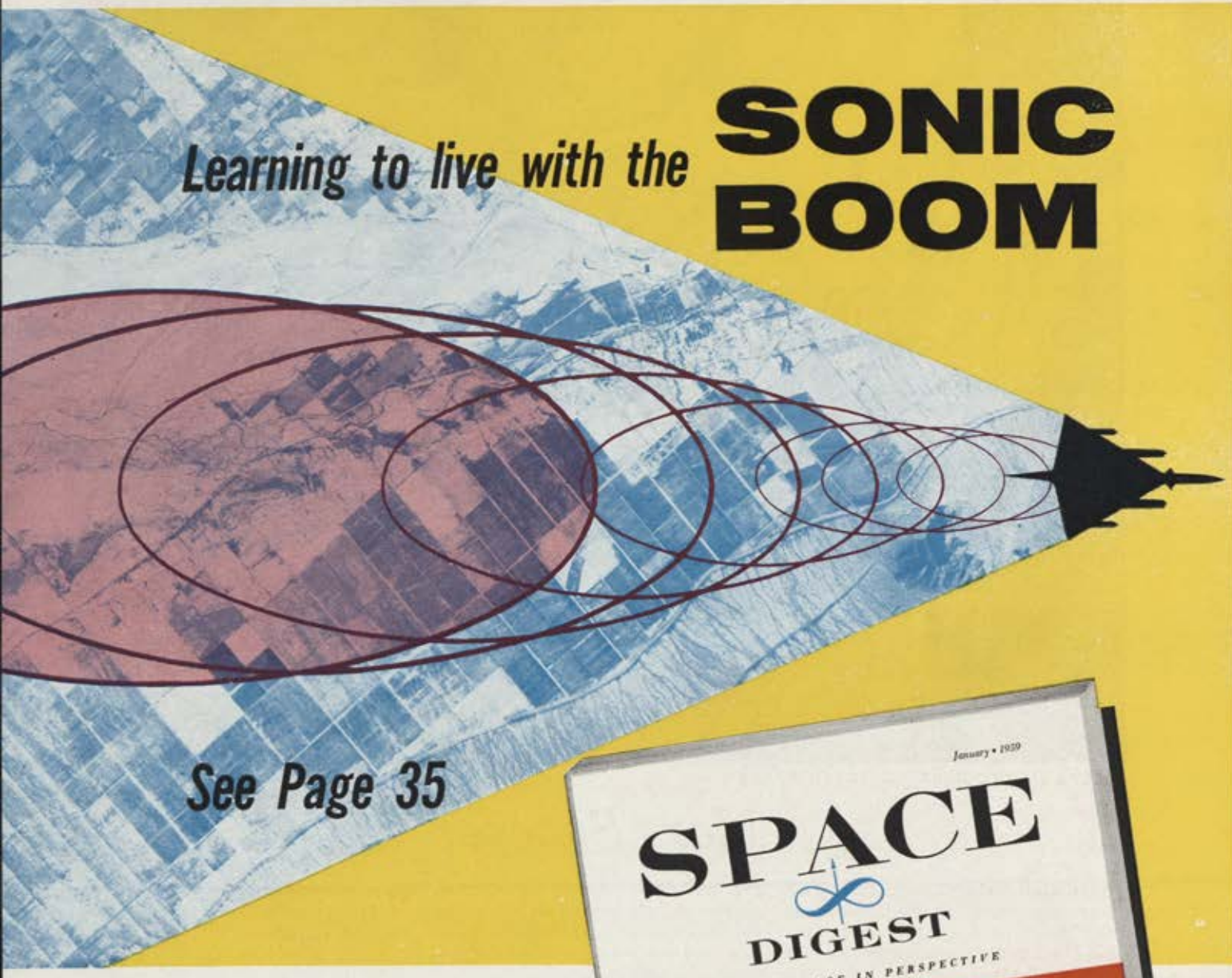
JANUARY 1959 / 50c

AIR FORCE

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

Learning to live with the SONIC BOOM



See Page 35

ALSO IN THIS ISSUE:

A Look at Britain's Missile Program
How the New Joint Staff is Organized
—A Photochart

STEPS IN THE RACE TO OUTER SPACE

Mars Snooper

This nuclear-fueled reconnaissance craft is preparing to land on Mars' outermost satellite, Deimos—12,500 miles away from the "red planet" (center) and 35 million miles away from the Earth. Deimos' gravitational pull is so slight that a featherlight landing could be made, and a take-off could be accomplished with little more than a shove of the pilot's foot! (At Deimos' orbital speed, such a push would start the ship back to Earth at 3000 miles per hour.)

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* * *

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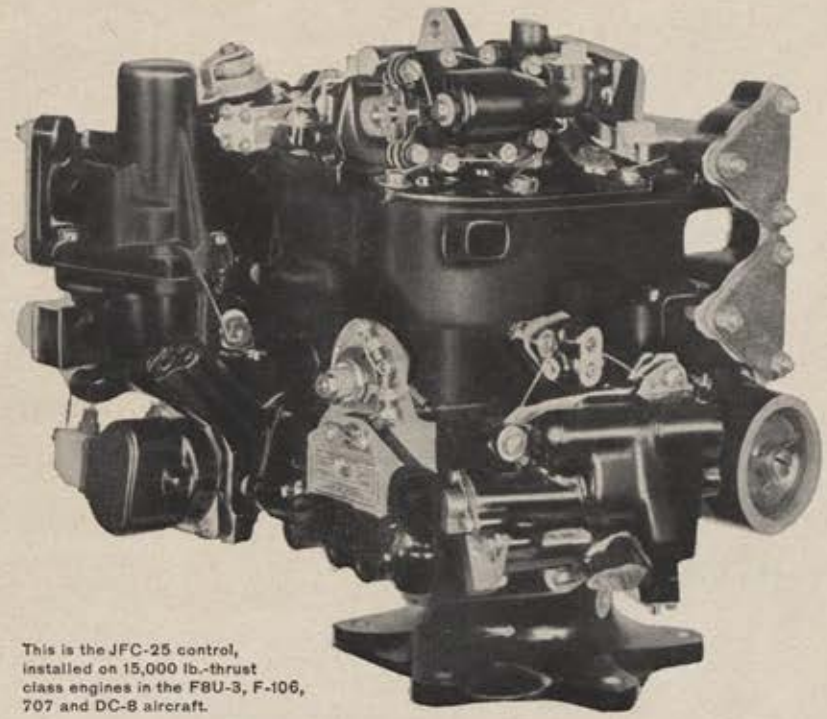

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CAMDEN, N. J.

AIR FORCE

THE MAGAZINE OF AEROSPACE POWER

Volume 42, Number 1 • January 1959

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FEATURES

SPACE DIGEST

Starts on page 57

DEPARTMENTS

An Editorial

New Budget Problems,

EVERY once in a while in this business one gets the dispirited feeling that "this is where I came in." This is particularly true at budget time, and this year, unfortunately, is no exception. Right now (ten days before Christmas) the final touches are being put on the federal budget for fiscal year 1960. While official figures must wait for the President's budget message in January, we have learned enough to believe that from a military point of view the New Year will bring, not a brave new world, but a tired old one—bright new problems with weary old solutions.

Before us we see side-by-side headlines. One says, "Khrushchev Hurls Threat to Make War—Warns West: Don't Pick Berlin Fight." The other says, "Defense Fund Curb Ordered by President." They neatly summarize the defense dilemma the nation faces. Heightened tension and increased military capability on the one hand; "less bang for less buck" on the other.

The precise dollar amounts which the President will request in his budget message are relatively unimportant. What are significant are the fiscal trends and what they portend.

One trend is toward a relatively stable budget figure year after year. Requests for new obligational authority (the license to spend money in future years) and authorized expenditures for fiscal year 1960 are pegged between $40.5 billion and $41 billion. This, incidentally, represents a victory for the Bureau of the Budget and its director, Maurice Stans, over Secretary of Defense Neil McElroy. Mr. McElroy had indicated that FY '60 spending would run about $41.5 billion.

A relatively stable budget has many attractions for fiscal-minded people. It makes a nice neat package. But it fails to take into account two extremely important factors.

The first is that Russian military strength is growing at a much faster pace than is ours. One would be hard put to find a responsible military authority who would dispute this. Russian achievements in space technology are easily translated into military capability. Mr. Khrushchev is rattling the sword with new authority.

And, most disconcertingly, an expert analysis of the latest Soviet economic plan (*see page 30*) indicates a planned rise in Soviet defense spending of upward of sixty percent. It's the sort of race in which one contestant marks time while the other travels at top speed. And no one knows just where the finish line may be.

The other factor making a stable budget a dangerous fallacy is the element of inflation. As the dollar shrinks in purchasing power, a stable budget figure likewise shrinks from year to year.

It is quite popular these days to blame inflation on defense spending. It has almost become a cliché to say, "The Pentagon is soaking up half the national budget. Therefore, it's the only place where substantial cuts can be made in order to fight inflation."

This just ain't necessarily so. The Pentagon has become a whipping boy for the economy-minded crowd because it is the biggest, easiest-to-hit target. But, as is pointed out in the box on the opposite page, increased defense spending during the current fiscal year, even with the push occasioned by the Sputniks, accounts for less than a third of the over-all increase in federal spending. Yet it is the first place that is cut, whereas logic would dictate that it be the last. Inflation is a threat. No one will deny that. But budget cutting is only one way to fight it, and the Pentagon need not take the rap for all the cuts.

The Air Force will get about $19 billion in new obligational authority for fiscal 1960, nearly the same as its anticipated expenditures for fiscal 1959 and fiscal 1960. Again, specific effects on specific programs are not clear, but certain conclusions can be drawn from available information.

Production of fighter aircraft is being cut back and stretched out to the point where there will be no replacements for losses from accidents. This means that currently operational fighters will be phased out through attrition, since through October of this calendar year alone the Air Force had lost ninety-seven through accidents. By fiscal 1961 the only fighters in production will be the F-101B and the F-105, the F-101B only because of a fiscal 1960 stretchout. The F-108 is not being pushed and will still be in the development stage in fiscal 1961. It may well wind up by being phased out through obsolescence while still in development, somewhat like Canada's Avro Arrow.

In the missile field, one Pentagon official describes the Air Force programs as "in good shape." And in one sense they may be, if measured against current programming. But many major missile programs are still in the development stage and relatively inexpensive to fund at the moment. These include the Titan and the Minuteman.

The Minuteman program will inevitably suffer a time lag in becoming operational since, in its case, the concept of concurrence has been thrown out of the window. The concurrence concept calls for simultaneous progression in development, production facilities, support equipment, training, and base construction and has been followed with great success in Thor and Atlas. Minuteman is subject to the "fly-before-you-buy" philosophy which has no place in this rapidly moving world.

The only Air Force missile in production to suffer in fiscal 1960 is Bomarc, which is being cut heavily. Goose,

Old Solutions

John F. Loosbrock
EDITOR, AIR FORCE MAGAZINE

Fairchild's decoy missile, and Rascal, Bell's bomber-launched missile, have already fallen under the economy axe.

The bomber picture is not bright either. About seventy B-52s are scheduled to be bought in fiscal 1960. Plans are to buy a total of about half of the B-58s originally programmed, which was less than a hundred. The B-58s will be produced at the low rate of four a month. Original plans were to keep this rate at only three per month until it was discovered that it would cost as much to get three a month as to get four. Production of both bombers will not be enough to serve as the operational equivalent of the B-47s which are wearing out. The B-70 program is still not costing too much money, being still in development, but even this is being stretched out slightly.

In operations and maintenance, the Air Force's flying money, the situation for fiscal 1960 looks equally gloomy. Some predict a repeat of what happened a couple of years ago when SAC's operational capability was seriously threatened through shortage of funds for fuel. Indeed, this might well happen toward the end of the current fiscal year.

In research and development we can look forward to no great increase. Yet this is the last area in which a level budget should be attempted. The very nature of research and development demands an ever expanding budget to take advantages of advances in the state of the art.

How does it all add up? For fiscal year 1960, we'd say "more of the same." We'd also say this is a long way from what it should be. It seems ironical that we are keeping the lid on our defense effort when the Russians are taking the lid off theirs.

