Lieutenant General Sam Maddux, Jr., Vice Commander in Chief of the United States Pacific Air Forces, the headquarters in Hawaii that is basically responsible for air operations in Vietnam.

The Symposium program was the first public and unclassified presentation to cover the full spectrum of the USAF effort.

The following report on that presentation was prepared by our editors from the transcript.

It takes air:

- To find and engage the enemy



Republic F-105 Thunderchief missions have a 95-percent effectiveness on missions in Vietnam, the fighter pilot on the panel revealed. On typical missions, such as the one shown, basic flights are of four Thunderchiefs each. Larger flights are assembled only to attack major target areas.



Lieutenant General Sam Maddux, Jr., now Commander of Air Training Command, was Vice Commander of Pacific Air Forces when he led the Symposium.

beyond the range of ground penetration.

- To move ground troops into battle.
- To soften up landing areas.
- To even the odds against human-wave attacks at remote villages and outposts.

It takes air:

- To strike the biggest, fastest, and most telling blows against the Viet Cong.
- To supply food, weapons, equipment, and ammunition in a land of heavy jungle, soggy rice fields, and unusable roads.
- To evacuate the dead and the wounded.

It takes air:

- To provide light to beleaguered villages that are under night attack.
- To interdict the enemy's men, his supply lines, and sources of supply in the North.
- To convince the enemy that he cannot hide, he cannot hold the initiative, and he cannot hope to win.

It takes air.

"In short," said PACAF's General Maddux, "air is an essential element in almost every facet of the complicated and demanding conflict" in Vietnam.

While this conflict has often been called a ground war, he pointed out, it would be more accurate to call it "a dramatic demonstration of the margin of difference air operations provide against guerrilla attacks in support of ground operations in a limited-war environment."

He continued:

"I do not say that airpower alone

will win the war, but I do say that without airpower we certainly would lose.

"Neither General [Hunter] Harris [PACAF Commander] nor the other Air Force commanders directly concerned with Southeast Asia stand alone in this conviction. As far back as September [1965], Ambassador [Henry Cabot] Lodge said in an interview that he considered American airpower 'as an utterly vital element in the struggle against the Viet Cong.' He added that, 'You have to have airpower if for no other reason than this is something we excel at, whereas the Viet Cong have terrorism, at which they excel.'"

General Maddux cited both American Army and South Vietnamese authorities as "among many who have singled out the B-52 raids as accurate and timely bombardment upon the VC concentrations, inflicting the heaviest casualties upon them.

"Further, sorties flown by B-52 crews not only had a demoralizing effect on the Viet Cong, but have strengthened the combat effectiveness of the U.S. Government and the Vietnamese forces."

The authorities cited by General Maddux were the Army's General William C. Westmoreland, U.S. Military Commander in Vietnam, and Lieutenant General Nguyen Van Thieu, head of Vietnam's National Leadership Committee. For commendation of the USAF role in providing close air support for Army ground forces, he turned to the ground commanders:

"A platoon leader of the 1st Cavalry Division who spearheaded the assault on Chu Phong Mountain . . . and who was surrounded by Viet Cong, said, 'I called for air support and almost immediately Douglas A-1E Skyraiders started pounding the Viet Cong with everything they had. These planes came in as close as we wanted them to. At times I could reach up and almost touch them. Thank God for the Air Force. They saved our necks.'"

And, again:

"An Army captain, the commander of a Special Forces outpost that was attacked in the first days of the very important battle at Plei Me, said, 'In my opinion the Air Force saved our camp.'"

"The senior Marine adviser of the U.S. Military Assistance Command said, 'The support rendered under sometimes marginal flying conditions was outstanding,' and in the estimation of the Marine advisers the decisive factor in the victory. . . . Air support in the form of Forward Air Controllers, flare ships, and attack aircraft claimed the majority of enemy casualties and provided the firepower superiority that produced the victory."

General Maddux gave some statistics on 1965 operations in Vietnam.

USAF pilots flew 50,000 tactical strike sorties in the period and dropped more than 80,000 tons (72,580 mt) of bombs. The Strategic Air Command B-52 effort out of Guam accounted for another 35,000 tons (31,750 mt). These figures do not include the activity of the South Vietnamese Air Force, which delivered 26,000 tons (23,590 mt) of bombs in more than 23,000 sorties, or of the U.S. Navy and Marine pilots.

In North Vietnam, USAF crews destroyed more than 300 bridges and damaged more than 800. The highway system has been cut in more than 2,000 places and the railroads in more than 200.

General Maddux gave more details on the air war:

"Highway tunnels have been caved in, ferry complexes have been attacked, and the river fords that have been a bypass for the destroyed bridges have been hit over 100 times.

"Troop staging areas, ammunition depots, large and small military encampments, fuel storage areas, radar sites, communications and powerplants, surface-to-air missile sites, antiaircraft emplacements, and a variety of important support facilities of the enemy have been struck repeatedly.

"No attempt has been made to destroy the Government or the economy of North Vietnam. One of the purposes of our mission is to persuade the enemy not only that continued aggression by them will be increasingly expensive, but that the United States has at hand the capacity to exact a much higher price, if necessary."

The General emphasized that in all these missions, as well as the situations in which USAF close air support "helped turn possible defeat into victory," the targets were "elusive, mobile, beautifully camouflaged, and often hidden by dense foliage of the jungle." He called the terrain "some of the most difficult in the world."

PACAF's Vice Commander pointed out that the air war is not entirely a shooting war. USAF pilots are sent out to perform "mercy flights, support missions, reconnaissance, rescue, psychological warfare, forward air control flights, medical-civic action," and other tasks. There are 25 types and models of USAF aircraft operating in Southeast Asia.

As for the airmen on the Symposium panel, as well as those in action in Vietnam, General Maddux said: "It takes airmen with a lot of guts to fly unarmed reconnaissance aircraft at ground level across some of the most heavily defended terrain in the world

(Continued on following page)

today. It takes skill and dedicated aircrews, working around the clock, to keep complex and sophisticated planes in the air and equipment functioning."

Reconnaissance—RF-101s

One of these reconnaissance pilots appeared first in the Symposium. He was Captain Stewart B. Matthews, Jr., who has been deployed to Vietnam four times. He has spent nine months in the theater and flown 110 missions in the McDonnell RF-101 Voodoo. He was the first pilot in that airplane to be shot at by a SAM missile over North Vietnam.

Holder of the Distinguished Flying Cross with Oak Leaf Cluster and the Air Medal with five clusters, Captain Matthews now is at Shaw AFB, S. C., training other pilots for Vietnam.

Captain Matthews said his aircraft usually carries six cameras, capable of taking pictures forward, side oblique, and vertically. The results from the RF-101 are complemented by pictures taken from the McDonnell RF-4C Phantom II and Douglas RB-66 Destroyer.

He described four basic photo-reconnaissance missions carried out over North and South Vietnam:

"The first is surveillance of routes of communication, such as roads, rivers, and railroads. Also, when required, specific activities will be regularly observed.

"Second, the prestrike photography of specific targets, assigned, of course, a short time before the strike mission is to be flown. . . .

"Then, after the target has been struck, our third mission is post-strike or bomb-damage-assessment photography. . . .

"Incidentally, these post-strike missions are at times pretty undesirable. The fighter people . . . have stirred up these ground gunners, particularly in North Vietnam, and these folks just know that two unarmed 101s are going to follow behind them. That is one mission we sure don't look forward to. . . .

"Last, but not least, the RF-101 has been very active in pinpointing mobile missile sites in North Vietnam and determining which of these are occupied. The missile search missions . . . were the highlight of my last trip. In fact, a SAM-2 missile was fired at me and my wingman one sunny Sunday morning. . . . I can't tell you what I did to escape, and I wouldn't anyhow, because I may want to use those same tactics again."

Captain Matthews said the intelligence collected by the reconnaissance planes is delivered "not only to the men who request it, but also to many

interested military and civilian intelligence agencies." The value of this, so far as the RF-101 is concerned, was first illustrated to the public at the time of the Cuban crisis in 1962.

In reply to questions, Captain Matthews said his RF-101 has no night photo capability; that mission is carried out by the RF-4C. He said his ability to detect troop movements—in the daytime—was limited only by the "density" of the terrain. The cameras cannot penetrate foliage.

The pilot said the film he exposes is processed for the air-strike crews in less than 15 minutes. He did not disclose the required turnaround time between sorties for the RF-101, but said "it is as good as it could be."

Captain Matthews showed slides of targets in North Vietnam, such as bridge sites, SAM missile sites, and the results of a Republic F-105 Thunderchief raid on an airfield and a railroad bridge. In one picture, there was a clear shot of a Viet Cong antiaircraft battery, taken at low altitude with the shadow of the RF-101 prominent in the photo. Captain Matthews said this was common, down to the detail of the enemy gunners firing or running around the compound. He said that, from the cockpit, he never has seen these men and was amazed to get a look at them in the finished picture.

Other recce photos showed how the VC dug ditches across roads to hinder traffic and showed the ambush of a convoy under way. There was one good shot of a 57-mm antiaircraft gun

firing at an RF-101. The muzzle flashes and the eight-man crew were clear.

Aerial Refueling—KC-135s

Captain Sidney L. Tucker, a Strategic Air Command combat crew leader for the past ten years, told the Symposium about the role of the Boeing KC-135 Stratotanker. Captain Tucker has flown this aircraft for 1,400 hours. Of these, 147 are combat hours rolled up on 27 sorties in the Western Pacific and Southeast Asia.

Prime mission of Captain Tucker's KC-135 was the refueling of fighters—the North American F-100 Supersabre, F-4C, Northrop F-5 Freedom Fighter, and F-105. He said he carried 87,000 pounds (39,460 kg) of fuel on missions that lasted about seven hours. The transfers were made over the Gulf of Tonkin, and later he was told by the fighter pilots "how comforting it is to know when they come off the target that they have a tanker waiting."

Captain Tucker also spoke of two other KC-135 missions. One is the role played in rescue operations:

"For instance, if a pilot is down in unfriendly territory, fighters in the general area of a downed pilot can suppress ground fire and enemy activity while helicopters are dispatched for the pickup. The cover fighters can shuttle back and forth to the tanker, take on fuel, and return to the rescue area. It turns a two-hour F-105 flight into one of several hours.

"A third role of the KC-135 is the



Captain Sidney L. Tucker, Boeing KC-135 Stratotanker pilot, told of the several roles of Strategic Air Command tanker aircraft in Southeast Asia. Above, a McDonnell F-4C Phantom II fighter draws fuel from a KC-135 en route to a mission in North Vietnam.

transportation of high-priority cargo. The total U.S. airlift capability has been enhanced by cargo transport in conjunction with fueling. A typical mission will support a strike sortie, offload fuel, recover at another base, offload cargo, onload fuel, fly another strike-support mission, and recover." The aircraft is configured to carry 55 passengers, plus fuel, plus 10,000 pounds (4,536 kg) of cargo at 600 miles an hour (965 km/hr).

Then there is the ferry problem. "The KC-135 is responsible for refueling in flight every aircraft being ferried to and from Europe and Southeast Asia," Captain Tucker said. "A typical ferry mission consists of a cell of three tankers and six fighters flying from the western United States to South Vietnam with en route stops at Hawaii and Guam. The over-the-water navigation is accomplished by our tanker navigators and relieves the fighter pilots of an arduous and energy-consuming task."

Captain Tucker said he never had suffered battle damage to his KC-135. He also said he had the capability of refueling Navy aircraft, but never had the experience. The Navy uses probe-type receivers on its aircraft, a type used on only a few USAF planes, such as the F-100. The KC-135, he explained, has only one boom, but it can feed fuel so fast that the rate of discharge is about the same as that of other tankers with the "triple-nipple" device (three hoses to feed three aircraft).

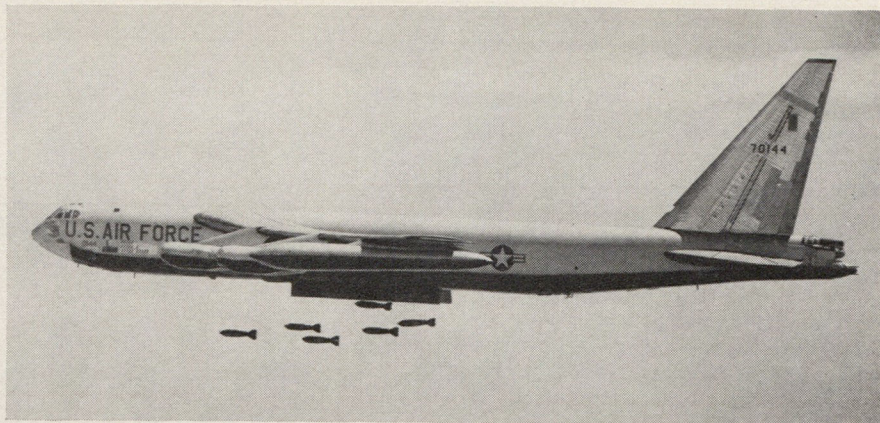
Captain Tucker was asked about planned refuelings as opposed to "saves," or refuelings performed without being included in the flight plan.

"Just about all of our missions, of necessity, have to have a coordinated rendezvous time and point," he said. "However, after refueling we generally have some fuel left, and we wait around for the people returning from the strikes. Quite often I have refueled the same people coming out that were [refueled] going in."

Captain Tucker showed moving pictures of the refueling mission, during which he pointed out that in all operations where planes are "fed" there is strict radio silence, except in emergencies.

There are signals used between the boom operator and the fighter pilot. In the F-4C, for example, the pictures showed that the pilot cannot see the boom, but gets himself in position by watching director lights at the bottom of the tanker. The boom operator, in his position at the tail of the KC-135, can complete the connection with the maneuverable outlet under his control.

Photos of the B-52 taking on fuel, at the rate of 1,000 gallons (3,785 l) a



A Boeing B-52 Stratofortress begins releasing its almost 40,000 pounds (18,100 kg) of bombs over a Viet Cong stronghold in South Vietnam. Operating in flights of 30 from their base on Guam 2,000 miles (3,200 km) away, B-52s have proved very effective in opening up areas previously impenetrable to U.S. and Vietnamese ground forces.

minute, showed that its pilot also used the signal lights.

Fighter Missions—F-105s

Then there was a fighter pilot, Lieutenant Colonel Hershel E. Galyon, of the 334th Fighter Squadron. He flew the Republic F-105 on 64 combat missions in Southeast Asia. Here the Symposium referred back to the presentations by both Captain Matthews and Captain Tucker. Colonel Galyon relied on the tankers to get to Vietnam, with stops in Hawaii and Guam, and in almost every one of his combat missions.

"SAC," he said, "literally provided the lifeblood which enabled us to do the job."

Then, he was provided with pictures of the targets he was to hit, taken by the RF-101. Colonel Galyon gave this account of a typical strike by the F-105s:

"We had seven of our pilots participate in the first strike on the thermal powerplant north of Haiphong. We received an operations order on the mission giving our tanker time, altitude, refueling track, time on the target, suggested routes, and altitude. The order also gave us the last known enemy defense information, including the location of the surface-to-air missile sites.

"We were furnished pictures of the target taken by the RF-101. The flight plan was done by the mission commander the night before. The briefing for the strike began three hours before start-engine time, and included everything in the operations order—the route, weather, rules of engagement, and, as in all briefings, up-to-date escape and evasion information.

"Then individual flight briefings followed for all. The final details of the strike were briefed by the flight leader.

The modern-day fighter pilot spends much more time briefing than flying.

"We took off with about five-minute separations between flights, and everything went as briefed until we approached the target area. Weather over the water to the east forced us to descend lower than we had intended. My flight crossed a small island that had not been defended up until this time.

"The enemy had moved in automatic weapons and 37-mm guns since we had been in the area. Two aircraft were hit, and the pilot ejected from one of them. I covered the downed pilot, called for Rescue, and he was picked up in 25 minutes by a flying boat while being fired at from the surrounding islands. The other flights hit the target with good results."

Colonel Galyon said, "The esprit de corps was the highest I have ever seen in any fighter squadron. We think we did a good job. Our pilots have been awarded an Air Force Cross, four Silver Stars, 25 Distinguished Flying Crosses, 26 Air Medals, five Airmen's Medals, and we have several citations still pending."

Questions centered on Colonel Galyon's work in Vietnam. In his replies he disclosed that the F-105s had a 95-percent effectiveness on assigned missions. He said the pilots wish they had more armor protection, particularly over the controls and fuel lines, but that weight was an important factor.

"Our machine is heavy enough already," he said.

Colonel Galyon said the maximum ordnance carried in the F-105 was eight 750-pound (340 kg) bombs, which were fine for little wooden bridges. For hard bridges, a 3,000-pound (1,360 kg) bomb was preferred.

He said his squadron lost only one aircraft to a SAM missile, most of the

(Continued on following page)

damage being caused by automatic weapons when the pilots were forced to a low altitude for delivery.

In-flight refueling was used on almost every mission, usually on the way in to a target.

Colonel Galyon showed a film clip of a typical mission, and disclosed in his narration that the basic F-105 flights were of four planes each. Larger flights were used only to go after big targets. Most of the bombing and rocket attacks were made in a dive, not in a level attitude. Runways of 8,000 feet are required and drag chutes used on almost every landing, to save brakes and tires.

Bombing—B-52s

Major Harold C. Braly, a SAC B-52 aircraft commander now assigned to the 454th Bombardment Wing at Columbus AFB in Mississippi, described bomber operations over Vietnam. He is a veteran of 26 missions in the theater.

Major Braly said that the Boeing B-52s he flew were rigged to carry 51 bombs; there were 24 on external racks, all of them 750 pounders (340 kg). In the bomb bay, there were another 27, all of them 500 pounders (227 kg). A modification has now been made to increase this load to 108 bombs, totaling 60,000 pounds (27,200 kg) of explosives.

The real start of a B-52 mission, all of which are flown out of Guam, comes with the touchdown after the previous strike, in Major Braly's opinion. That is when the aircraft is serviced and loaded for the next trip.

Then the procedure goes something like this:

"The strike order, itself, is initiated in the field by the ground unit commanders in the form of a request. This goes directly to the U.S. Military Assistance Command in Vietnam, known as MACV. From there it goes to the Commander in Chief, Pacific; the Joint Chiefs of Staff; [then back to] Commander in Chief, SAC; 3d Air Division; and finally to the bomb wing itself for staff planning and action. . . .

"Our flights themselves require, on an average, 12 hours, which makes an average working day for the flight crews about 19 hours in duration. A typical mission for my crew would begin in the afternoon or early in the evening approximately 12 hours prior to our scheduled time over target. . . .

"At the general briefing . . . we would get such information as our route and target weather, route navigation and bombing tactics, and intelligence on the target and enemy reaction. . . .

"Following this, the crews would split up by crew position for specialized briefings. The pilots, for example,



Air rescue operations, ranging across South Vietnam and often penetrating deep into North Vietnam, have not only saved pilots whose planes were shot down but have contributed to extremely low death rate among wounded who are brought to medical facilities. Above, wounded C-123 crewman is rushed by buddies to airfield dispensary.

would receive information on the parking location of their aircraft, taxi and takeoff plan, and recovery instructions for landing.

"The radar operators and navigators would receive more detailed instructions on their targets and the aiming techniques which we employ. Similarly, the electronic-warfare officers and the gunners would receive more comprehensive information on their specialties."

There followed the loading on buses, the ride to the apron, and the preflight check for the aircraft and weapons. After the takeoff there was nothing critical until it was time for the air-to-air refueling. The success of it, Major Braly said, would determine whether or not the mission could be completed. Contact with the assigned tanker was made about three and a half hours after takeoff.

To pinpoint the bombs on target, Major Braly said, the crew goes through a target checklist.

"At this point in the mission, crew coordination and individual competence become quite critical. I would like to emphasize also that, throughout, route timing is especially important to mission success, and especially on the bomb run." He also gave credit to the ground crews, who are often "required to work around the clock to provide us with aircraft capable of top-flight performance."

Under questioning, Major Braly said his units served a tour of 120 days, but that the replacement unit will serve 180 days. He said the B-52 bombings are quite accurate, but "the effectiveness

really depends upon the intelligence that we get."