How long this can go on is anybody's guess. One thing is sure. It can't last forever. Many Air Force planners look forward with fear to the year after next, and beyond, when they feel the pinch will really come. Stretchouts cannot continue indefinitely. The time will come when the big, potentially expensive weapon systems now in research or development stages, including the antimissile missile, will begin to cost large sums.

Then the really hard choices will have to be made. There isn't a prayer of continuing all, or even many, of them without future substantial budget increases. This means loss of operational flexibility, loss of freedom of action. We will be in the position of a householder crouching in a darkened home while thugs prowl outside. We can hope to guess where and when the blow will come and to take some of them with us.

But it is an almost certain way to die and a horrible way to live.—END

Defense Spending Isn't the Villain That Is Pushing Up Expenditures

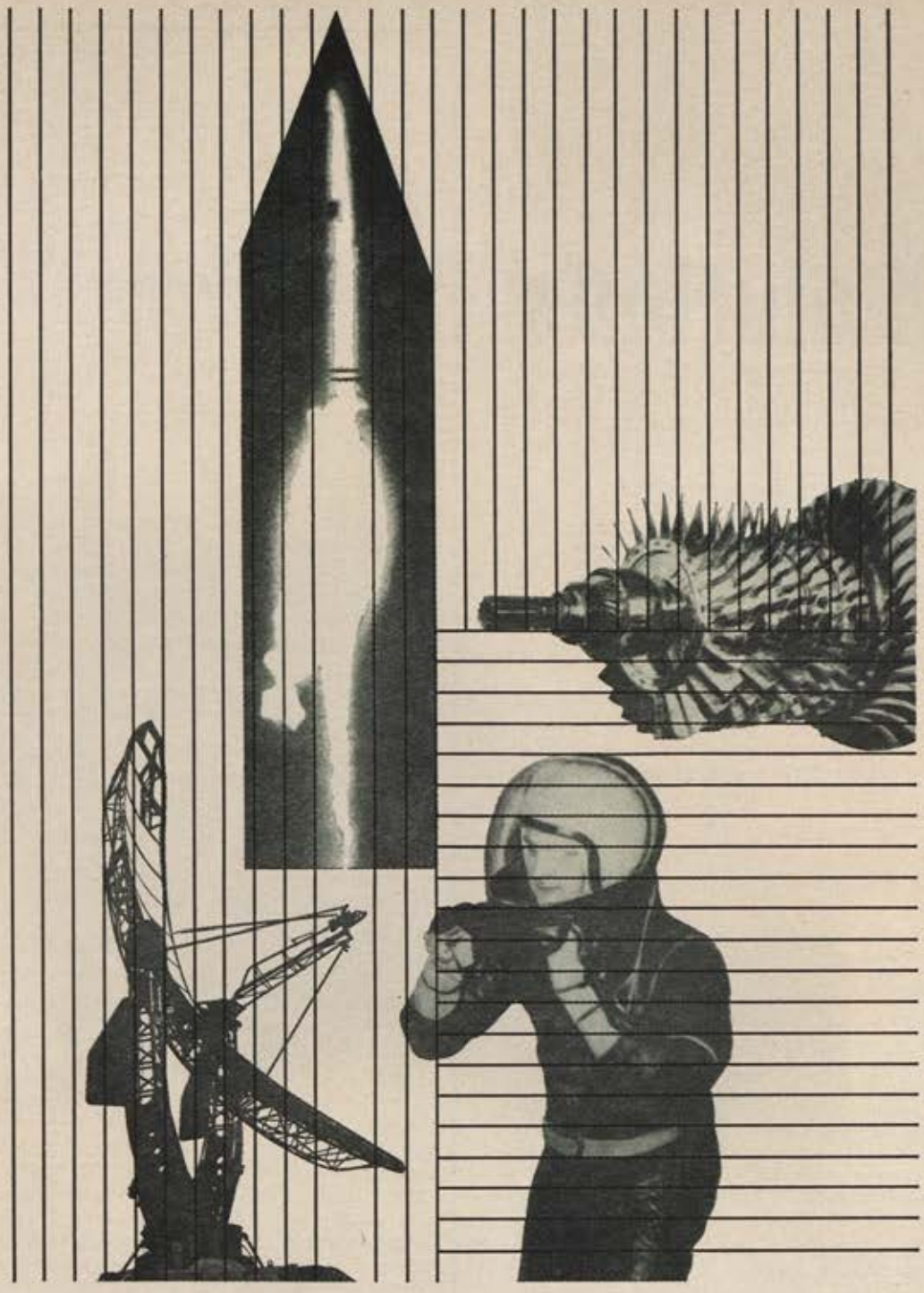
The budget of the federal government, like the budget of a business enterprise, is a planning document. It is the place where the federal government's programs are brought together and evaluated in the light of their costs. Properly used, the budget would provide the basis for judging the relative benefits to be derived from each government activity and the private product that must be given up to pay for these activities.

It is a sad fact that our budgetary process does not yield the right decisions, either with respect to the total amounts to be spent or the composition of expenditures. We spend too much on many things and not enough on others. In effect, we deny ourselves governmental services which, in some cases, are necessary to the very survival of our nation while paying for other services which are not worth their costs.

Every once in a while, the nation is awakened to the fact that it is not supporting necessary public services adequately. More often than not, what we do under these circumstances is to push ahead rapidly to make up the deficiency without cutting back on the unnecessary expenditures. And, when the budget gets too big, the necessary expenditures are slashed and the nonessential ones are left alone.

Budgetary developments during the past year are a good case in point. The American people were, on the whole, unaware of the gravity of the external threat against us until a Russian-made satellite began whirling around in the earth's atmosphere a year ago. As a result of this rude shock, the Congress appropriated more money for the Department of Defense and other defense-related activities. But, despite the urgency of the situation, most of the rise in expenditures during the current fiscal year will be due to nondefense spending. Federal expenditures in fiscal year 1959 are now expected to exceed those in fiscal year 1958 by $7.2 billion. National security outlays will account for only $1.9 billion of this increase and the expanded science and education programs will account for another $260 million. The remaining $5 billion is spread throughout the budget.

It is now clear that the budget for the coming fiscal year—1960—cannot be balanced at this higher level of expenditures, even if the current recovery restores high employment quickly. An effort will undoubtedly be made to cut expenditures in order to bring the budget closer to balance; but, judging from the past record, we can expect the defense program to be squeezed while other programs continue to rise. There are clear indications from Washington that this squeeze is already beginning.—*From an address by* HOWARD C. PETERSEN, *President, Fidelity-Philadelphia Trust Co.; Vice Chairman, Committee for Economic Development.*



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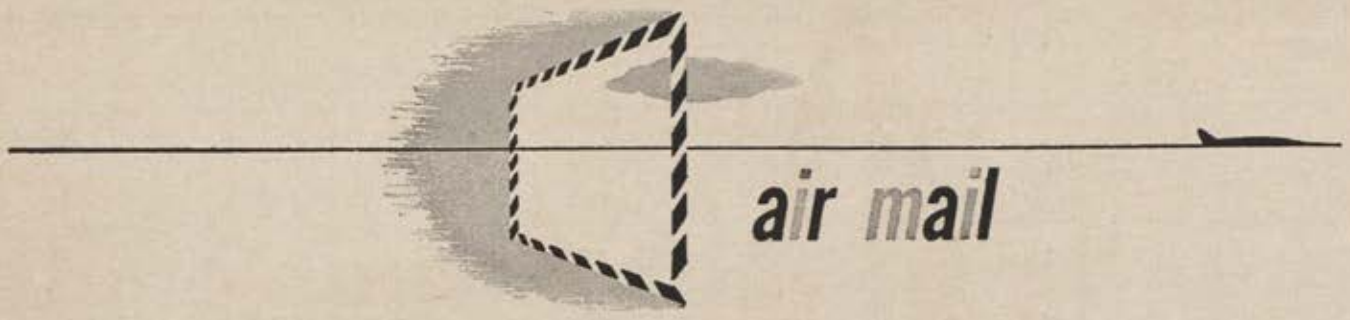

Decisions Possible but Not Likely

Gentlemen: I would like to take exception to your November '58 editorial.

It appears you have accepted as a basic premise that we are incapable of deciding which weapons and weapon systems are essential and necessary. This impugns upon the decision-making ability of our military leaders and also points up the unwillingness we have to facing reality.

If we accept your editorial at face value, we are leaderless militarily; we are a mob. Therefore, give the mob in uniform all the money it needs to develop anything that might strike its fancy.

Our unwillingness to face the reality that the Army, Navy, and Air Force act like three corporations bidding for an important contract is evident. The contract here is national security. The obvious fact, even to a layman, is that the Air Force is national security personified.

However, your editorial neglects the fact that we have able, competent military leaders who know what to do, but are hamstrung by reluctant abandonment of our "old balanced-forces" concept. It is slowly being abandoned, thank heaven, but not fast enough. Your comments, with their wide circulation, cannot help this situation.

Frankly, sir, you also place too much confidence in the American people. I feel you are being quite naive in assuming that "no American will dodge the issue if it's made clear to him." The average American is willing to "sacrifice" so long as his individual boat isn't rocked. If the "average American" you speak of were really concerned about defense spending, it wouldn't be in the state of chaos it now is.

Let me congratulate you on the "new" AIR FORCE Magazine. The SPACE DIGEST section is excellent. I must take issue with Mr. Kimball's letter regarding disagreement with your policies. Controversy is good—you learn what the other fellow is thinking.

Capt. Richard J. Green, USAFR
Woodbury, N. J.

● *Far from believing that we are incapable of deciding which weapon systems are essential, I believe that such decisions are possible but not probable. Further, the elimination of duplication takes time, and today there is no time to lose. We must pursue the long-term goal of economy and efficiency, but the short-haul requirement can only be met with more money.*—JOHN F. LOOSBROCK, EDITOR

Changing Statistics

Gentlemen: I have been an avid reader of AIR FORCE for a number of years and find your articles highly interesting and entertaining. Your articles on private aircraft have been especially helpful, as have your informative reports on weapons and weapon systems used by the United States Air Force.

However, I have noticed more than once discrepancies in statistical information you have published. One such example appears in the August 1958 issue under the heading "The Fighters," in which it is stated that the speed of the F-102A is 800 mph. Actually, the F-102A is capable of speeds over 1,000 mph. Several pilots with whom I have discussed this have confirmed my observation.

I think statistical information of this type should be reported more factually. I find it difficult to use your magazine as a form of reference in specific matters.

Bob Thompson
Overland Park, Kan.

● *You're correct in observing that there is a good deal of variation in statistical information in print, in* AIR FORCE *and elsewhere, on the performance capabilities of aircraft. One reason is that at first security will permit use of one set of figures—but within the space of a month or so an entirely new set of figures may be permitted, as more becomes known about the aircraft or as it goes into first-line service. Another reason is that there are different kinds of statistics used. One report may refer to maximum speed, another to cruising speed. Both figures are valid for the aircraft, but both would be subject to further change as more becomes known or declassified with the advance of its test program.*—THE EDITORS

Global Safety

Gentlemen: The State Department's desire to wait for a warmer international climate before attempting to forward the idea of a strong United Nations is based upon a false premise. A more friendly climate is not likely to arise while two colossal opponents yearly arm with greater and more destructive weapons of mass destruction. A warmer climate is more apt to arise if the US as one of these contending nations should, in good faith, offer to the world a plan whereby the safety of its opponent—its own safety—and the safety of every country on the globe might be assured.

Such a plan must endow the UN with the power to enact, interpret, and enforce law applicable to all nations large and small. The present belligerent atmosphere can only be changed by some such bold, imaginative, and practical approach. Relying upon such a plan to gain support from both East and West, the US should immediately declare that the cornerstone of this country's foreign policy is the development and strengthening of the UN.

This plan should be furthered by the appointment of a bipartisan commission composed of men of unimpeachable integrity who would concentrate on this problem and recommend to the President, the State Department, and the US Senate, the exact changes necessary to transform the present United Nations Charter—which is comparable to the Articles of Confederation as they existed in 1776—into some type of constitutional body capable of enforcing law in the limited field of war prevention.

J. A. Migel, Vice President
Institute for International Order
Charlestown, R.I.

Venerable Old Girls

Gentlemen: It may interest World War II aviators who flew B-17 Fortresses in the ETO that some of their mounts are still flying!