Major Braly narrated a moving picture of a B-52 mission. In this, he disclosed that the radios are silent during takeoff, at which point the aircraft weighs about 450,000 pounds (200,000 kg). Water injection is used to get 20 percent added thrust on takeoff.

He said the B-52 has been particularly effective against VC strongholds, where the enemy has had years to prepare elaborate tunnel systems. The film showed such a jungle area under attack.

Major Braly said the briefings always include information on the proximity of friendly hut areas to the target area. "These are scrupulously avoided in our attacks."

"Occasionally we have been called upon to provide direct ground support, and this is an unusual role for the B-52 in the past. On these occasions we have bombed within as close as 1.8 miles [2.9 km] of our friendly troops. This is one of the reasons why our timing is so critical."

Air Rescue

Representing the helicopter rescue crews that have served in Vietnam was Captain Bruce C. Hepp, credited with saving three downed pilots in North Vietnam, and now assigned to Paine Field, Washington. His aircraft was the Kaman HH-43B Huskie.

Captain Hepp gave specific examples of the kind of rescue missions flown. In one case he went deep into North Vietnam, more than 200 miles

(320 km), to save a downed F-105 pilot, Captain James J. Talifarro. Captain Hepp told the story in these words:

"He had been downed by enemy fire along the Song Ca River, northwest of Vinh. He had ejected from his disabled aircraft and landed safely, but in the midst of a large number of enemy troops. They had him pinned down, and he couldn't move. He was in a dense bamboo forest on a hillside, and the thick undergrowth hampered the enemy troops trying to reach him. . . .

"We headed directly toward the pilot at maximum speed. We had to detour around all the known flak positions and were severely hampered by heavy rain showers and instrument conditions. . . . We got to the area, we spotted the orange-and-white parachute, and we also received an electronic homing signal from the pilot. . . .

"During this time the fighter aircraft flying rescue cover were busily beating down the enemy ground fire. . . . The fighter pilot sent up a smoke flare . . . this was a big help. . . . We blazed away with our M-16 rifles and did everything we could to try to hold the fire down so we could get in and get him out.

"The pilot in the other helicopter—we go in pairs—orbited above us . . . and the entire crew . . . pulled their M-16s out. . . . It was just like the Fourth of July around there. . . .

"We were able to approach within about 200 feet [60 m] horizontally of Captain Talifarro's position, and I hovered about five feet [1.5 m] above the 100-foot-high [30 m] bamboo. We reeled out the full length of our cable and waited for Talifarro to reach the hoist so we could pull him up. He required fully five minutes to get to the sling. The undergrowth was so dense he could scarcely move. . . .

"The rescue combat air patrol fighters came in and fired a final salvo of 2.75 rockets. . . . We got out of there just as fast as we could."

Captain Hepp gave the details of another rescue mission, carried out by a Grumman HU-16 Albatross. This involved an F-105 pilot down in the sea and surrounded by high waves. The amphibian landed on the water, picked up the pilot, and taxied five miles (1.5 m) before it was able to take off. A North Vietnamese patrol boat tried to interfere, but was strafed and damaged by USAF F-4Cs over the scene.

Captain Hepp said the rescue crews, all part of the Military Airlift Command, have an outstanding list of awards. As of last January 31, these included 28 Silver Stars, two Legions of Merit, 41 Distinguished Flying Crosses, 11 Airman's Medals, four Bronze Stars,

249 Air Medals, 10 Purple Hearts, 32 Air Force Commendation Medals, a Joint Service Commendation Medal, and two Republic of Vietnam Distinguished Flying Crosses. The 38th Aerospace Rescue and Recovery Squadron also has a Presidential Unit Citation.

In winning these distinctions, the crews rescued 134 personnel in Southeast Asia. Of these, 94 were aircrew members. There were 40 other combat personnel. These included, Navy, Marine, and Vietnamese forces.

Medical assistance and good-will missions also are flown by the Rescue crews.

"Any time we had a spare airplane," Captain Hepp said, "we would take the flight surgeon and fly into a remote area where the people were in need of medical aid and attention. He would set up a small medical aid station. . . . We would bring everyone in who needed treatment. . . .

"While the flight surgeon was busy treating the sick, usually the pilots and other crew members of the chopper would go out into the village and, of course, the kids would swarm around . . . for candy, toys, and gum. . . . It is really an education."

The film shown by Captain Hepp was of a simulated rescue because "we can't find anyone to walk into North Vietnam to be rescued so that we can take pictures." He concluded that "the only real satisfaction we get is to bring one of these men back and look him right in the eye, knowing that the kids at home have a daddy to come home to them."

Intratheater Supply

Sixty-five percent of the air cargo moved inside South Vietnam is carried by Lockheed C-130 Hercules transports. The mission was described by Captain Edward D. McHalek, a squadron commander, who has been deployed to the theater four times on Tactical Air Command rotational assignments.

The aircraft, he said, has a maximum gross of 155,000 pounds (70,300 kg), but can go with 175,000 (79,380 kg) in an emergency. The speed goes up to 300 knots, and the altitude to more than 30,000 feet (9,100 m). It has good short-field capability. The C-130 can haul 92 ground troops or more than 60 paratroops. In a litter configuration, it has room for 74 patients. The range is about 2,500 miles (4,000 km).

The slogan "You Call, We Haul" applies to the C-130 operation in Vietnam. A request to headquarters can get the plane on the way within minutes.

Captain McHalek pointed out that the C-130 does more than air-evacua-

tion and combat-support missions. It also drops flares to help fighters find their target at night. He continued:

"Although we do a variety of jobs, our primary mission is that of supporting the Army and the airborne forces. Our Tactical Air Command assault airlift forces do this in a number of ways. First, we fly in mass formation to air deliver forces and equipment. During our U.S. duty, we trained and worked closely with the Army's airborne forces to achieve a high state of readiness.

"In September of last year we dropped a 1,100-man South Vietnamese unit in an action against the Viet Cong. . . . If necessary, we can land forces and equipment on unprepared landing zones in one-minute intervals. Last fall . . . in 15 days we used our C-130s to airlift some 6,500,000 pounds [2,900,000 kg] of fuel, ammo, and rations into the Pleiku area in support of the 1st Cavalry because Highway 19, which runs from the coast to Pleiku, was not secure.

"A third way in which we can support ground forces is through the use of several auxiliary modes of delivery. One method we used in South Vietnam is called PLADS, or parachute low-altitude delivery system. This involves flying at 200 feet [61 m] and releasing an unopened parachute from the tail door ten seconds prior to delivery. At the delivery point the chute is opened and pulls the cargo out of the aircraft. It swings once and hits the ground. This gives pinpoint accuracy and is especially useful for small loads.

"Another capability we have is the low-altitude extraction system. . . . We fly at an altitude of 50 feet [15 m] above the ground, and at the delivery point release the parachute, which pulls the loaded pallet from the aircraft. . . . The cargo just hits the ground and slides to a stop.

"We also support the ground forces through our medical airlift capability. We can convert the C-130 from a logistics aircraft to one ready for air medical evacuation use in less than one hour. I have often flown from Clark [in the Philippines] to Da Nang with 11 sorts of needed equipment, and on the return trip carried the wounded and sick back to hospital care.

"We also use our aircraft for in-country paramedical missions, picking people up in combat zones and getting them to medical attention. . . . I have seen cargoes of not only people and ordinary military equipment, but such things as rice, hospital equipment, fuel, clothing, and even live cows, pigs, and chickens.

"These animals were not only air-landed, but air-dropped. The animals (Continued on following page)

are used to resupply Vietnamese units and villages. The Vietnamese soldier often carries all his belongings with him. I saw one soldier get on board with his pet canary.

"One problem we have is small-arms fire, since many of the areas around airfields are not secure. In fact, you can attract small-arms fire almost anywhere in South Vietnam. On one occasion, I was flying an Army support mission from Bien Hoa. . . . I was surprised to see friendly fighter aircraft diving down on either side of me conducting air strikes with bombs, rockets, and strafing passes, while I was on my final approach. This was within two miles of the landing zone. I must have been a pretty good target, being slow and low. . . ."

"Another problem we have is weather. It is often quite bad, but with airborne radar we usually can cope with it. . . . We don't find all the approach aids you do in a permanent base. But the many navigational aids carried on board the C-130, such as the radio altimeter, the Doppler system, and radar have helped. . . ."

Captain McHalek showed a film clip that followed a typical C-130 mission. Emphasis was on the speedy loading and unloading, with a ground crew chasing an aircraft with a loaded pallet even before the pilot had stopped taxiing.

"The C-130," the Captain explained, "makes an expensive warehouse." That is why the ground time is kept to a minimum. The film showed a typical landing spot and a fast offload, with cargo pushed out, pallet by pallet, as the aircraft taxis ahead a few feet at a time. Unloading is accomplished in a minute or two with the engines running and the crew carrying out the takeoff check list as the fuselage is emptied.

Strategic Airlift

The newest aircraft playing a role in Vietnam that was represented by a pilot is the Lockheed C-141 StarLifter of the Military Airlift Command. The Symposium speaker was Major Henry G. Tinsley, Jr., who has flown 15 round-trip missions from the U.S. to Southeast Asia. He now is based at Travis AFB, California, as an engineering officer.

Major Tinsley centered his presentation on Operation Blue Light, the airlift of the 3d Brigade of the 25th Division from Hickam AFB, Hawaii, to Pleiku. He described the mission at length and showed a film taken during the operation last winter.

As for the aircraft, he stressed that it is a first-generation transport in the MAC inventory, and the world's first turbojet designed for aerial delivery of

cargo and troops. It also is the first to have an automated cargo-handling system.

The StarLifter can haul 154 troops or a combination of men and supplies. The 145-foot (44 m) fuselage can carry a payload of 68,500 pounds (31,070 kg). The trip from Travis AFB in California to Saigon is 8,500 miles (13,680 km). The C-141 does this and puts the cargo on the ramp in 22 hours. That is less than half the time required by the Douglas C-124 Globemaster, the C-141's predecessor aircraft. The plane can offload and be on the way home in less than one hour. On one mission, Major Tinsley said, he put 55,000 pounds (25,000 kg) of cargo on the ramp at Pleiku and was on his way back in eight minutes. The engines were never shut off.

"One of our crews," he said, "had a three-minute ground time. Had it been any quicker they would have had to log it as a touch-and-go landing."

The C-141 can be converted for evacuation of wounded in less than two hours. Patients are airlifted from Clark AB, in the Philippines, to the USAF hospital at Lackland, in San Antonio, Texas, with refueling stops in Japan and at Travis AFB, California. The time from Clark to Travis is 14 to 16 hours.

"Operation Blue Light is a good example of our work with the Army," the Major said. "We had the job of moving the 3d Brigade of the 25th Division, and their equipment, from Hawaii to Pleiku, some 6,000 miles [9,660 km]. We had to move 3,000 troops and 4,600 tons [4,170 mt] of cargo. We were able to accomplish this mission eight days ahead of our required closure date."

"The C-141 and the Douglas C-133 Cargomaster were selected as the prime movers for this operation. The 141s were used as both troop carriers and cargo transports, while the C-133, with its greater bulk capacity, was used for cargo and heavy equipment."

"Our 141s were configured with 61 troop seats and space for approximately 12 tons [10.9 mt] of cargo, or a maximum load of 55,000 pounds [25,000 kg]. This was a little less than our maximum load. However, it allowed us to accept the adverse wind factor going over that route."

"With one-hour ground time en route, from Hickam to Pleiku was 18 hours. The C-133 used two hours on the ground and 30 hours from onload to offload."

"General [William C.] Westmoreland, Commander of U.S. Forces in Vietnam, said, in appraising Operation Blue Light, 'This was the most professional airlift I have seen in all my airborne experience.'"

Air Support

"Air support in Vietnam is much like the faucet in your kitchen. You turn it on, and once you turn it on it just keeps flowing along."

"There certainly is no shortage of air support in Vietnam at this time, and if anybody does not receive air support, it is simply because he doesn't ask for it."

This statement came from Captain John R. Gilchrist, who flew 178 missions in the Cessna O-1E Bird Dog. From that cockpit he directed strikes by A-1Es, A-1Hs, F-100s, Martin B-57 Canberras, F-4Cs, General Dynamics/Convair F-102 Delta Daggers, Douglas A-4 Skyhawks, and Ling-Temco-Vought F-8U Crusaders. All of them were in support of ground action by the 1st Cavalry Division (Airmobile).

In Captain Gilchrist's background are seven years as an F-100 pilot, then Army training as a parachutist. After this, there were 14 months in training with the Army at Fort Benning, where he and the troops practiced and perfected the role of the Forward Air Controller. "Let me tell you now," he said, "that it works and it works well."

Here are the highlights from Captain Gilchrist's presentation to the Symposium:

"One Forward Air Controller was assigned to each battalion. Two liaison-officer FACs were assigned to each brigade. We had an Air Liaison Officer, an Airlift Officer, and a Reconnaissance Officer at headquarters."

"The FACs worked hand in hand with the support coordinator and usually not out of sight of the Battalion Commander. The ground FAC is essentially an Air Liaison Officer when on the ground, and, in fact, he is the Air Force to the 780 men in that battalion. . . ."

"To be 100-percent effective, the FAC must be airborne. The airborne FAC is the eyes of the team. He can move from one company to another as needed. He can divert to another battalion if necessary. He sees more than the ground FAC and can control things more accurately."

"Therefore, we had double coverage in the 1st Battalion, one on the ground and one airborne. The airborne FAC uses the Cessna O-1 or L-19 aircraft. It carries four 2.75-inch [7 cm] marking rockets and moves out at a blistering 80 miles an hour [129 km/hr]. Radio communications include FM, UHF, and VHF, which permits continuous and simultaneous contact with the Army ground elements and the airborne strike aircraft."

"Coordination with the Fire Support Coordinator . . . is all-important so as to integrate close air support, artillery,

air rockets, and mortars, and frequently we had all four going at the same time within 500 meters of one another."

The Captain related the story of a typical mission:

"We had an American battalion split into three groups under heavy fire in dense jungle. Through close coordination, one flight of A-1Es with white phosphorous bombs were used to mark the intended target. There was a quick confirmation with the Fire Support Coordinator and then a rapid adjustment, and less than 30 seconds later a full load of ordnance was dropped on a VC force of over 100.

"At that time an automatic weapon opened up between two of our companies. There was no way to mark our lines. The ground unit was out of smoke. Panels could not be seen in the dense jungle. The friendlies were 35 meters away. [A meter was described as "an Army yard."] They were 35 meters on either side of the automatic weapon.

"In talking with the Fire Support Coordinator, he could only tell me the weapon was under the big tree. I saw no less than about 2,000 big trees from where I was. I picked out what I thought was the tree and then briefed the strike pilot as to my selection. I advised our troops to keep their heads down and asked for the shortest possible burst of 20-mm cannon fire to identify the target.

"He rolled in on final, I held my breath, and I am sure the guys down there ducked their heads. I was quite relieved when I heard, 'That is the one.' The fighters then did away with the gun position. All this was within 100 feet of friendly units, the personification of close air support."

In the question-and-answer period, Captain Gilchrist was asked about the allegation in a House subcommittee report that USAF's FACs have no way to talk directly to the Army. He repeated what he had said about radio equipment and added that there is portable gear available wherever the infantry wants it.

"With that combination, there is no way we can lose. We can talk to anybody that the company commander can talk to. And in some cases the Army has used our radios when their communications have broken down..."

"The performance of the Air Force in Vietnam makes the Air Force welcome in any infantry gathering."

Fighter Missions South

Captain Billy J. Vinson, now attached to the 31st Tactical Fighter Wing at Homestead AFB, Florida, spoke at the Symposium about his

Captain Billy J. Vinson, a North American F-100 Supersabre pilot with 128 combat missions, spoke about day and night fighter strikes in South Vietnam under direction of Forward Air Controllers (FACs). He said close-support missions "contributed greatly toward... stopping the so-called summer offensive of the Viet Cong."



experiences as pilot of a North American F-100 Supersabre. He flew 128 combat missions in five months of duty in Vietnam, many of them on the close-support assignment where his targets were defined by the FACs, such as Captain Gilchrist.

Before the 1st Infantry Division arrived, Captain Vinson flew preplanned strikes against transportation routes and storage areas. Also, there were preassault strikes, clearing areas for Army operations. Most of the flying was from Saigon to the Central Delta, all out of Bien Hoa, 15 miles (24 km) northeast of the capital.

He flew many night missions, and told of a typical sortie:

"Our night missions were very successful, and I am sure they were demoralizing to the VC. One of these missions I remember in particular was the attack on Bu Dop, a small special missions camp six miles [9.6 km] north of Saigon. I was on 15-minute alert when we got the call to scramble at 2:30 in the morning. We took off and were briefed on the target and its location after we got in the air.

"Bu Dop is a camp of about 200 Vietnamese Special Forces and their families, and they had 12 American advisers there. We arrived at the target ten minutes after takeoff, but before the flare operation, and there was a raging battle in progress. We relayed the request from the FAC for the flare ship and started making dry passes at high speed to scare the enemy off.

"We couldn't actually tell the friendlies from the foes because of the darkness. After the flare ship arrived, we started attacking the target. We dropped our ordnance as close as possible, for the VC were actually inside the outer perimeter wall of the fort by this time. When we finished dropping our bombs, we actually strafed the village walls. When we finished, another flight of F-100s was overhead to relieve us, and we provided close air support for the village

until the VC broke off the attack in midmorning.

"The Army commander of the area stated later that the Air Force was the only thing that saved the fort from being overrun. This battle lasted only a few hours, but some lasted several days.

"One of these was the fort at Plei Me, which is southwest of Pleiku. We provided close air support around the clock for these people. I think if you ask any man who was inside the fort, he will tell you that the Air Force saved the day for them. . . .

"On all our strikes, day or night, we were under the control of a FAC. I really can't overemphasize the importance of these individuals, because they were the key men in making the mission successful. . . .

"During our tour in Vietnam we didn't lose a single aircraft or pilot. Several things contributed. . . . All of our pilots were highly experienced, and we used good battle-tested tactics. Luck was probably on our side, too, but one of our greatest assets, I think, was our outstanding maintenance people. The maintenance people were highly motivated and played a major role in getting the fighters airborne when needed and back on the ground safely. . . .

"The weather [in Vietnam] is lousy . . . average rainfall during the summer months is 14 inches [36 cm] a day . . . concentrated just over the runway for takeoff, over the target when you are trying to attack, and over the runway again when you are landing. . . . I flew 128 missions in South Vietnam and only failed to strike my target because of weather on two occasions. . . .

"I believe our mission in South Vietnam contributed greatly toward the Army's getting a foothold and stopping the so-called summer offensive of the VC. I am absolutely certain about one point—that is, the friendly ground forces were always glad to have us at their service."

☆☆☆

Men of NASA's Manned Space Flight Center spent a busy month in preparing the Gemini-10 mission to overcome the flaws that marred the flight of Gemini-9. Meanwhile, the unmanned Surveyor surprised even its managers by accomplishing a soft landing on the moon on the program's first try, transmitting thousands of photos of the lunar surface. Thus, NASA's successes and problems in June centered on . . .

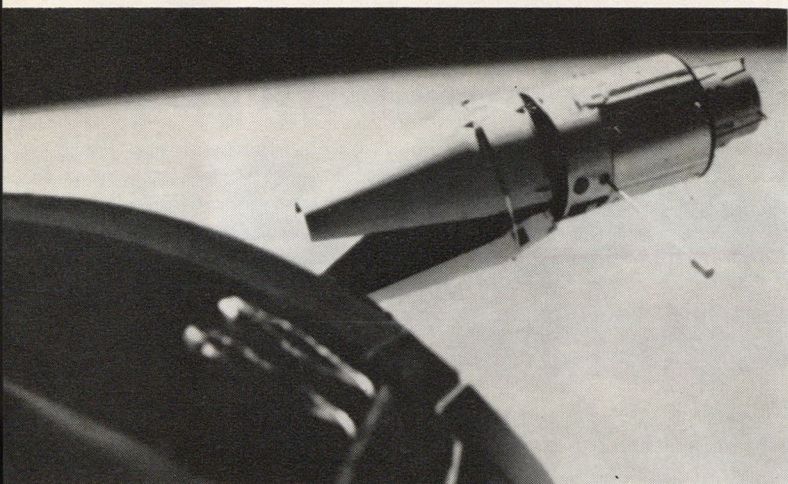
The Flights of Gemini and Surveyor



For Air Force Lieutenant Colonel Thomas Stafford, left, Command Pilot, and Navy Commander Eugene Cernan, Gemini-9 was a "hard-luck" flight, but important data was obtained and the flight wound up with a near-perfect landing in the Atlantic.