(Continued on following page)

A French firm has at least ten Forts which they use for aero survey work, and amongst these are two old ladies which served with the Eighth Air Force. The most interesting of these is AAF Serial No. 42-32076, which made an emergency landing in Sweden after a mission to the Third Reich in 1944. She was converted by the Swedes into a civil transport for one of their airlines, but was given instead to the Danish airline DDL. In 1948 she was sold to the Danish Air Force, which used her for trips around their territories. Eventually, in 1954, "076" went to France with her current owners.

The other veteran is AAF Serial No. 44-8846. This machine was originally allotted to the 351st Bomb Group at Polebrook, England, in the winter of 1944-45. It saw combat service until the end of the war and was then transferred to the 305th Bomb Group for occupational duties in Germany. How it reached the present owners is unknown.

These two Forts are probably the sole flyable survivors with combat experience left from the vast air fleet of B-17s. The French firm also has a third Fortress (Serial No. 44-8889) which may also have seen war service in the ETO. I should be grateful if any of your readers could tell me the original USAAF unit of this machine and of old "076."

The famous Eighth has no personal memorial to its men in the English countryside where it was based. It is just wishful thinking, I know, but what a wonderful memorial one of these old girls would make—far better than a hunk of stone.

Roger A. Freeman
Essex, England

Still Not Sure

Gentlemen: May I express my congratulations and admiration for the first edition of SPACE DIGEST, included with the November issue of the always-amazing AIR FORCE Magazine. This is indeed another example of the forward-looking Air Force Association, of which I am increasingly proud to be a member.

I suppose this is a pipe-dream, but I would be most happy to see the new magazine devote a little space to something which seems to be going on within the space and atmosphere around our planet—the puzzling unidentified flying objects, which have received such strange treatment through the Air Force. I am sure you are aware that more and more people, —pilots, military brass, elected officials, and scientists—are becoming interested in the subject. It would indeed be sensible and foresighted if the Air Force Association were to do more than take the USAF's suggestion to neglect the subject.

Lee R. Munsick
Morristown, N.J.

• *Thanks for your kind words* about SPACE DIGEST. *We hope it will truly cover the space age in perspective. On the matter of UFOs, this is something we can only report on as news in itself. The Air Force has freely admitted that a percentage of phenomena has never been satisfactorily explained, and we have reported this in connection with USAF's Project Bluebook. But we do not feel we can report with surety on the subject of unexplained phenomena without a far greater mass of evidence.*—THE EDITORS

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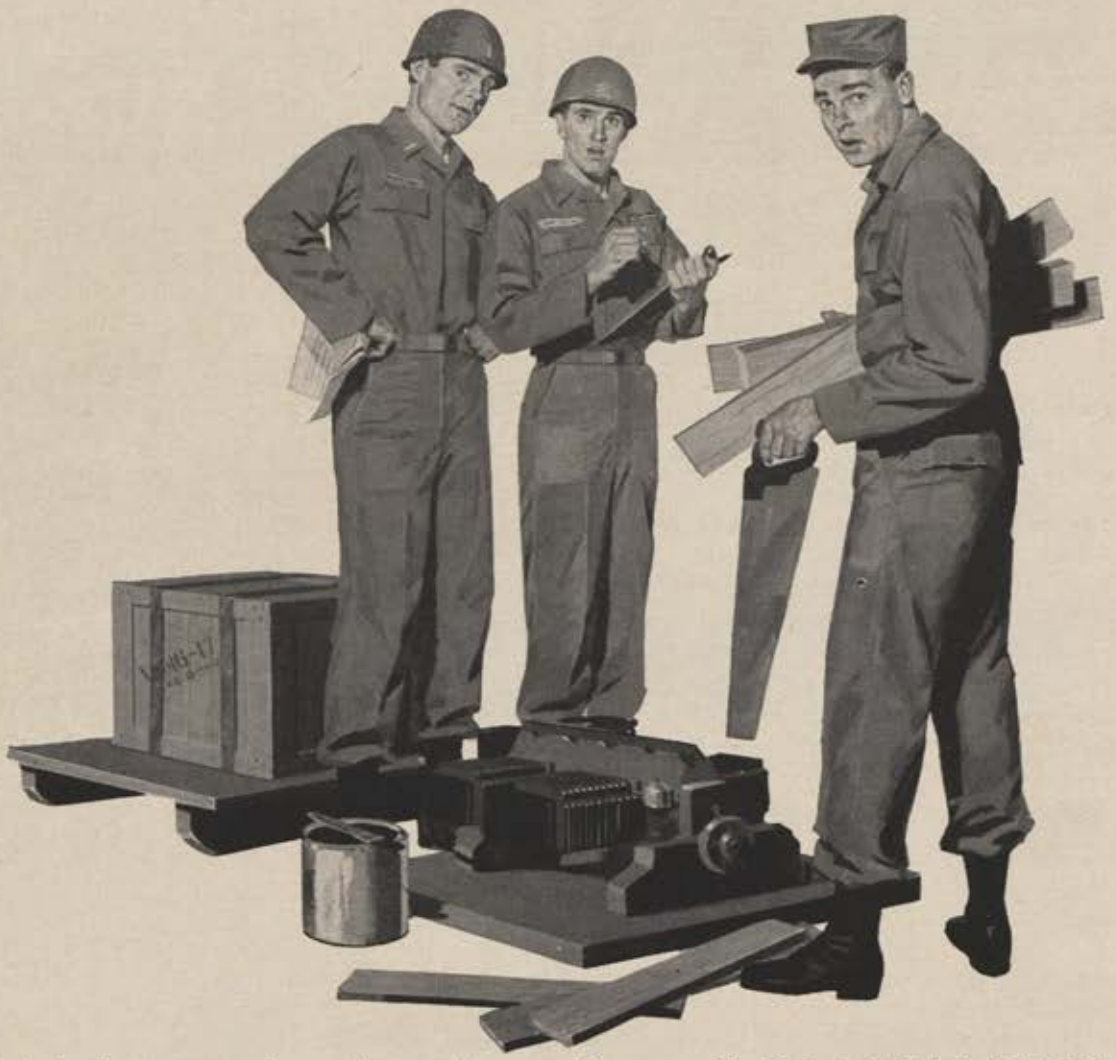

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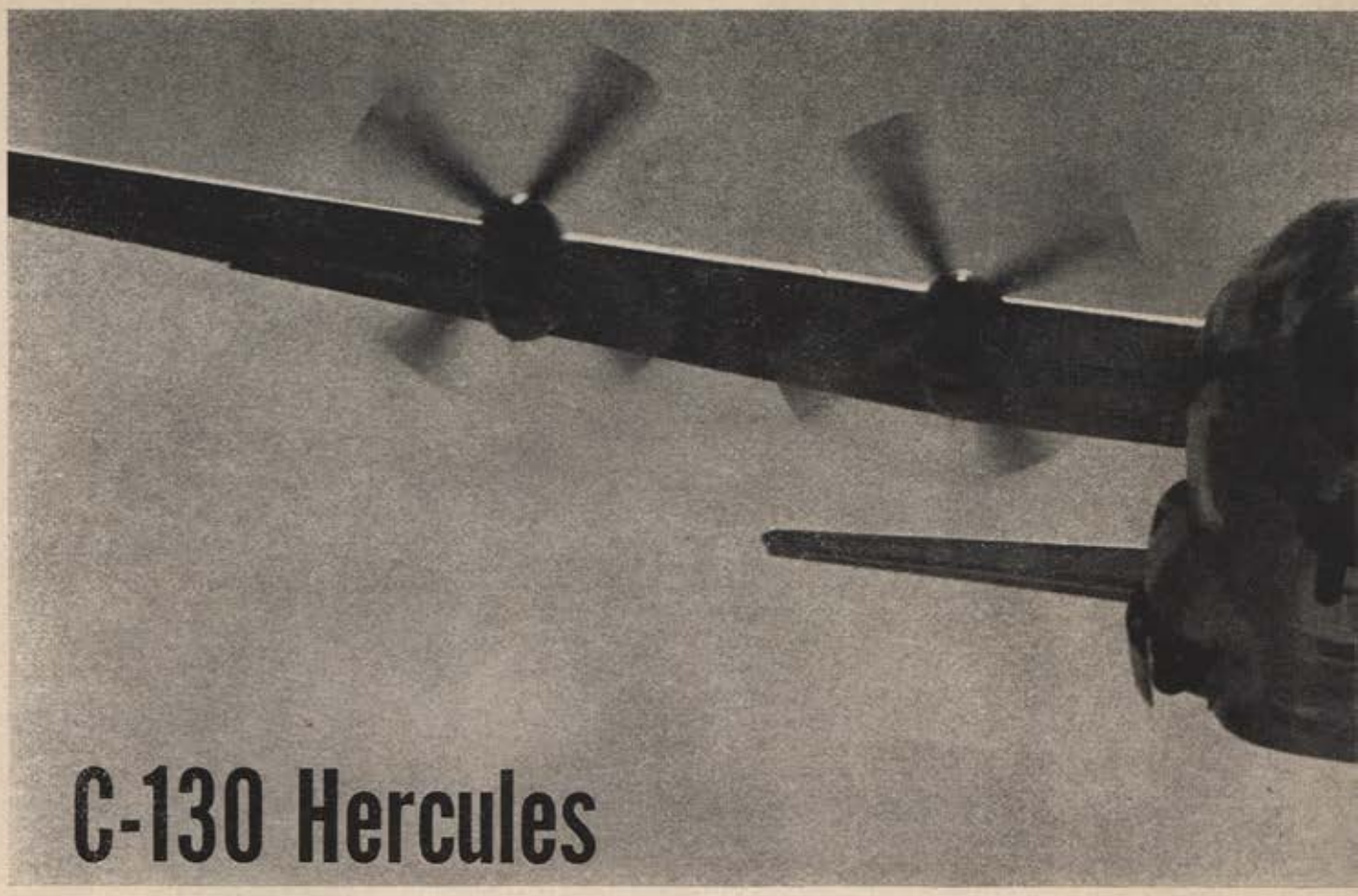

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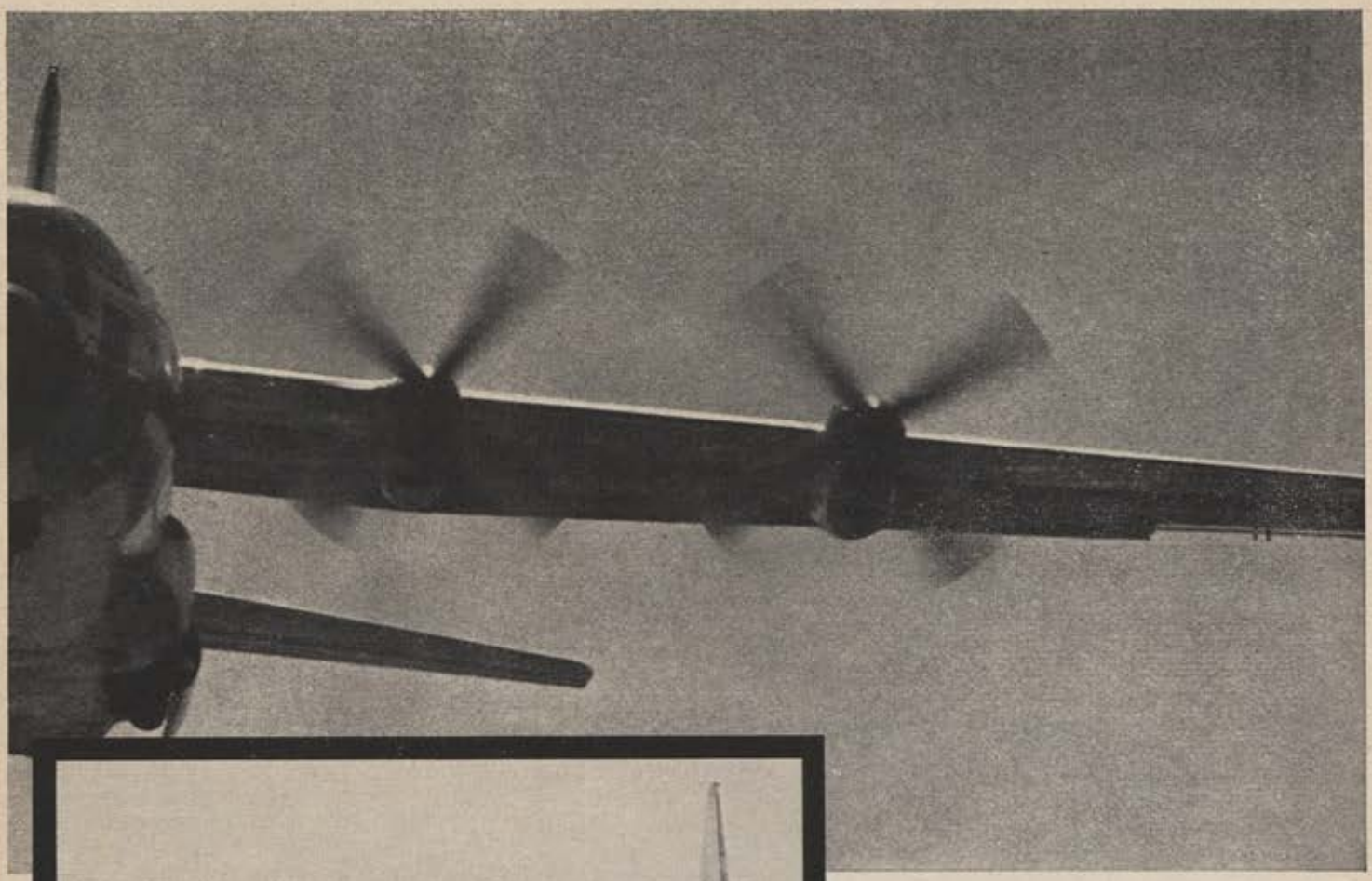

During 11 days of the Middle East crisis 100 C-130s were the backbone of a 200-plane aerial armada that transported over 5,000 troops and 8 million pounds of cargo to the trouble zone.