U.S. space projects are moving into high gear. Gemini-10 was scheduled for launch late in July, piloted by Navy Commander John W. Young and Air Force Major Michael Collins, almost before Americans had time to digest the space achievements represented by the flights of Gemini-9 and the unmanned Surveyor, which delivered thousands of photographs of the moon after a successful soft landing on the program's first attempt. More Surveyors will follow soon. And in mid-June, an Air Force Titan IIIC booster put eight satellites into near-synchronous orbit over the equator on a single mission.

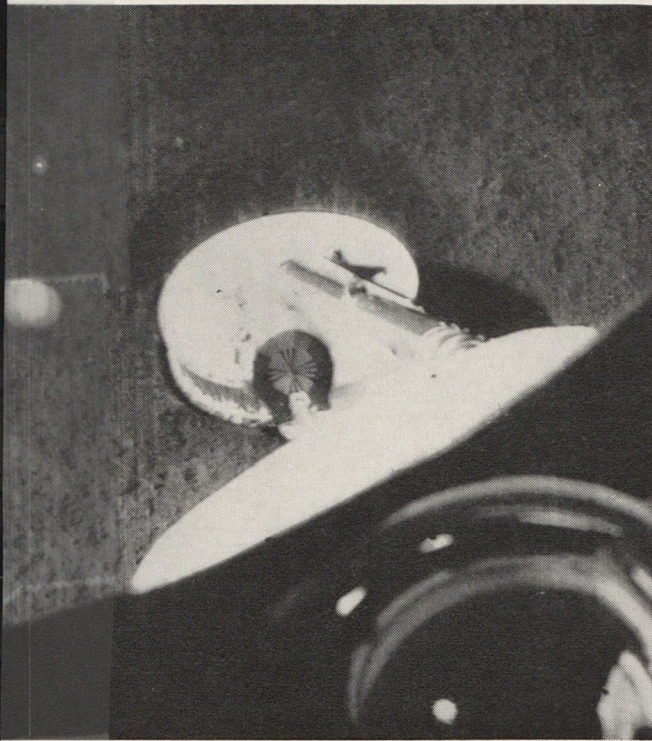
Before the year is out, the U.S. expects to "fly" two more Gemini spacecraft and to conduct the first unmanned space test of the three-man Apollo capsule, being readied for its moon mission by 1970. A manned Apollo is slated



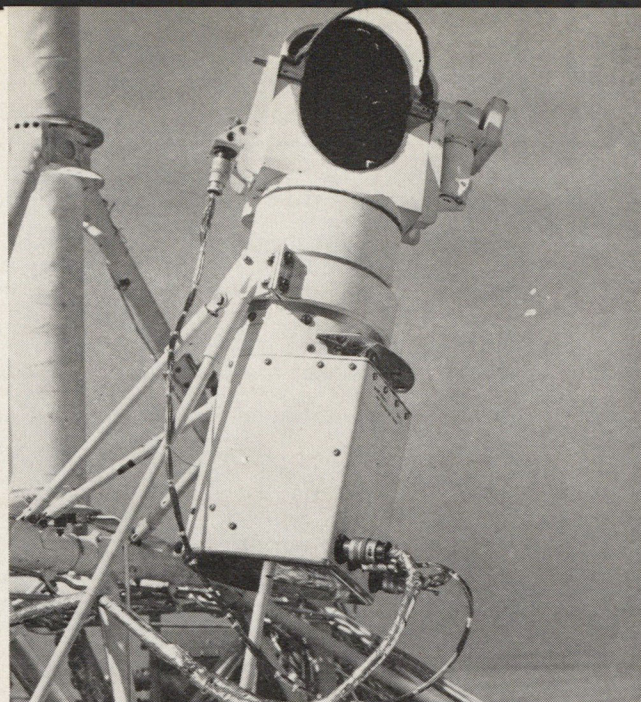
A major part of the Gemini-9 mission objectives—docking with the target vehicle—had to be canceled because a shroud covering the vehicle's nose failed to separate. Colonel Stafford radioed that the target vehicle looked like an "angry alligator."



Attached to his umbilical line, Astronaut Cernan moves about outside the Gemini-9 spacecraft. He spent nearly 2½ hours in the void, smashing previous records, but had to give up a test of an astronaut maneuvering unit (AMU) when his visor fogged.



Surveyor's camera snapped this self-portrait of one of its three legs resting on the lunar surface. The photo indicates that, although Surveyor's weight of 625 pounds (283.5 kg) is far less than the projected 22,000 pounds (9,980 kg) of the 2-man Apollo lunar-landing vehicle, the moon's crust at this location seems strong enough to sustain a manned spacecraft.



This is the camera device aboard the Surveyor spacecraft which sent back more than 10,000 photos of the lunar surface and horizon. The U.S. has scheduled six more Surveyor vehicles to gather additional data on the moon before manned landings.

for its first earth-orbit trial run late this year or early in 1967.

Gemini-9—with its two-man crew of Air Force Lieutenant Colonel Thomas Stafford and Navy Commander Eugene Cernan—and the Surveyor were launched within two days of each other early in June. If things had gone “normally,” troubles might have been expected with the Surveyor, not with Gemini-9. After all, Surveyor represented the first U.S. attempt at a soft moon landing; the Soviets had failed several times before succeeding in a similar mission with Luna-9. Moreover, the Surveyor's Atlas-Centaur launch vehicle had logged more failures than successes in previous tests. But Surveyor performed superbly and sent back more than 10,000 pictures before the lunar night descended, with a remote possibility of more transmissions when the sun fell again on the moon's side facing earth.

Gemini-9, after two postponements—first when its Agena rendezvous target vehicle was driven into the Atlantic by a faulty booster, and next when a ground-based computer malfunctioned—was successfully launched on June 3, with two major assignments—rendezvous with a target docking vehicle, and a projected 2½-hour walk in space by Commander Cernan, including the first test of an astronaut maneuvering unit (AMU), which would free him from dependence on the Gemini capsule for life support.

Commander Cernan did set a new walk-in-space record of more than two hours, but he was unable to hook up the bulky AMU and had to cut short his stroll when his face visor fogged up. Colonel Stafford guided Gemini-9 to three separate rendezvous with the target vehicle. However, the docking maneuver proved to be impossible because a protective launch shroud had failed to separate from the target vehicle.

For a flight marked by so many difficulties, Gemini-9 wound up with a near-perfect reentry, coming down in the western Atlantic well within sight of the recovery ship.

In the early days of U.S. space activities, the National Aeronautics and Space Administration often said it learned from its failures as well as from its successes. In that context, although Gemini-9 was graded an over-all success, it taught NASA many lessons to be applied to forthcoming missions.

☆☆☆



Detail of lunar surface is shown in this 600-scan-line photo transmitted on June 2 with camera pointed southeast on moon. Rock in right foreground is 6 inches (15.2 cm) high and 12 inches (30.5 cm) long. From Surveyor I's photos, surface seems to be the consistency of sandy loam, as in newly plowed field.

The U.S. Air Force will get its Northrop F-5 Freedom Fighters and the Lockheed F-104 returns to Vietnam combat. . . . The Navy installs floodlights on its carriers and tests quick-snap flaps to improve carrier landings. . . . There was much to cheer about in major expansion of the world's jet and turboprop transport fleets, in simultaneous launch of eight satellites into near-perfect orbit, and in a pair of record-breaking around-the-world flights. . . . But overshadowing all these events was the tragic loss of two superb test pilots in the . . .

Death of the Valkyrie

BY ALLAN R. SCHOLIN, Associate Editor

As a result of its "very favorable" performance in Vietnam, a top Department of Defense official reports that Northrop F-5s will be bought for the Tactical Air Command (TAC). DoD has already allocated money for long-lead-time items for 32 Freedom Fighters. Of these, 12 will be turned over to the Military Assistance Program to replace those borrowed by the Air Force for the "Skoshi Tiger" test in Vietnam, four will be assigned to a TAC pilot training unit at Williams Air Force Base, Arizona, and 16 will be added to the Seventh Air Force in Vietnam.

The number of airmen already assigned to F-5 maintenance training courses indicates that additional orders

will soon be placed to bring the total to at least 100 planes.

The F-5s to be delivered to USAF will be similar to the Canadian CF-5s. They will be equipped with two-position nose gear and takeoff doors to improve short-field capability, along with a larger dorsal fuel cell and a 225-gallon (852 l) pylon tank instead of 150-gallon (568 l) tank on the Skoshi Tiger models to extend range. First planes on order, however, will be powered by present General Electric J85-13 engines of 4,080-pound (1,850 kg) thrust, instead of J85-15s with 4,300-pound (1,950 kg) thrust scheduled for the CF-5, because the latter engine is not yet in quantity production.

To reduce foreign-object damage to engines in operating from unimproved airstrips, Northrop is installing retractable screens on air intakes for use on takeoff and landing.

* * *

To study the size, scope, operation, and economic impact of general aviation in the United States, 23 high-ranking government and aviation leaders from West Germany, Switzerland, and Austria recently completed a ten-day air tour of this country.

Sponsored by the Aircraft Owners & Pilots Association of Germany, an affiliate of the AOPA of the U.S., the 4,500-mile (7,250 km) itinerary included visits to aircraft and equipment manufacturing plants in the states of Pennsylvania, Florida, Oklahoma, and Kansas. Stops were made at busy major airports as well as small airfields where only general aviation serves the air-transportation needs of the area.

The Europeans, all of whom are concerned with transportation, economics, and civil flight regulations in their home countries, discussed with community leaders and national aviation officials air traffic control, airport development, aviation service facilities, air safety, and the economic impact and other aspects of general aviation.

As result of very favorable performance in Vietnam test, Northrop F-5A Freedom Fighter, shown here on bombing mission, will be bought for Tactical Air Command.



as part of the nation's total air-transportation system.