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What's New With ★ RED AIRPOWER

Here's a summary of the latest available information on Soviet air intelligence. Because of the nature of this material, we are not able to disclose our sources, nor document the information beyond assurance that the sources are trustworthy.

Last month this column reported briefly on the strength of Red China's air force. More details are now available. Nearly all aircraft operated by the Chinese Communist air force were designed and built in Russia, although a new twin-engine light transport (piston) has just been built by the Chinese. MIG-15 and MIG-17 production has begun under Soviet license in China.

Col. Gen. Ya Yalu is now in supreme command of the Red Chinese air arm. He has about 1,800 fighters, according to the latest figures, 700 bombers, 300 cargo aircraft, and 200 trainer aircraft. Of these, the Chinese are maintaining about eighty percent operability of their aircraft at any one time.

The table below gives the different types:

DESIGNATION	TYPE	NUMBER
MIG-15 (Fagot)	Jet fighter	1,100 (approx.)
MIG-17 (Fresco)	Jet fighter	400
MIG-19 (Farmer)	Jet fighter	few
IL-28 (Beagle)	Light jet bomber	300 (approx.)
LA-9 (Fritz)	Piston fighter	150 (approx.)
LA-11 (Fang)	Piston fighter	150 (approx.)
TU-2 (Bat)	Piston bomber	300
TU-4 (Bull)	Piston bomber	100
IL-12 (Coach)	Piston transport	300
LI-2 (Cab)	Piston transport	
TU-70 (Cart)	Piston transport	
Trainers of various types		200
		3,000

The Red Chinese have based most of their IL-28s at Hangchow, in Chekiang province, which reflects their need to work their jet aircraft only out of locations where there are good rail and water transport facilities to bring in fuel and other supplies. Many of the transports, which are piston aircraft, and require less logistical support, are based on small strips opposite Formosa.

° ° °

Sign of the times: The Soviets have been busy looking over munitions factories and chemical works for operating engineers who can be trained as rocket specialists. The search of Russian industry has become quite intensive as part of the effort to provide enough able personnel to run missile bases in the field.

° ° °

Rapid expansion of the East German aircraft industry is under way. Today there are eight different works, employing a total of 21,000 people. Pirna is the center of the industry, which reports through the Ministry of Defense, much as in Russia. In addition to the test field at Pirna there are other flight test groups stationed at Aschersleben, Stendal, Havelberg, and Luckenwalde.

The East German air force at present numbers 10,800 men, of whom 8,000 belong to fighter squadrons. Staff for these units is located at Cottbus. Although the air force has only seventy MIG-15 type aircraft today, the buildup of aircraft is expected to be very rapid because the East German aircraft industry is going into production of Soviet types under license. Dessau is the principal site for fighter manufacture.

In keeping with the buildup of East Germany's aircraft industry and air force, various smaller airports first established by the Luftwaffe, as well as new fields, are being expanded or built. Most are grass strips up to 3,500 feet long. The fields are protected by artillery units, but so far there are no missiles.

° ° °

Wages of Aeroflot personnel vary a great deal, judging from the few figures which are available. One reason for this is that the Russian airline does not use a standard wage for each type of work across the USSR. Workers are paid more in Siberia and the Moscow region than in many other parts of Russia. At Kiev, for example, skilled workers for the airline get from 1,000 to 2,100 rubles per month. Engineers who do airframe and engine repair work get from 1,900 to 2,100 rubles. Lecturers in the School for Civil Aviation at Kiev bring in 3,000 to 5,000 rubles per month. Pilots on the TU-104A jet transports get around 8,000 rubles per month for flying sixty hours. One ruble is worth about ten cents in American money.

° ° °

The new Soviet seven-year plan places great emphasis on the expansion of aviation throughout the USSR. The rate of expansion in air transportation will be greater than that for water or rail transportation, according to the plan, whose goals are to be met in 1965. There is to be a sixfold increase in air passenger traffic in the seven-year period.

Part of the program will be accomplished by providing better service, especially with jets. As a result some ninety airports will have to be built or rebuilt in Russia before 1965.

° ° °

The same plan calls for an increase in aluminum production by 180 percent over 1958. It also calls for increased research and development, particularly in areas that show promise of immediate results. The areas named include: nuclear reactors, cosmic rays, and semiconductors. Chemists were told to concentrate on new synthetic materials.

° ° °

In their technical literature, the Russians indicate they are giving some thought to aircraft that fly at Mach 5, which is at least 1.5 higher than the B-70.

To achieve these higher speeds the Russians are talking of new cooling techniques to handle higher engine temperatures. They mention ceramic refractory materials as one possibility, though they admit in the same sentence that the materials are giving them problems because of brittleness.

Another idea they are kicking around is combining turbojet and ramjet engines. The turbojet would be used for takeoff purposes, and the ramjet would kick in when the aircraft was flying fast enough to feed it ram air.—END

AIRPOWER in the news

Claude Witze
SENIOR EDITOR

Have We *Learned* Anything?

WASHINGTON, D. C.

One of the most discouraging events of 1958 took place in early December when President Eisenhower was quizzed at a press conference about reports that the Russians have an 8,700-mile-range ballistic missile and a nuclear-powered airplane. Without debating the merits of this intelligence, which has been done to death in the past few weeks, it is important to point out that the White House reaction does not indicate there has been any improvement in the approach to our technological race with the Soviets.

The President said he would not try to refute anybody who said the Reds have an improved ICBM. He indicated he would try to refute anybody who said they have a nuclear airplane. He did not say or indicate that he felt such achievements, true or false, are of any major concern to the United States.

There are a lot of competent people around this town who feel it is very foolish to deny reports of this type, if only on the basis of what the Russians have done in the past few years to prove they are not a nation of benighted peasants.

It is true that we have fired an Atlas ICBM over its full range (*see page 78*) and that the range can be increased. It is true that we have looked upon the nuclear airplane as a technological must but also as a vehicle with severe drawbacks in the military service. Because the Administration has consistently favored today's hardware over advances in more basic technology, the nuclear airplane has not received the emphasis it undoubtedly has received in Russia.

The appalling thing about our reaction to the reported Russian advances is the utter lack of any sense of urgency about our own programs. What this has led to has been succinctly summarized by William Leavitt in this issue of SPACE DIGEST (*page 60*). It is not an encouraging picture, despite the increased interest of the American people who were jolted by Sputnik and may be jolted again by a Soviet nuclear airplane.

At this writing President Eisenhower still is on the record for promising that the Defense Department will have a new Directorate of Research and Engineering and the vacancy persists. The longer it stays open, the greater is the possibility that a second-rate man, not a first-rate one, will get the assignment.

It is impossible to find any excuse for this delay except the common one that no first-rate man will take the job after looking at the complex table of organization over which he might not have any clear cut control.

Meanwhile, despite all the love and kisses that are displayed in public between the Army, the National Aeronautics and Space Administration, the Air Force, and the Pentagon's Advanced Research Projects Agency, the inevitable conflicts persist. ARPA has announced its Project Discoverer satellite program, which is part of the old USAF Sentry schedule with a new name and a few alterations in the vehicles. It also has drawn up a budget for fiscal 1960. At the same time there appears, here and there in the public prints, the word of some nosey reporter who wants to know whether ARPA will be permitted to exist through much of calendar 1959.

From where we sit, it appears that ARPA, being older and not requiring its own technological laboratories, has jumped into a void left, for the moment, by NASA. The new space agency is only three months old, and it cannot be accused of sitting around idle in that time. But it also is true that competent staff members are not easy to find, and T. Keith Glennan, the administrator, must do a lot of persuading to attract top talent to his agency.

In its first major procurement action, NASA has turned to the Rocketdyne Division of North American for development of a 1.5 million-pound-thrust engine to be capable of launching manned satellites.

It is significant that on the day the award was announced, the fifty-fifth anniversary of Kitty Hawk, Mr. Glennan himself declared that "we need more clearly to define our national programs, both military and civilian, in the space field."

He also told the Wright Day dinner here that "the Russians know what they are doing" and we must make sure we know what we want to do.

Somehow, it is highly likely that Congress is going to look at the situation and do something about it. In this contest the conservative bettors will put their money on NASA and Mr. Glennan. His agency is a creation of Congress, set up with strong support from the White House, where Dr. James Killian—a close friend of Glennan's—sits at the right hand of the President. Also, NASA was fathered in the legislative sense by Lyndon Johnson, the Texas Senator, who is both intelligent and powerful. Having put Mr. Glennan in this spot, the Senator will find it difficult to do anything but support him in what he needs, be it men, money, facilities, or shootin' hardware.

It is at this point that we come back to the attitude of the Administration. NASA said it needed the men and facilities at the Army's Ballistic Missile Agency in Huntsville, Ala. After a bewildering and hysterical period of screaming by Army partisans there was no executive decision to support NASA or not support it. There was an "agreement" that pleased the White House and led the *Washington Post* to make the cutting editorial comment we have reprinted in this issue on page 28.

Most annoying to friends of airpower is the continued lack of constructive action to give the Air Force a substantial jump in the direction it should be going. USAF still needs a program looking toward the conquest of outer space, and this means a military reconnaissance satellite should go up as soon as possible. USAF needs an anti-ballistic-missile missile. It needs missiles to defend its bombers and the fastest possible progress in the field of an air-launched IRBM.

The big question is, can we overcome the administra-

(Continued on page 19)

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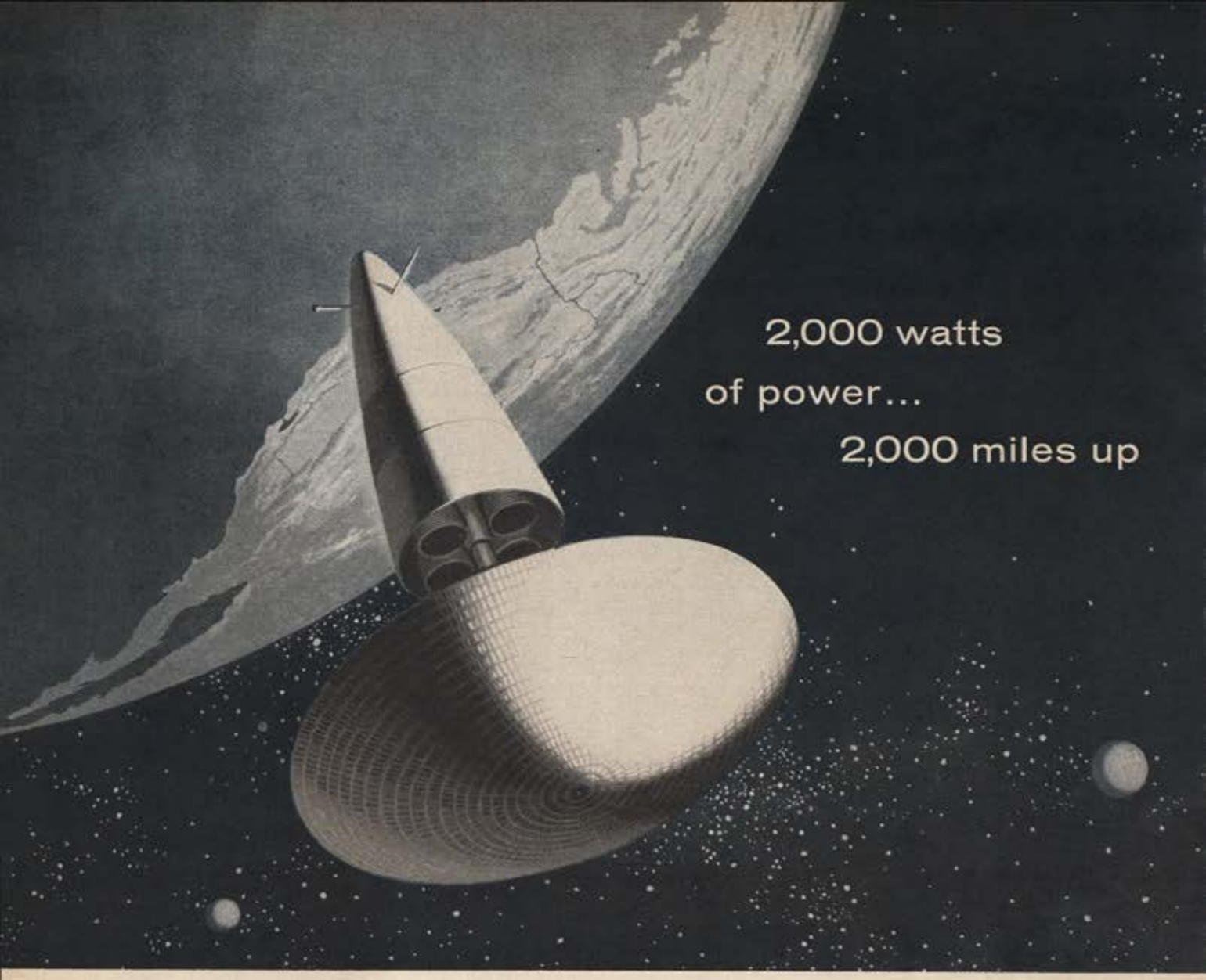

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tive block to achievement of these things? And if it is to be done under the over-all supervision of a Defense Department research directorate, will that office by bossed by a competent staff?

Congress and the Pentagon

By this time the daily press and the weekly commentators are grinding out their usual conjectures and predictions about the new congressional year. We do not have the advantage of knowing as this issue of AIR FORCE goes to press what views on legislation have been expressed by the President. Also lacking is the atmosphere that will be created by all those new faces on Capitol Hill. As pointed out last month, it is perfectly clear that there are going to be some changes made, almost all them traceable to what happened at the voting machines early in November.

It can be reported that the Department of Defense worked up a legislative program for the Eighty-sixth Congress that included 138 items. The White House was given a chance to express an opinion about the proposals and on the basis of that advice the list was cut to seventy-three items.

Even earlier, several pieces of legislation requested by the Air Force had been rejected in the Pentagon. These included action to catch up with a couple of meritorious recommendations of the Cordiner Committee and the dental care bill.

Of the seventy-three topics on the Defense Department program for Congress, seventeen are of major importance, and the Air Force has a strong interest in their fate. One of the prime efforts will be to effect amendment of the Reserve Officers Personnel Act of 1954. Changes considered vital to improvement of the Reserve Forces have been held up by the Defense Department, but the Air Force Association as told at its Convention last September that the legislative package will be ready for the Eighty-sixth Congress. The House Armed Services Committee is prepared to hold hearings on the proposals. The legislation will seek to ensure that Reserve officers are promoted under a system that is as similar as possible to the one used for Regular officers. It also will try to establish more uniformity among the armed services in their administration of Reservists.

Reservists on active duty will have their status improved if Congress acts favorably on a bill designed to make the service more attractive beyond the obligated tour of duty. The proposal would make contracts mandatory for officers after the first two years of service but eliminate the present one-half month's pay for these first two years. On completing his contract, a Reserve officer would receive two months' basic pay for each year served under the contract, whether or not his release is involuntary. Under present law, he gets one-half of one month's basic pay for each month served but nothing if he sheds his uniform at his own request.

If the Reserve officer, giving satisfactory service, is dropped involuntarily during the contract, the new proposal would provide two months' basic pay and allowances for each year he served under the contract. Under the present law he can get only one-half of one month's basic pay for each year served or one month's basic pay and allowances for each year of the uncompleted contract, but not both.

Officers presently on duty are not forgotten; there is provision for the transition to a new system. If they would be eligible for a contract under the new law and are RIF'ed, those who have more than ten years' active duty would get two months' basic pay for time beyond the ten-year mark.

New faces but old issues will dominate 86th Congress.

Finally, the proposed law would provide that if a Reserve officer has given satisfactory commissioned service for fourteen years he will receive a Regular commission, be released with readjustment pay, or given a contract that will carry him to eligibility for retirement.

Legislation of major interest to Regular officers has been prepared by the Secretary of Defense. The object is to get more uniformity in the promotion systems used by the three services. The Eighty-fifth Congress considered a related proposal that contained a number of clauses having application only in the Navy and Marine Corps.

The Career Management Plan proposed now has these features:

- Ability would be given greater weight as a criterion for promotion. The bill would permit choice of five percent of new officers from a group junior to those in the primary list being considered. It would provide selection for promotion to permanent grades above captain in the Army and Air Force on a "best qualified" basis.
- Regular officers who have failed twice to win promotion to the permanent grade of colonel (captain in the Navy) or brigadier general (rear admiral) could be involuntarily retired.
- It would establish for all services minimum uniform periods of service in grade for eligibility for permanent promotion to the grades of first lieutenant through colonel.
- It would provide various administrative procedures for selection boards.
- It would provide other miscellaneous provisions relative to officer severance pay and retirement of certain Navy and Marine Corps officers.

Failure of the last Congress to extend the Capehart housing program left the Air Force with a continued problem in this area. The new session is expected to get a request for extension of the Armed Services Mortgage Insurance program for another one or two years. Other housing amendments probably will be added.

Both the Air Force and its industry suppliers favor a bill that would guarantee contractors' protection when they face unusual hazards in performance of their work for the government. Proposed legislation would authorize the Defense

(Continued on following page)

Department to pay contractors for their claims in this area only to the extent that compensation is not realized from insurance or other sources. The authority would last until the end of 1968.

Some contractors are known to hesitate about accepting obligations that involve possible accidents that would result, or could result, in huge liabilities and losses. Supply and construction in the areas of atomic energy weapons, missiles, and special propellants are examples of this kind of hazard. There is a limit on the extent of commercial protection a contractor can buy; the proposed bill would restrict the government's obligation to all parties to $500 million for each incident.

Basic USAF Arithmetic Lesson

In the public discussions now getting under way over how the military budget pie will be sliced, our readers will bump into the annual confusion over USAF's wing strength. It is the purpose of these paragraphs to provide the fundamental figures needed for intelligent discussion.

For background, it serves no purpose to recall anything beyond 1953, when Gen. Hoyt S. Vandenberg laid his career on the line to plead for strength of 143 wings. He didn't get it, but a 137-wing structure was set up on authority of the Joint Chiefs of Staff. The threat has not declined since then, but all other curves continue to go down.

Here is a breakdown of USAF combat wings, by command. It shows the wing structure for fiscal years 1958 and 1959. FY '59 will end on June 30, 1959.

Wing Strength	*End of FY '58*	*End of FY '59*
Strategic Air Command	44	43
Tactical Air Command	45	35
Air Defense Command	28	27
	117	105

It is not easy to find any authoritative prediction about where we are going from 105 wings, which is thirty-two fewer than the JCS approved back in 1953. If you want an educated guess, a future Air Force of about eighty wings appears possible.

Meanwhile, there is a further breakdown of the 105-wing structure that may be good for your local record:

Command	*Aircraft Category*	*Wings*
SAC	B-52 heavy bomber	11
	B-47 medium bomber	28
	RB-47 medium reconnaissance	3
	Light reconnaissance	1
		43
TAC	F-100 tactical fighter	17
	B-66, B-57 tactical bombers	3
	Light bomber	3
	Troop carrier C-124	4
	" " C-130	5
	" " C-123	2
	Tactical missile	1
		35
ADC	Fighter-interceptors	27

On the subject of manpower, USAF at present has 863,800 personnel and it will be cut by next June 30 to 850,000. There is a law placing a ceiling of 500,000 on the Air Force's rolls, but it is currently suspended and action is needed by the Eighty-sixth Congress to keep it in suspension.

When you are talking about USAF strength in terms of wings, keep it in mind that the number of aircraft and the number of men in a wing is determined by operational requirements. Thus, a typical fighter wing consists of seventy-five airplanes and 1,400 persons. A heavy bombardment wing has only thirty aircraft, but it takes 3,600 men to keep 'em flying.

Questions and Answers

Aside from routine studies of the budget, the Eighty-sixth Congress will hold hearings on a number of other subjects of interest to the Air Force. So far as we know, most of the topics are well-chewed bones, but there is no denying there will be a scrap of meat found here and there. Congressional hearings are not evil things, but they get abused once in a while. When they are abused there is a rash of unfair headlines and a lot of stuff that comes from irresponsible or vested interest sources gets into the record. Usually, it is impossible to get it out.

One subject that illustrates this point is the new Air Force Academy in Colorado Springs that created a flurry last summer. Now the General Accounting Office is winding up an eight-month study of the expenditure of academy funds that was undertaken for the House Appropriations Committee. It will go into some of the subjects discussed last year and, while it may restore balance to the picture, it will include criticism. Areas in which brickbats will fly probably include the design of the buildings, architectural expense, charging of costs, and the final price as compared to the estimates.

There has been no end to the probes into the Military Air Transport Service, and there is no sign there will be an end. This is a subject that attracts the attention of several congressional committees, some of them goaded by the commercial carriers. The airlines, facing continued and more stringent financial problems, cannot be expected to turn down the heat. Since MATS was taken over by Lt. Gen. William H. Tunner, he has held meetings with representatives of some airlines in an effort to show how much we need both military and commercial transport services. Nevertheless, it is expected that new efforts will be made to cut down on MATS, build up contract services. It will be interesting to see how far this effort gets if Berlin continues to stand on the brink of another transportation crisis.

Already under way is a congressional probe of USAF contracting practices. There are sounds of high interest in cost-plus-fixed-fee agreements, negotiated contracts and a few other features that are of major concern to the aircraft and electronics industries.

In this general area one of the big headline-getters will be an inquiry into USAF's Ballistic Missile Division and its relationships with Ramo-Wooldridge Corp., which was hired to manage the ICBM and IRBM programs. This company has been immensely successful and success is a hard thing to achieve without making somebody else unhappy.

There are a number of other subjects slated for scrutiny. One is the entire defense concept, under which we are supporting both area and point defense weapons. On the antimissile missile there is skepticism about this system of charging the Air Force with the task of locating an enemy ICBM and having the Army find out how to knock it down. There will be an effort to find somebody who denies we need more airlift, but a new study made for the Joint Chiefs of Staff should carry a lot of weight as soon as its conclusions are known.—END

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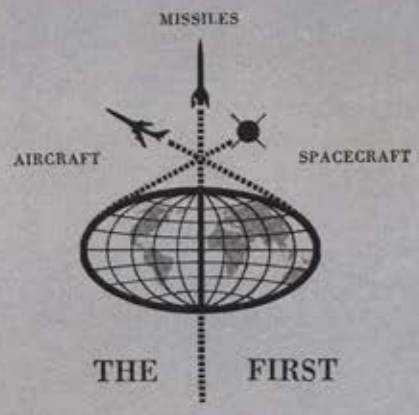

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Included in the program will be the Fourth Annual Jet Age Conference of the Air Force Association. Attendance will be by invitation only.

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The following organizations are among those who have scheduled meetings in Las Vegas or in nearby cities so as to participate in the WORLD CONGRESS OF FLIGHT, or will conduct activities in conjunction with this event.