Throughout the tour they were able to see for themselves the ease of operations, the absence of red tape, and excellent cooperation which exists between all types of air service in the U.S.

Robert V. Reynolds, the Federal Aviation Agency's Assistant Administrator for General Aviation Affairs, and Max Karant, vice president of AOPA in the U.S., accompanied the tour. Among the foreign guests were Germany's Secretary of State for Aviation, Erwin Lauerbach; Dr. Heinz Knott, of the Ministry of Finance; and Prince Georg von Waldburg zu Zeil, president of the German Aero Club.

Result of the air tour was a better mutual understanding between people who, although they speak different tongues, talk the same language—development and progress through general aviation.

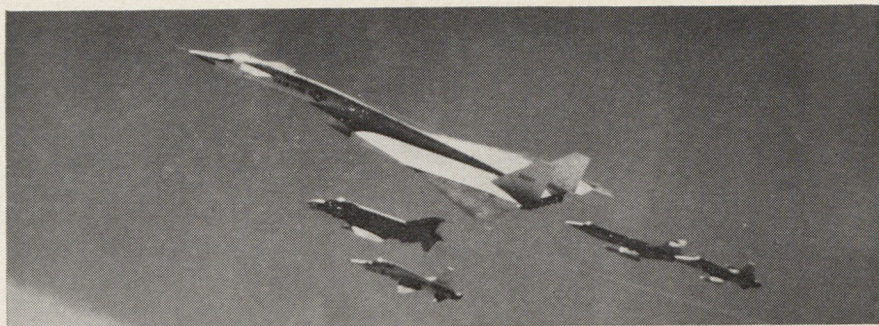
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It was expected to be a "no-sweat" mission for the XB-70 No. 2—some speed-calibration checks and sonic-boom runs above Edwards Air Force Base in California, and at the end posing for some in-flight photos in formation with two chase planes and two other supersonic jets.

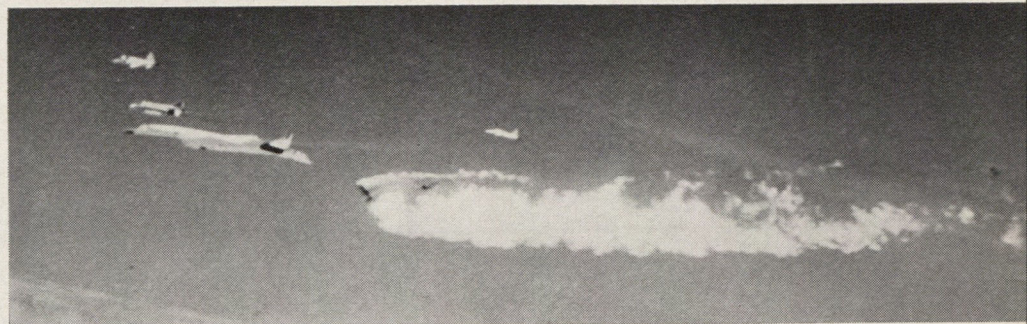
Al White, test pilot for North American Aviation, Inc., and Colonel Joe Cotton, USAF's XB-70 test director, figured it was a good mission to give Major Carl S. Cross his first ride in the Valkyrie's right seat. Major Cross, a 40-year-old native of Chattanooga, Tennessee, had been with the project since his return from Vietnam in 1964. Now he was being readied for aircrew duties in the USAF-NASA test program scheduled to begin June 16 to gather data for the U.S. supersonic-transport program.

Because the mission was comparatively easy, the General Electric Company had received permission to photograph the XB-70 in flight with four other planes equipped with GE engines—a McDonnell F-4B, flown by a Navy pilot; Northrop's F-5A and T-38; and a Lockheed F-104. The F-4 and F-5 would join up with the Valkyrie after it had carried out its primary objectives. GE had leased a civilian Lear Jet for its photo crew and had arranged for one of its own civilian pilots to fly the F-5. Colonel Cotton would be flying the T-38 chase plane, and NASA's Chief Test Pilot, Joseph A. Walker, who was scheduled to fly the XB-70 during the NASA tests, would be in the F-104.

Though the planes were dissimilar, the flight was expected to pose no difficulties. Formation flying is a basic skill in a military pilot's repertoire. Nor



This was the fatal five-plane formation on June 8 led by North American XB-70, before it was struck by Lockheed F-104, second from right, piloted by Joe Walker, chief test pilot for National Aeronautics and Space Administration. Other planes in the flight are a Northrop T-38 trainer, nearest camera, piloted by Colonel Joe Cotton, the Air Force's XB-70 test director; a McDonnell F-4B Phantom II, flown by a Navy pilot; and a Northrop F-5A, leased by General Electric and flown by a GE test pilot.



Walker's F-104 is enveloped in flame after damaging the XB-70's right stabilizer and shearing off the left. Colonel Cotton in the T-38 chase plane, in radio contact with Al White and Major Cross in the XB-70, describes damage to the tail as the Valkyrie continues momentarily in level flight and other planes instinctively scatter. Walker, killed or knocked unconscious by the collision, went down in the Starfighter. Seconds after this picture was taken, the XB-70 started to spin and White bailed out.



With XB-70 now tumbling violently and out of control, copilot Major Cross was apparently pinned in cockpit by G-forces, unable to activate his escape mechanism. Photo plane's wing is in the foreground.

was the photo mission unusual. In-flight photographic data is essential in the evaluation of flight-test phases of any new plane. And the public's interest in flight pictures of the airplanes its tax dollars buy—particularly the newer ones—is, as editors have found, apparently insatiable.

Major Cross had become an Air Force pilot in March 1945, before his twentieth birthday. He saw combat in the Korean War, earned a bachelor's degree in aeronautical engineering at the USAF Institute of Technology in 1959, and was a student in the Aerospace Research Pilot School at Edwards in March 1960 when Joe Walker made his first flight in the North American X-15. In his career he had flown most of the Air Force's newer aircraft, including the C-141.

Walker, 45, was a graduate of Washington and Jefferson College in his home town of Washington, Pennsylvania. After three years as a P-38 pilot in World War II, he had joined NASA in 1945, shifting to its Flight Research Center in 1951. In 25 X-15 flights, he piloted it to the fastest speed (4,104 mph or 6,605 km/hr) and highest altitude (354,200 feet or 107,960 m) yet

(Continued on following page)



At 45, Joseph A. Walker had achieved top rank among world test pilots. In his 25 flights in USAF-NASA X-15, he set speed record of 4,104 mph (6,605 km/hr) and altitude mark of 354,200 feet (107,960 m).

achieved in a winged vehicle. He had also logged many hours in the F-104.

Now, on June 8, at 25,000 feet (7,620 m), Cross in the right seat could see Walker in the F-104 chase plane off his wing. The XB-70 led the way, flanked, in a V-formation, on the left by the F-4B and by Colonel Cotton in the T-38, on the right by Walker in the Starfighter and the F-5. They were flying about 20 feet (6 m) apart—loose by military standards. The Lear Jet was behind and to the left of the T-38.

The mission was almost over when Walker's F-104 somehow ticked the Valkyrie's right wing. In an instant the Starfighter flipped up and to the left, nicking the XB-70's right stabilizer and shearing off the left one. Trailing a scarf of flame, the F-104 plunged earthward.

Colonel Cotton called "Mid-air!"

Mid-air!" as the other pilots instinctively swung away. Walker, killed or knocked unconscious by the collision, went down in his plane.

Colonel Cotton drew closer to the XB-70 and spoke as calmly as he could to White and Cross. "OK," he said, "you're straight and level. . . . It looks like your tail is gone—you'll probably spin." For brief seconds the bomber held its course, then veered downward. "Now you're beginning to spin. . . . Bail out!"

Struggling to regain control, White and Cross managed to right the 550,000-pound (249,500 kg) giant for a moment, but then it flipped sharply again. Following it down, Colonel Cotton radioed ground control: "One capsule ejected. I don't know which one. . . . It's the left capsule. Al is out." He watched in vain for the second, as the tumbling Valkyrie crashed onto a barren slope in the Mojave Desert.

The accident, and the circumstances surrounding the photo mission, are being thoroughly investigated. Representative George H. Mahon, Democratic Congressman from Texas, Chairman of the House Appropriations Committee, summoned Defense Department witnesses to testify, and the Air Force convened two groups—a standard accident investigation board, whose findings are privileged, to determine what happened and why, and another, headed by Major General Joseph J. Cody, Jr., Air Force Systems Command's Deputy Chief of Staff, whose results will become public record.

The death of Joe Walker and Carl Cross is an irretrievable loss to the nation. Destruction of Valkyrie No. 2—the more sophisticated of the two planes, with five-degree wing dihedral, automatic air-inlet controls, and a fifth fuel tank giving it longer range—is a damaging blow both to Air Force

and NASA test programs. Although USAF had just about completed its test series, the XB-70 was expected to yield more data useful to development of the Advanced Manned Strategic Aircraft (AMSA) and other large Mach 3 aircraft, while NASA had installed extensive instrumentation in the plane for forthcoming SST tests.

XB-70 No. 1, temporarily grounded for work on its landing gear, will probably carry on the test programs, although this was by no means certain at press time. But there is no question that the June 8 tragedy will prove costly in the long term as well as in taking the lives of two exceptional pilot-engineers and wiping out millions of dollars invested in the Valkyrie.

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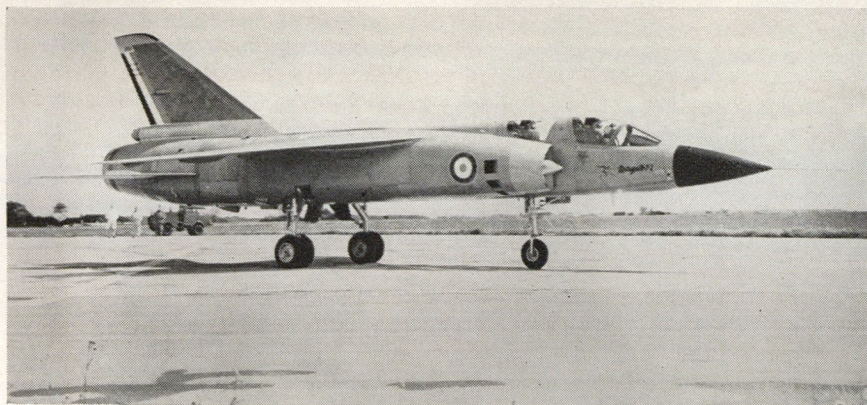
Eight satellites—seven experimental communications relay stations and one gravity-gradient satellite—were launched from Cape Kennedy, Florida, June 16 by the Air Force aboard a Titan IIIC booster.