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National Aeronautic Association
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Board Meeting

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Board Meeting

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Reserve Officers Association
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Scientific Advisory Board of the Air Force
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FLIGHT LINES

American Machine & Foundry, which holds a contract for the design and development of a launching system for the **Titan intercontinental ballistic missile,** has released artist's drawings of an underground launching system to be built at **Vandenberg AFB,** near Lompoc, Calif. The missile will rest on an elevator inside a steel framework embedded in the ground and will be raised to ground level for launching. The system is designed to **eliminate the overhead gantries** used in launchings at Cape Canaveral and for static missile tests.

December honors:

Dr. John Francis Victory, Assistant to the Administrator of the **National Aeronautics and Space Administration,** was awarded the **Wright Brothers Memorial Trophy** at the annual **Wright Day Dinner of the Aero Club of Washington** on December 17. Dr. Victory, **first employee of the NACA** when it was established in **1915** and a leading figure in aeronautics, was awarded the **NACA's Distinguished Service Medal** in August of last year.

The **Wright Brothers Trophy** was established in 1948 to honor significant public service to aviation in the US. Earlier recipients: **William F. Durand, Charles A. Lindbergh, Grover Loening, Jerome Hunsaker, James Doolittle, Carl Hinshaw, Theodore von Karman, Hugh Dryden, Edward Warner, and Stuart Symington.**

The award committee includes heads of the **National Aeronautics and Space Administration, Institute of the Aeronautical Sciences, Aircraft Industries Association, Air Transport Association, Aviation Writers Association, and the Aero Club of Washington,** in consultation with the president of the National Aeronautic Association.

The 1958 Frank G. Brewer Trophy for outstanding contributions to **aviation education** was awarded to **Dr. Evan Evans at a National Aeronautic Association** awards luncheon in Washington in December. Dr. Evans, **Executive Director of the National Aviation Education Council,** has been an educator for forty years, specializing in aviation education and training for more than sixteen years. The Brewer Trophy winner is selected annually by a committee appointed by the president of the National Aeronautic Association.

Maj. Gen. Edward P. Curtis, Special Assistant to the President for Aviation Facilities Planning in 1957, has received the **Collier Trophy** award for 1957 from President Eisenhower at a **White House ceremony.** General Curtis' **Aviation Facilities Planning report** on the problems involved in the use of air space in the jet age led the way to reorganization of the nation's air agencies into **the new Federal Aviation Agency.**

General Curtis, **AFA's "Aviation Man of the Year" in 1957,** was a World War I pilot and was **Gen. Carl Spaatz's chief of staff** during World War II. He is a major general in the USAF Reserve and a vice president of **Eastman Kodak Co.** in Rochester, N. Y.

The **Collier Trophy,** established in 1911 to honor the greatest practical achievement in American aviation, is presented annually by a committee appointed by the president of the National Aeronautic Association, including representatives of the major aviation industries, agencies, and associations.

USAF Chief of Staff Gen. Thomas D. White at the site of the first British Thor IRBM unit, the 77th Strategic Missile Squadron, Feltwell, England. From left, Maj. Gen. W. H. Blanchard, Commander, 7th Air Division; General White; Air Vice Marshal K. B. B. Cross, Commander, 3d RAF Group; Group Capt. Andrew William (hidden), Commander of the 77th; and Col. William Delahay, chief of USAF technical group for the missile agreement, at Feltwell.

A series of **three meetings** is scheduled in **Washington, Chicago, and Los Angeles** between January 8 and 16 to **instruct Department of Defense suppliers in the use of new procedures** to be used in **selection of spare parts for all equipment delivered to DOD** after the first of the year. The four military services have cooperated with the **National Security Industrial Association,** the **Electronics Industries Association,** and the **Aircraft Industries Association** for the past three years in a study to update the spare parts buying methods of DOD.

The new technical documentation, considered by industry as one of the **most significant advances in the field,** will replace **with one standard method** the **present diverse methods** of technical documentation required for DOD parts selection.

The **Washington** seminar will be held on **January 8 and 9** at the Shoreham Hotel; the **Chicago** meeting on

(Continued on following page)

January 12 and 13 at the Sherman; and the Los Angeles one on January 15 and 16 at the Alexandria Hotel.

The **Hiller X-18 Propelloplane** was rolled out by the USAF and Hiller Aircraft Corp. on December 8 at Moffett Field, Calif. The sixteen-and-a-half-ton **tilt-wing research vertical takeoff and landing craft** is also capable of **short takeoff and landing or conventional operation,** depending on the length of runway available.

The X-18 has been under development by Hiller since 1956. An eight-foot model was tested for six months in 1957 in the NACA wind tunnel at Langley Field, Va. It will begin **flight tests early this year** and will be tested by the USAF this spring at Edwards AFB, Calif.

The Propelloplane uses two **Allison T-40 turboprop engines** plus a **3,400-pound-thrust Westinghouse J-34 turbo-**

The X-18, Hiller tilt-wing research transport, rolls out, with its wings in the ninety-degree position, for VTOL.

The GAM-72 decoy missile, developed and manufactured by McDonnell Aircraft, has been successfully launched from B-47 and B-52 bombers of the Strategic Air Command. The Quail, powered by a GE J-85 engine, has a recovery parachute, so that it can be reused for further flight tests.

jet for **control of pitch** in hover or transitional flight. Stanley Hiller Jr., president of Hiller, believes that the conversion of our entire air transportation to VTOL will be gradual but is only a matter of time.

Northrop Aircraft has received a production order from the USAF for **T-38 supersonic trainer airplanes.** The lightweight **twin-jet trainer,** designed to match the high-performance characteristics of combat craft **of the 1960-1970** period, is programmed for use by ATC. The first of four service-test T-38s is now readying for its initial flight.

The President's **promotion list for November 1958:**

To **temporary brigadier general, USAF:**

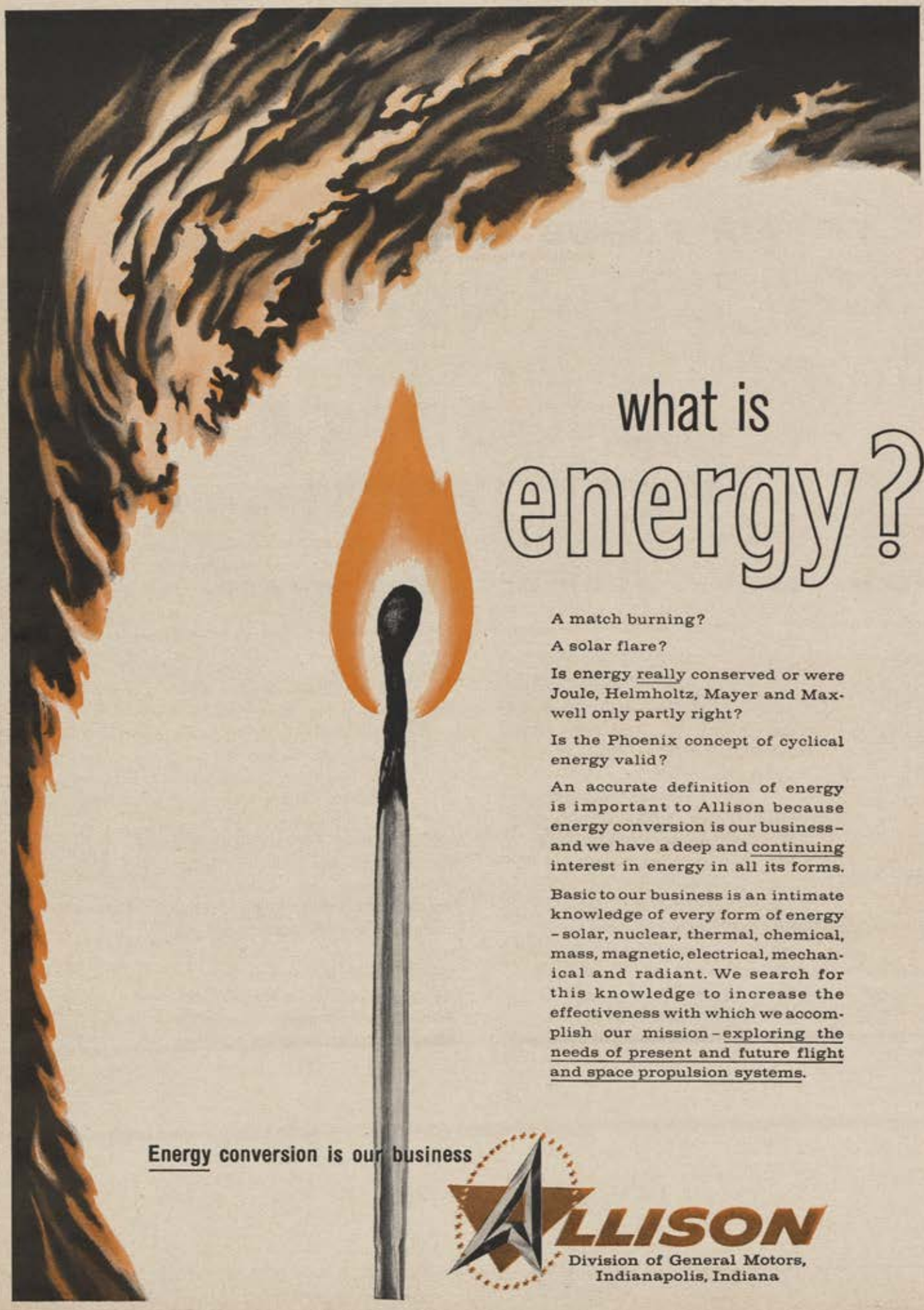
Loren G. McCollom, Deputy Comdr for Programming, Air Defense Systems Division, ARDC, Laurence Hanscom Field, Mass.; **Robert H. Curtin,** Deputy Director of Installations, DCS/O, Hq. USAF; **Joseph T. Kingsley, Jr.,** Chief of Staff, AMC, Wright-Patterson AFB, Ohio; **William E. Creer,** Comdr, 801st Air Division, SAC, Lockbourne AFB, Ohio; **Joseph H. Moore,** Chief of Staff, 9th AF, TAC, Shaw AFB, S. C.; **Eugene B. LeBailly,** Deputy Director, OIS, Hq. USAF; **Jerry D. Page,** DCS/O, ATC, Randolph AFB, Tex.; **Stephen D. McElroy,** Chief of Staff, Air Force Academy, Colo.; **Ariel W. Nielsen,** Comdr, 201st Air Division, SAC, Forbes AFB, Kan.; **John C. McCawley,** Chief, Manpower Division, AMC, Wright-Patterson AFB, Ohio; **Benjamin G. Holzman,** Comdr, AFOSR, ARDC, Wash., D. C.; **Richard L. Bohannon,** Surgeon, 5th AF, PAF, APO 925, San Francisco, Calif; **James G. Moore,** Surgeon, ATC, Randolph AFB, Tex.; **Edward J. Hopkins,** Comdr, AF Accounting and Finance Center, Denver, Colo.; **Frank W. Gillespie,** Comdr, 31st Air Division (Defense), ADC, Snelling AF Station, Minn.; **Frederick R. Terrell,** Comdr, 64th Air Division, ADC, APO 862, N. Y.; **Norman L. Peterson,** Deputy Comdr, Air Weather Service, MATS, Scott AFB, Ill.; **Charles E. Jung,** Deputy Comdr, Oklahoma City AMA, AMC, Tinker AFB, Okla.; **Richard P. Klocko,** Comdr, 6900th Security Wg, USAF Security Service; **Neil D. Van Sickle,** Asst Chief of Staff, US-Taiwan Defense Command, APO 63, San Francisco, Calif.; **Robert F. Worden,** Deputy Director for Policy, DCS/P&P, USAF; **Robert G. Ruegg,** Director of Procurement and Production, DCS/M, Hq. USAF.

To **temporary major general,** USAF:

Moody R. Tidwell, Jr., Judge Advocate General, AMC, Wright-Patterson AFB, Ohio; **Leo P. Dahl,** Comptroller, AMC, Wright-Patterson AFB, Ohio; **James S. Cathroe,** Assistant for Dental Services, Office of the Surgeon General, Hq. USAF; **Elvin S. Ligon, Jr.,** Comdr, 3500th Recruiting Wg, ATC, Wright-Patterson AFB, Ohio; **John M. Reynolds,** Comdr, 93d Bomb Wg (Heavy), SAC, Castle AFB, Calif.; **Robert A. Breitweiser,** Director of Intelligence, J-2, Office of the Joint Chiefs of Staff, Hq. USAF; **Fred M. Dean,** Comdr, Air Task Force 13, 13th AF, PAF, APO 63, San Francisco, Calif.; **Cecil H. Childre,** Director of Operations and Training, TAC, Langley AFB, Va.; **Hewitt T. Wheless,** Director of Plans, DCS/P&P, Hq. USAF; **William K. Martin,** Comdr, 72d Bomb W'g (Heavy), SAC, APO 845, N. Y.; **William E. Eubank, Jr.,** Comdr, 4310th Air Division, SAC, APO 30, N. Y.

STAFF CHANGES . . . **Brig. Gen. Frederic H. Miller,** who was Director of Materiel Programs, DCS/M, Hq. USAF, is now Deputy Director of Supply and Services in the same office. . . . **Brig. Gen. Stephen D. McElroy,** Chief of Staff, Air Force Academy, Colo., will succeed **Maj. Gen. Walter Agee** as Comdr, CAP, Bolling AFB, Wash., D. C. . . . **Brig. Gen. Robert F. Worden,** former Deputy Director for Policy, DCS/Plans and Programs, Hq. USAF, has become Deputy Director, J-5 (Plans and Policy), the Joint Staff. Also assigned to the Joint Staff, as Deputy Director, J-4 (Logistics), is **Brig. Gen. Robert G. Ruegg,** former Director of Procurement and Production, DCS/M, Hq. USAF.

Brig. Gen. Sam Maddux, Inspector General, ATC, Randolph AFB, Tex., has become DCS/Flying Training, ATC. The new DCS/Technical Training, ATC, is **Brig. Gen. Jerry D. Page,** who had been DCS/O, ATC, Randolph AFB, Tex.—END



what is energy?

A match burning?

A solar flare?

Is energy really conserved or were Joule, Helmholtz, Mayer and Maxwell only partly right?

Is the Phoenix concept of cyclical energy valid?

An accurate definition of energy is important to Allison because energy conversion is our business – and we have a deep and continuing interest in energy in all its forms.

Basic to our business is an intimate knowledge of every form of energy – solar, nuclear, thermal, chemical, mass, magnetic, electrical, mechanical and radiant. We search for this knowledge to increase the effectiveness with which we accomplish our mission – exploring the needs of present and future flight and space propulsion systems.

Energy conversion is our business

ALLISON
Division of General Motors,
Indianapolis, Indiana

Plan NOW To Attend . . .

AIR FORCE ASSOCIATION'S

1959 CONVENTION

AND

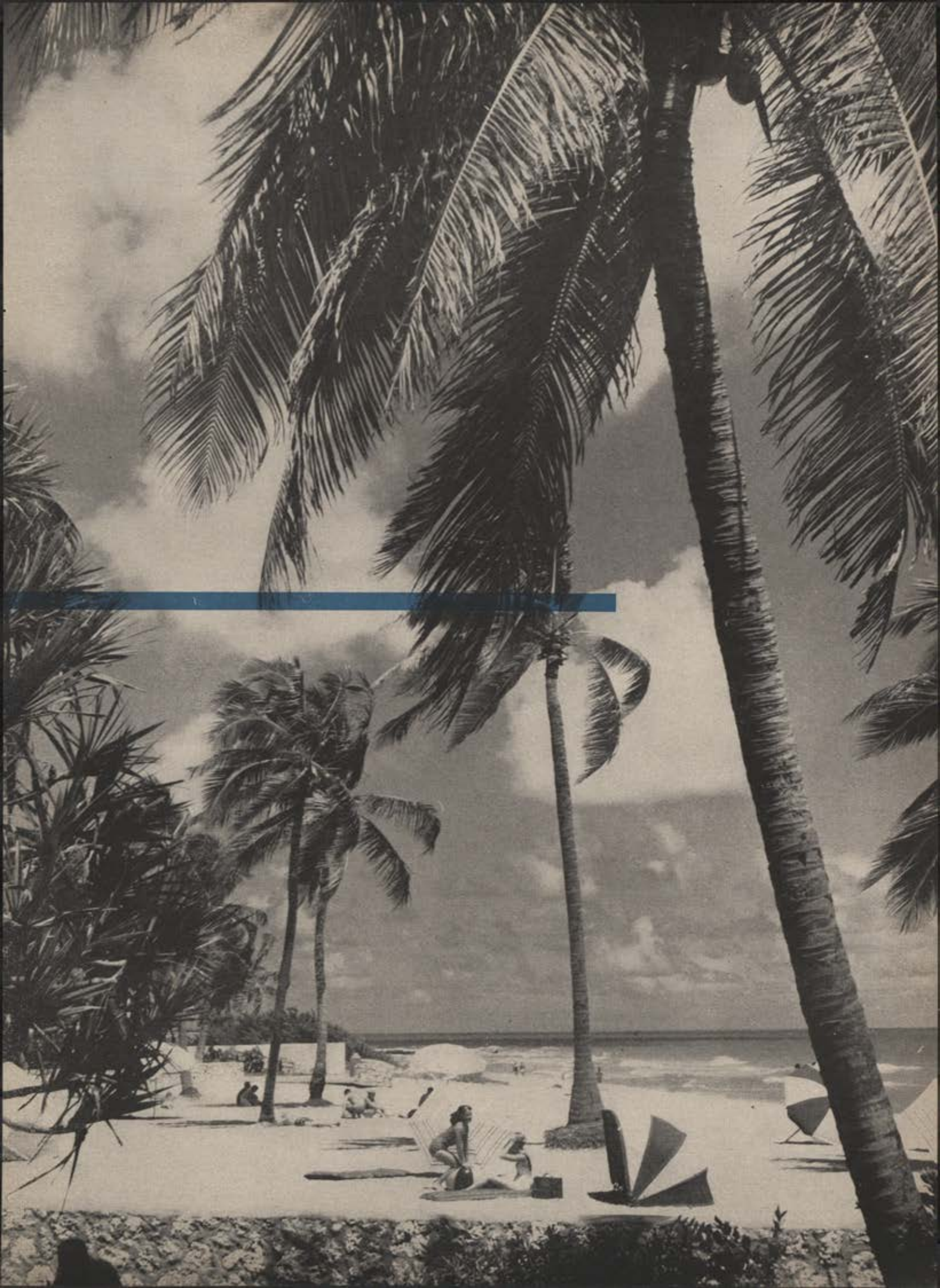
AEROSPACE PANORAMA

MIAMI BEACH, FLORIDA · SEPTEMBER 3-4-5-6

As you shovel the winter snow away from the front door, now is the time to make plans for AFA's 1959 annual National Convention and Aerospace Panorama, which will be held in sunny Florida, at world-famous Miami Beach, September 3-6. One look at the picture of the palm trees will make you want to head for the Convention six months early.

During World War II, thousands of Air Force personnel received their training at Miami Beach. The AFA Convention will offer a good opportunity to return to the Beach for a little "hut-two-three-four" reminiscing. Few will recognize much of the Miami Beach of the 1940s. Hundreds of ultra-modern hotels have been constructed from one end of the Beach to the other since the war. In fact, only two of the twenty hotels that AFA will use for the Convention existed during the war.

The February issue of Air Force Magazine will carry a form for use in reserving hotel accommodations for the 1959 Convention. AFA's Housing Bureau will open February 2, and reservations will be confirmed beginning on that date. No reservations should be requested until the address of the Housing Bureau is announced and the official reservation forms are available.



VIEWS & COMMENTS

Defense, Not Economy, Must Come First

IF President Eisenhower, as reported, is going over details of the proposed military budget for fiscal 1960 with a view to lopping off about $3 billion from a total of almost $42 billion, he should be ready to give a full accounting.

There has been evidence of some waste, mismanagement, and duplication from time to time and if this can be eliminated it will be all to the good. But in times of amazing scientific discoveries and sudden technological breakthroughs, there is no escaping the continuous spiral in defense costs. A World War II submarine cost $4 million, but an atomic submarine costs $45 million. As long as our world commitments remain what they are and there is no progress toward world disarmament, the United States is going to have to pay a large sum for military security.

American citizens have shown that they do not begrudge paying what is really needed for national defense. They do not want defense cuts made just because someone has passed the word that a showing in economy would be a mighty fine thing right now for the Administration. They remember the Johnson, Rockefeller, and Gaither reports which cited imperative defense needs that could be met only by rising expenditures: Cabinet members and Pentagon officials, including Secretary of Defense Neil McElroy, had said during recent months that rising defense costs might be expected.

How does it happen now, with the world situation no better, that the Administration can speak of something like a seven percent cut? A lot of people would like to know the answer. Is there to be some temporizing with the national safety? If so, the people are entitled to know what risks are to be taken and why. President Eisenhower, who won office largely because of his reputation as a man who was an expert in all military matters, should be able to give the answers on these and similar questions. He can no longer expect that the people will take anything he says as gospel. He must back up words with evidence.

This will be the first time that the President has taken a personal interest in military budget details. He directs that every missile item to be dropped or retained must come before him for personal decision. That will be fine, but the question arises why he did not dig into the missiles mess a year ago. Service rivalries, favored industrialists, unnecessary duplication, and mismanagement have had a heyday here.

If Mr. Eisenhower can remedy the situation and lead the way in showing how to improve research and engineering to a point where, once a project is embarked upon, a superior product will emerge, he will make a major contribution. It is in this field that improvements are badly needed. As new weapons become costlier and the time lag from the idea to the finished product becomes more important, basic research in the right direction assumes paramount importance.

Mr. Eisenhower once expressed himself in a forthright way on military economies. He said: "I have seen unwise military cuts before. I have seen the terrible consequences. I am determined to do all I can to see that we do not follow that foolhardy road again." It is to be hoped that he still adheres to that philosophy.—*The St. Louis* Post Dispatch, *November 29, 1958.*

What Means This 'Fully Cooperative'?

UNDER this somewhat euphemistic label the Army and the new National Aeronautics and Space Administration have suppressed, if they have not ended, their intramural scrap over control of the Army Ballistic Missile Agency at Huntsville, Ala. Dr. T. Keith Glennan, head of the civilian NASA, understandably could not wholly conceal his misgivings about the compromise. The arrangement calls for Maj. Gen. John B. Medaris, as head of the Army Ordnance Missile Command, to decide how much of the Huntsville facility's time and staff will be available for civilian research and development. In deciding, he is to be "fully cooperative," but military requirements as he sees them clearly are to have first call. On the other hand, the Army Jet Propulsion Laboratory at Pasadena will be placed under NASA's control, with NASA to decide how much of this facility to release for military work.

This compromise seems to get away from one of the basic concepts of the reorganization of space and missile research undertaken earlier this year—a reorganization that called for choices among military and civilian projects to be made at a higher level, with both sides represented in the decision. Army resistance to NASA's bid for control of the Huntsville agency apparently was so strong that this concept could not be maintained in the vital initial test of the new scheme's workability.

Just how much substance has been lost along with the form of improved administration remains to be seen. For the moment, at least, the most depressing aspect of the affair is President Eisenhower's seeming detachment and evident avoidance of a clean-cut decision. "I am gratified," the Chief Executive felt it sufficient to say, "that the Department of Defense and National Aeronautics and Space Administration have reached agreements. . . ."

Who's running this government, anyway?—*The Washington* Post and Times Herald, *December 5, 1958.*

Time, Money, and Professionalism

The complex job tomorrow's Air Force officers will take on was emphasized pointedly in the recent speech of USAF Vice Chief of Staff, Gen. Curtis LeMay, in his Wright Memorial Lecture delivered to the officers and cadets of the Air Force Academy in mid-December. Excerpts follow:

IN WORLD Wars I and II, time and distance had not yet been compressed into the small capsule they are today. As a result, the small corps of military professionals we had in those days had the time to train amateurs. . . . The situation today—and even more so in the future—will not be the same. Each of us—every officer and every airman must be a professional. When an emergency occurs, there will be no time to train the amateur. Survival will depend upon the professional force we have in being. The initial phase will be the decisive phase. If our equipment . . . skills and . . . leadership are first rate, we will survive and only then.

Another reason we need professionals in the military service today . . . can be simply stated in one word—money. You have undoubtedly heard that approximately fifty cents of every tax dollar goes to national defense. A substantial portion of the total defense budget—many billions of dollars—is spent by the Air Force. This money represents a large share of our national resource, and spending it wisely is a tremendous responsibility. . . .