It was the first of three launches scheduled in 1966-67 to place a total of 22 communications satellites and two gravity-gradient devices in orbit to establish an experimental military communications satellite system under the Defense Communications Agency.

The gravity-gradient experiment is designed to examine the possibilities of using the earth's gravitational force to stabilize future satellites in near-synchronous equatorial orbits.

The eight satellites were stacked together under a shroud on liftoff and held together until the Titan IIIC stage was put through a series of

(Continued on page 46)



Well ahead of schedule, Dassault Mirage III-F made its first test flight in June. Designed as low-level Mach 2.5 strike fighter, III-F is successor to earlier Mirage III fighters now operational in France and many other countries, and is expected to lead, in turn, to Mirage III-G, to be equipped with variable-sweep wings. The III-F may also be tested in VTOL configuration, using lift engines from canceled Mirage III-V program.



Artist's sketch shows shroud as it falls away to expose eight satellites borne aloft by Titan IIIC booster. In near-stationary orbit, satellites were released one by one to form a necklace around earth.

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maneuvers to reach a 21,000-mile-high (33,810 km) orbit along the equator. Then they were dealt out one at a time to disperse in random fashion along the orbital path, increasing the coverage of the communications system. Any one satellite is capable of linking two ground stations more than 10,000 miles (16,100 km) apart.

Philco Corporation's Western Development Laboratories is the prime contractor for the communications satellites and General Electric's Missile and Space Division for the gravity-gradient vehicle.

U.S. Air Force Lockheed F-104 Starfighters, which last were flown in combat during December 1965, have returned to the Vietnam War.

Working with Air Force F-4C Phantom jet crews, the Starfighters primarily fly escort to protect strike aircraft against North Vietnamese MIG fighters.

Pilots from the 435th Tactical Fighter

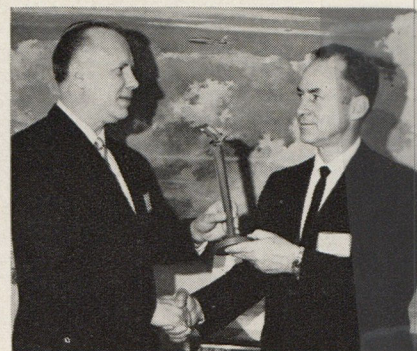
Squadron from George Air Force Base, California, brought the stubby-winged jets back to Vietnam.

The Starfighter can deliver bombs, and is equipped with Sidewinder heat-seeking missiles and a rapid-firing 20-mm Gatling gun for aerial combat.

During their last Vietnam tour, Starfighter pilots flew strike missions in North and South Vietnam and escorted other pilots and crews flying over North Vietnam and the Gulf of Tonkin.

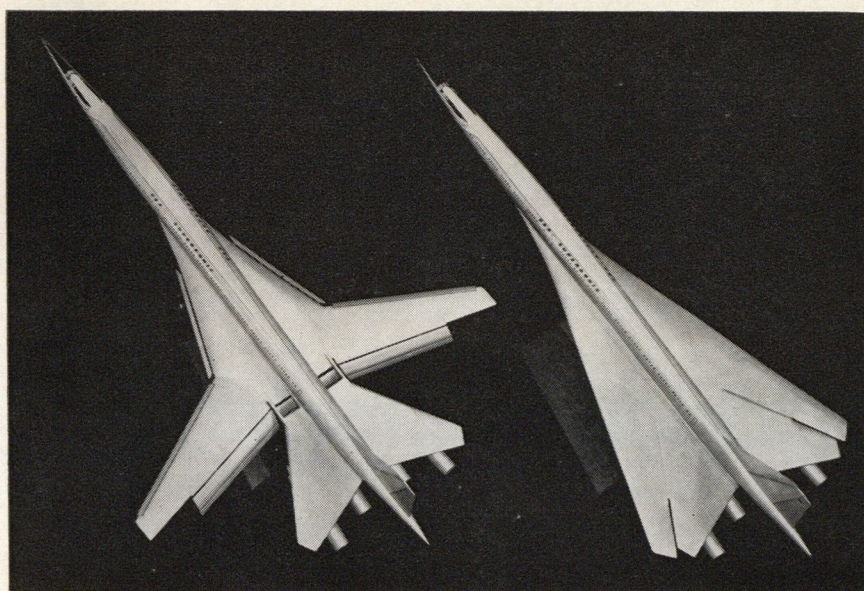
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In an unprecedented burst of aircraft buying, world airlines in the past year have ordered more than 700 jets, to bring the total now flying and to be delivered in coming years to about 2,500. A new survey recently published by Esso International, Inc., shows 1,439 jets and 1,024 turboprops in service at midyear. On order for delivery during the rest of 1966 and from 1967 onward are 1,009 jets and 225 turboprops, which will bring the world air-



Replica of West German memorial, erected at Geisenheim on the Rhine in memory of fighter pilots of all nations, is presented to Robert Johnson, right, by Rudolph Thun, a former German Luftwaffe pilot, on behalf of the German Fighter Aces Association. Johnson, one of America's top fighter aces, shot down 28 planes as a Republic P-47 pilot in WW II. He is author of "Thunderbolt," describing his wartime experiences and a former president of Air Force Association.

Major Robert E. Messerli, who trains German pilots in F-104 Starfighter at Luke AFB, Arizona, receives memento from Lockheed test pilot Tony Levier, on logging 2,000 hours in F-104. Colonel E. P. McNeff, right, heads Luke training group.



Shortly after publication of our July issue, containing detailed report on American SST program, Boeing released these views of its revised SST design. Major change is in the wings, which when fully swept back now are integrated with large tailplane to form a single delta-shaped lifting surface. For subsonic flight, wings are pivoted forward. Engines have also been moved aft, eliminating possibility of damage to tail surfaces.

line fleet to 3,697 turbine-powered aircraft.

Boeing is far in the lead as top jet supplier, the Esso survey shows, with sales of 1,218 jets, of which 716 are now in service. Biggest Boeing seller is the 727 trijet with 496 orders. Deliveries to date have been made on 332 long-range Boeing 707s and 133 720s and on 251 short/medium 727s. Douglas has turned over 251 of 342 DC-8s on order and 27 of 330 DC-9s. Britain's BAC.111, twin-jet competitor of the DC-9, has sold 93 copies, of which 55 have been delivered.

Short/medium-range jets dominated airline buying in the past 12 months, as 501 orders were placed for all models, the DC-9, Boeing 727 and 737, the BAC.111, Hawker Siddeley Trident, and Sud Aviation Caravelle. At the other end of the range/size spectrum, the Boeing 747 jumbo jet was announced in April with a Pan American order for 25 and will introduce a new era of mass jet transport. Douglas has been increasing its orders for the Super-60 Series of stretched DC-8s and contemplates a subsonic superjet of its own that would match or exceed the capacity of the 747.

While production has closed down on such big turboprops as the Britannia, Electra, and Vanguard, orders continue to come in, largely from local airlines, for the turboprop conversions of the piston Convair 240/340/440, for the Fokker and Fairchild F-27, Fairchild's stretched FH-227, Britain's Handley Page Herald and Hawker Siddeley 748, and the French Nord 262. Of the grand total of 2,448 jets in service and on order, 1,986, or 81 percent, are U.S. built. Britain follows with 221 sales,

including the BAC.111, VC. 10 and super VC.10, and the Trident, and France is the third-ranking supplier with 213 orders for the twin-jet Caravelle. Among the turboprops, Britain retains the lead it has held in recent years with 538 orders, covering the Britannia, Vanguard, Viscount, Handley Page Herald, Hawker Siddeley Argosy and 748, and the Short Skyvan.

* * *

Fast-acting flaps on Navy fighter planes are expected to reduce carrier landing wave-offs or mishaps. The device, called a Direct Lift Control (DLC), enables the pilot with a flip of his thumb to raise or lower his plane on approach without changing the angle of descent. Suggested to the Navy by Douglas Aircraft Company engineers, the DLC system has been tested on Ling-Temco-Vought F-8C Crusaders.

Normal flight controls require a pilot to tilt the aircraft up or down to adjust errors in his glide path. When this occurs near the carrier ramp, the pilot may run into problems. Last-minute climb requires the pilot to go around, or make fast and unsafe attitude and power changes to snag the arresting cable. If he is coming in too high, he dives into the carrier deck with possible damage to nose gear and other components.

With DLC, an airplane can be rapidly readjusted to proper glide slope well after corrections could no longer be made with conventional control systems. With the thumb-wheel switch on the control stick, he either raises or lowers the flaps to adjust altitude while maintaining constant attitude and power setting.

On the basis of encouraging results in a ten-month evaluation, the Navy will incorporate DLC in more than 200 fleet Crusaders scheduled for modernization over the next four years, and is considering adding it to other present and future carrier-based aircraft.

* * *

Two U.S. business jet aircraft—a Lear Jet and a Jet Commander—recently completed around-the-world flights in total elapsed time of 65 hours 40 minutes and 86 hours 8 minutes, respectively. Total time in the air was 50 hours 19 minutes for the Lear Jet, 55 hours 27 minutes for the Jet Commander.

The flights were performed to demonstrate the speed, utility, and dependability of modern business jet aircraft. Both were officially sanctioned by the National Aeronautic Association, and numerous records claimed for planes of their types have been submitted to the Fédération Aéronautique Internationale for certification.



Four-man Lear Jet crew, from left, wearing wreaths, John Zimmerman, John Lear, Hank Beaird, and Rick King, are greeted by Mr. and Mrs. William P. Lear, Sr., on their home-coming at Wichita, Kansas.

Jet Commander crew shown on arrival at LaGuardia Field, New York, includes, from left, Jerry Jermyn, Fred Austin, radio-TV personality Arthur Godfrey, pioneer flyer Dick Merrill, and Karl Keller.



The two pilots flew almost identical routes, the Lear Jet departing from Wichita, Kansas, home of Lear Jet, Inc., and the Jet Commander from New York City's LaGuardia Airport. Both refueled in Newfoundland and the Azores, crossed southern Europe and Asia to the Philippines and Japan, then flew to Shemya in the Aleutian Islands and down the U.S. west coast to Los Angeles before heading to their terminal points.

The Lear Jet flew 19,976 nautical miles at an average speed of 397 knots; the Jet Commander covered 20,225 n.m., averaging 357 knots.

Neither plane encountered any appreciable mechanical problems throughout its flight. Average ground time for 16 stops en route for the Lear Jet was just under an hour. The Jet Commander made 19 stops, averaging a little over an hour and a half each.

The Lear Jet, an eight-place plane, is slightly smaller than the Jet Commander. It was designed for a maximum gross takeoff weight of 12,500 pounds (5,670 kg) to permit certification as a private aircraft. The 11-place Jet Commander, built by the Aero Commander division of Rockwell-Standard Corporation and certificated as a commercial transport, has a maximum takeoff weight of 16,800 pounds (7,600 kg). Both are powered by two General Electric CJ610 turbojet en-

gines (civilian counterpart of the military J85) with 2,850 pounds (1,293 kg) of thrust. Its lighter weight gives the Lear Jet a cruising speed of 450 knots, compared to 410 knots for the Jet Commander.

They are closely matched in range, with a slight edge to the Lear Jet. Longest leg flown by the Lear Jet was 1,480 n.m. between Singapore and Manila, and by the Jet Commander, 1,430 n.m. between Chitose, Japan, and Shemya.

* * *

Dixon B. Hoyle, an official of the U.S. Atomic Energy Commission, has been appointed Deputy for Euratom Affairs to Ambassador John W. Tuthill in the U.S. Mission to the European Communities, and Senior AEC Representative at Brussels, Belgium. Mr. Hoyle was to assume his new duties about July 20.

Mr. Hoyle serves as principal adviser to Ambassador Tuthill in conducting U.S.-Euratom programs on the peaceful uses of atomic energy, and to other U.S. Ambassadors in Euratom countries with respect to bilateral cooperative atomic energy programs. He succeeds the late Charles F. Schank, who died in Brussels last January.

Mr. Hoyle has been Assistant Director for Technical Implementation in AEC's Division of International Affairs since 1961. He earned a B.S. degree

(Continued on following page)

in Meteorology in 1944 from New York University and a degree in Chemical Engineering from Cornell University in 1948. During World War II he was a Weather Officer and Priorities and Traffic Officer in the U.S. Army Air Forces. From 1948-52, he worked for the Standard Oil Company of Indiana as a chemical engineer. In 1954 he joined the staff of AEC's Division of Production, becoming Chief of the Materials Branch, Division of International Affairs, in 1957, and Chief of the Euratom Branch two years later.

* * *

An electrically scanned laser system more precise than radar in tracking rockets during launch periods has been developed by Sylvania Electric Products, Inc., a division of General Telephone & Electronics Corporation.

The unit, which uses a highly concentrated light beam to locate and track its target, is the first laser system capable of relocating a rocket momentarily "lost" in a cloud bank. Mechanically scanned laser tracking systems cannot be moved rapidly enough to recover a speeding target once it has been lost. In its present stage of development, the new system can pinpoint, within 12 inches (30.5 cm), the exact location of a rapidly moving object up to a height of eight miles (12.8 km).

The system, built for the National Aeronautics and Space Administration, is expected to be tested at Cape Kennedy, Florida, next year during a Saturn-V launch.

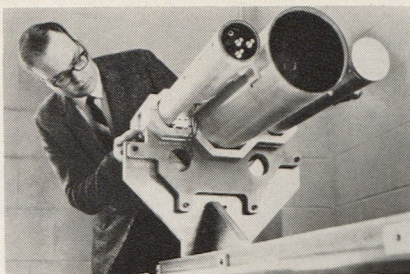
A key component of the system is an optical beam deflector that searches out the target by re-aiming the laser beam electrically when contact with the target is interrupted.

A horizontal and vertical scan pattern directs the laser beam to 2,000 different locations within one-half second by means of two banks of movable mirrors. When the beam strikes its target again, the deflector is deactivated automatically and the system resumes normal tracking.

* * *

Three giant parabolic tracking antennas, 85 feet (25.9 m) in diameter and weighing about 500 tons (453 mt) each, are now being erected on three continents by the Advanced Products Department of Blaw-Knox Company as part of NASA's Apollo program.

These additions to the telemetry equipment that will track the Apollo vehicle when Air Force Lieutenant Colonels Gus Grissom and Edward White and Navy Lieutenant Roger Chaffee ride into the proposed 14-day earth orbit late this year or early in 1967 are being constructed at Camp Irwin, California; Canberra, Australia; and Madrid, Spain.



The XY-Type tracking antennas were designed and fabricated for NASA by the Blaw-Knox Equipment Division in Blawnox, Pennsylvania. Technicians from Blaw-Knox will handle erection of the antennas at the three designated NASA ground stations.

The 85-foot-diameter "dish" of each antenna contains 6,000 square feet (557.4 m²) of surface. The reflector surface has an RMS deviation from the best-fit paraboloid of less than 0.040 inch (1 mm). The structures will withstand winds of up to 120 mph (193 km/hr) without damage.

* * *

Floodlights have been installed on the flight decks of U.S. Navy aircraft carriers in an effort to reduce night carrier-landing accidents and improve working conditions for deck crews.

Under combat conditions, it had long been a Navy practice to black out ships at night to minimize detection by enemy subs or aircraft. But nowadays,

Technician demonstrates laser device designed by Sylvania for tracking rockets during launch, which is said to be more accurate than optical equipment in relocating the target vehicle after it passes through a cloud bank. The laser beam is directed to 2,000 locations within half a second by two banks of movable mirrors.

Navy officials point out, radar detection makes visual sighting unnecessary.

In Vietnam waters, floodlights have proved to be a definite asset, making it much easier to recover pilots returning from attack missions. It also reduces hazards to crews on the flight deck, helps them work with more confidence, and speeds up flight-deck operations.

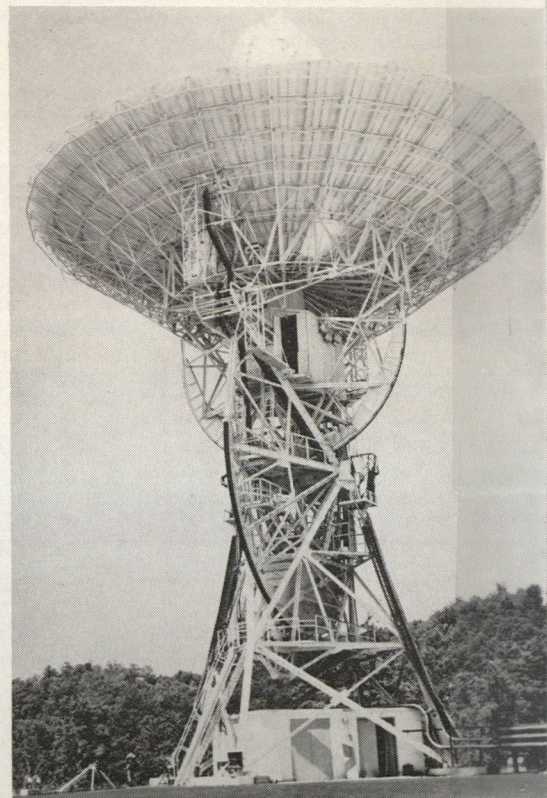
The Navy had feared that pilots' night vision would be impaired in taking off from a lighted deck, but experiments aboard the USS SARATOGA two years ago showed considerable latitude existed in the amount of lighting that could be employed without adversely affecting vision.

The soft glow of lights illuminates the carrier landing area in natural colors, assisting the pilot on approach. The Navy expects the floodlights to bring the night-landing accident rate more in line with the much lower daytime rate.

All carriers are being equipped with lights as they report to shipyards for other rework.

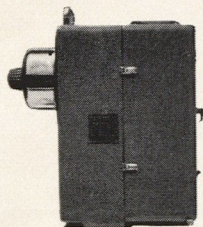
☆☆☆

This giant antenna weighing about 500 tons (453 mt) and with a "dish" 85 feet (25.9 m) in diameter is one of three being erected by Blaw-Knox Company at Madrid, Spain; Canberra, Australia; and Camp Irwin, California, to track NASA's Apollo spacecraft. The structure will withstand winds of up to 120 mph (193 km/hr).





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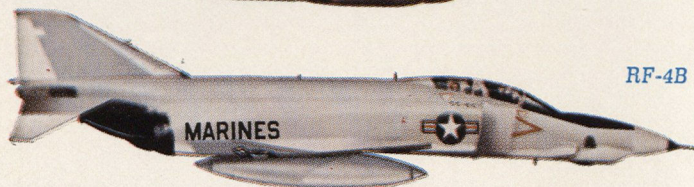
F-4B



F-4B



F-4C



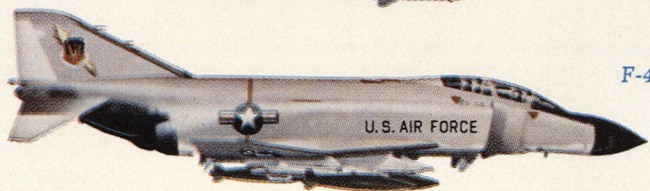
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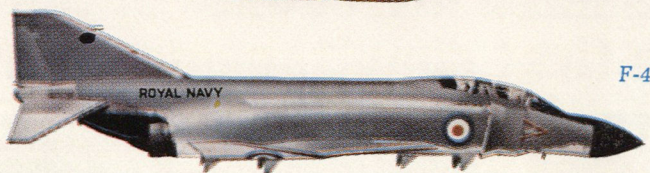
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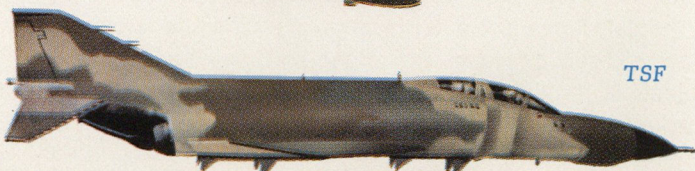
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