I cannot emphasize too strongly the critical requirement for first-rate brains and ability in modern weapons engineering, operations, and management. There is no question at all that we are today, and will be in the future, a big business. . . . National security is the Air Force's only product, and in this we are not permitted to have a bad year, nor can our stock ever be allowed to drop. There can be no margin for error in our operations. . . .

We need good decisions. The better trained and more professional Air Force we have, the better will be the decisions that result. This applies equally everywhere . . . wherever men are called upon to reason and decide. Wrong decisions, regardless of how and where they are made, can mean wasted money, squandered time, and perhaps loss of life. And lives, time, and money are precious commodities, to the United States Air Force and to the country.

The Commands that Count

UNDER modern conditions it is impossible, even in time of active war but to a much greater extent in time of "cold war" or peace, to draw a sharp distinction between planning and command. During the second World War, planning decisions were to a considerable extent command decisions, since they established the conditions under which field command would have to work and determined the tools it would have available to work with. With the coming of peace or cold war (whichever term one prefers), planning became an even greater element in command. Under combat conditions the field commanders necessarily make the major decisions; under noncombat conditions, the responsibility necessarily falls to the staffs. The essential questions cease to concern the best utilization of organized troops in the field; they become questions of the adoption of weapon systems, the over-all utilization of manpower, the expansion of the "readiness" of one service at the expense of the "readiness" of another. All these are staff, rather than command, decisions. They are not taken in the heat of battle, but rather in cool calculation of what battle might at some unknown future date require.

Yet they have the effect of command decisions. Those who make or endorse the plans are in effect determining the strategy both for peace and for the opening phases, at least, of a future war; they are giving the commands which really count.

—*From* Arms and the State, (*Twentieth Century Fund, New York, $4*) *by Walter Millis, with Harry C. Mansfield and Harry Stein.*

Answering a Letter from Moscow

What all of us need to understand about the enemy we face is pointed up eloquently in the following excerpts, the first from Gill Robb Wilson's editorial in the December 1958 issue of Flying, *the second from Nikita Khrushchev's remarks to Senator Hubert Humphrey during the legislator's recent visit to Russia.*

THE Washington scene is vastly complicated, continually under heavy pressures from sometimes very worthy interests. But no interest or combination of interests is so fundamental as the stature of the nation itself in relation to the threat of conquest with which it is faced.

We must be first on the new frontiers and far foremost in pioneering the technologies that are the measures of strength or weakness. This requires not only scientific achievement but political integrity, breadth of understanding from the schoolroom to the corridors of statecraft, and intellectual courage in the highest places.

The penalty of failure is war—the murder of civilizations. Unparalleled American strength on the frontiers of the universe is the one power that can thwart war.

• • •

You are lucky we are fighting you economically and not by military means. We now have more A- and H-bombs than we will ever need. We are ready to stop production of new weapons and to dismantle some of those we have.

We have a missile with a range of 14,000 kilometers [about 8,700 miles].

We have a bomb capable of a five-megaton blast which is simple to construct and requires a minimum of fissionable material.

(More Views and Comments on following page)

Are the Soviets Increasing Their Defense Spending?

The terminology of Soviet economists differs from those of the West, and, according to one expert, veiled in the recent Soviet economic forecasts was an indication that the Russians are projecting a sixty percent increase in defense expenditures. Paul W. Ward reported on this in the Baltimore Sun, *December 11, and we reprint his important article here with special permission.*

WHILE the United States government struggles to hold its future outlays close to current levels, the Kremlin is projecting an increase of more than sixty percent in its arms expenditures, Naum Jasny calculated here today.

A Russian-born Washingtonian and one of the world's leading dissectors of Soviet statistics, Jasny based his calculation on the ninety-six-page "theses" about "The Development of the National Economy of the USSR for 1959-65" issued at Moscow in Premier Nikita S. Khrushchev's name twenty-six days ago.

Besides deducing from the document that Soviet military expenditures are "planned to grow" during the next seven years at a rate "somewhat larger" than sixty percent, Jasny said:

"As far as I am aware, this is the first time since the first [1928] five-year plan that at least a hint of Soviet 'defense' expenditures has been included in a document pertaining to a plan of longer duration than one year."

Jasny, a retired Agriculture Department employee whose international standing as a scholar has just been underwritten in an Oxford University publication praising his work, had some trouble making his deductive process clear to persons less well versed than he in the intricacies of Soviet economic theory and practice.

It is a process complicated, in addition, by a problem in translation from Russian to English that appears to have tripped translators of most of the versions of Khrushchev's "theses" published to date in this country.

Their versions quote Khrushchev as saying:

"During the seven-year [1959 to 1965] period consumption will increase by sixty to sixty-three percent." But, according to Jasny's translation, what Khrushchev said was that "during the seven-year period the consumption fund will increase by sixty to sixty-three percent." And, Jasny adds, the difference represented by inclusion of the word "fund" is a major one.

For the phrase "consumption fund" has a very definite meaning in Soviet economies and does not mean "personal consumption," Jasny explains, bulwarking the assertion with citations from such recent Soviet publications as the *Dictionary-Handbook of Social-Economic Statistics* and I. A. Gosulov's *Economic Statistics.*

"Especially since Khrushchev's statement is in the section of his 'theses' on popular well-being, it is easy to be misled into thinking that the consumption fund he spoke of involves personal consumption," Jasny said. "But Khrushchev's statement is in the paragraph devoted to national income, and, in any case, the 'consumption fund' concept is definite in the USSR."

It is one of two components of "national income" in the USSR, the other being the "accumulation fund" and comprising "investment and the change in stocks (i.e., inventories)," Jasny continued.

The "consumption fund," he added, comprises all the other ingredients of "national income" as calculated for Kremlin purposes, including defense expenditures as well as "personal paid-out incomes—administration, education, health services, social insurance, etc."

Stressing, next, that total real wage and real income of workers and peasants includes in Soviet statistical practice the government's outlays for "free," or non-contributory, social services, including schools, family allowances, pensions, and health insurance, Jasny went on to dissect these and administrative expenses out of Khrushchev's data.

"Only the total real wages and total real incomes as well as expenses on administration need be considered in deriving from the scheduled growth of the consumption fund the growth in defense expenditures," he said, adding:

"The total real wage fund represents the bulk of the incomes of the population. It is scheduled in the 'theses' to rise by sixty-nine percent, with the real wage rising by forty percent and the number of earners increasing at the same rate.

"The total real incomes of the *kolkhozniki* (collective farmers) may be assumed to grow by forty percent, too, with income per working person rising forty percent but the number of earners remaining unchanged.

"Assuming also that the incomes of the *kolkhozniki* represent about twenty percent of total personal incomes in the USSR, the latter are to rise by sixty-two percent in seven years according to the data in Khrushchev's 'theses.' One must assume that the income of the rest of the population—men in the armed forces, students, and the like—will grow at the same rate.

"That leaves us with administrative expenses to calculate. These in recent years have been rising only slowly in 'real' terms or even declining, and, while this trend will not necessarily continue, a sharp upturn seems unlikely.

"In any event, administrative expense is a relatively small component of the consumption fund, amounting, according to my calculations, to less than ten percent of the earned income of the Soviet population in 1955, figured at 1926-27 prices.

"Accordingly, the total rise in all components of the consumption fund—except 'defense' expenditures—is likely to be slightly below the scheduled (sixty to sixty-three percent) growth in the consumption fund as a whole. And this obviously implies that the Soviet government's expenditures on 'defense' are planned to grow during the next seven years at a rate somewhat larger than that of the consumption fund."

"In former years," Jasny added, "attempts were made to veil the fact that the consumption funds includes 'defense' and administrative expenses.

"Some of these attempts were equivalent to falsifications. But the subdivision of 'national income' into the consumption fund, equivalent to 'non-productive consumption,' and the accumulation is clear in the Soviet 'dictionary-handbook' and in Gosulov's book.

"Moreover, the 'consumption fund' concept must be known to every reasonably competent person in the USSR. Only in the unlikely case that the 'theses' were written by Khrushchev himself or some other absolutely incompetent person could the term 'consumption fund' be used in the sense of personal incomes only.

"If that has happened in this case, it should be revealed when the control figures for the seven-year plan are themselves made public."—END

CESSNA L-27A

Now on duty to save money for the Air Force

The Cessna L-27A is now on operational duty with the U. S. Air Force. Its speed—the highest speed of any U. S. A. F. light twin transport—and its range and versatility are proving highly valuable in raising administrative mobility.

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WITH THE EDITORS OF AIR FORCE MAGAZINE

SHOOTING THE BREEZE

The march of technology has produced an interesting by-product—the likelihood of bigger—if not better—football and basketball teams for the Air Force Academy, which, incidently, isn't doing too badly right now.

With fewer and fewer future officers expected to have to squeeze into fighter cockpits, the Academy has raised its height limit from six feet, four inches to six feet, six inches, in line with West Point and Annapolis. And the weight ceiling has gone up from 216 to 239 pounds, again the same as Army and four pounds heavier than Navy.

As a much-less-than-20/20 type ourselves, we are heartened by the Academy's new vision requirements. Now a youngster with 20/50 can enter, providing it's correctable to 20/20.

☆

Latest addition to the staff of AIR FORCE/SPACE DIGEST is Navy veteran Frederic M. Philips. Philips comes to us from the London desk of United Press International. His military background includes three years in the Navy with service aboard the carrier *Wasp* during the Korean War, and tours in the Atlantic, the Mediterranean, and the Pacific.

A native New Yorker, he attended public schools in that city, studied at Columbia College and the Pulitzer School of Journalism, Columbia University, emerging with a master of science degree in journalism. He spent two and one-half years with UPI in New York and London.

Philips, who is twenty-seven years old, brought here from London his English bride of ten months.

Philips is the fourth AIR FORCE/SPACE DIGEST staff member from Columbia Journalism, joining Claude Witze, Dick Skinner, and Bill Leavitt. The editor, only non-Columbia male staff member on the strictly editorial side, is beginning to feel outnumbered. Old school ties are strictly *verboten*, as are campus drinking songs and photo albums.

Beautiful girls are a traditional American sales gimmick, and Convair carries on the tradition in its 880 jetliner promotion. The 880 was rolled out for the first time last month. This mockup picture shows off the Dorothy Draper-designed interior of the prototype. The meal looks good, but we prefer the two dishes on either side of the tray.

"Would you mind getting that contraption off the track?"

☆

A Soviet writer, commenting on planning in the welfare state, came up with a typical bourgeois conclusion. Too many planners, he says, citing the case of a cement plant which was not yet completed when plans were made to expand it and increase its production.

☆

We don't know about you, but we were fascinated by the story from Dayton, Ohio, last month, in which it was disclosed that the Air Force has classified all monkey business. The Dayton reporter, we are sure, had tongue in cheek, monkey-like, when she wrote that the public information officers got the shakes every time somebody asked a question about monkeys. The primates, of course, are

used for space experimentation. They take rides in balloons and missiles and tell the aeromedics a lot about how a man will react under similar circumstances.

The big issue isn't secrecy about monkeys and how they train for spaceflight. The big issue is the professional animal lovers, like the anti-vivisectionists and the Society for the Prevention of Cruelty to Animals. The blunt truth is, these people go mad every time a squirrel monkey or a little Russian dog—was it Laika?—gets hurled toward the stars.

It might as well be here that we tell you about our own organization. It's called the American Society for the Prevention of Cruelty to People. We are opposed to neighborhood mongrels who push the citizenry around, bite people in the leg, desecrate their property, besmirch their cabbages, and the like.

We feel pretty strongly about this, and we feel just as strongly that monkeys are the best thing to send into space in 1959. We think USAF should take the same attitude.

☆

Our man in the Patent Office reports, gratuitously, that there's a Pat. Pending on a new bourbon, to be called "Outer Space." We know a few bourbon drinkers who have been out of this world for years.

☆

Reunion upcoming: Dale W. Smiley writes us that anyone interested in holding a reunion of the 51st Fighter-Interceptor Wing, commanded in Korea by Col. Francis S. Gabreski during 1951-52, should contact Smiley at the following address: **Capt. Dale W. Smiley, 4022 Mound Pass, Fort Wayne, Ind.**

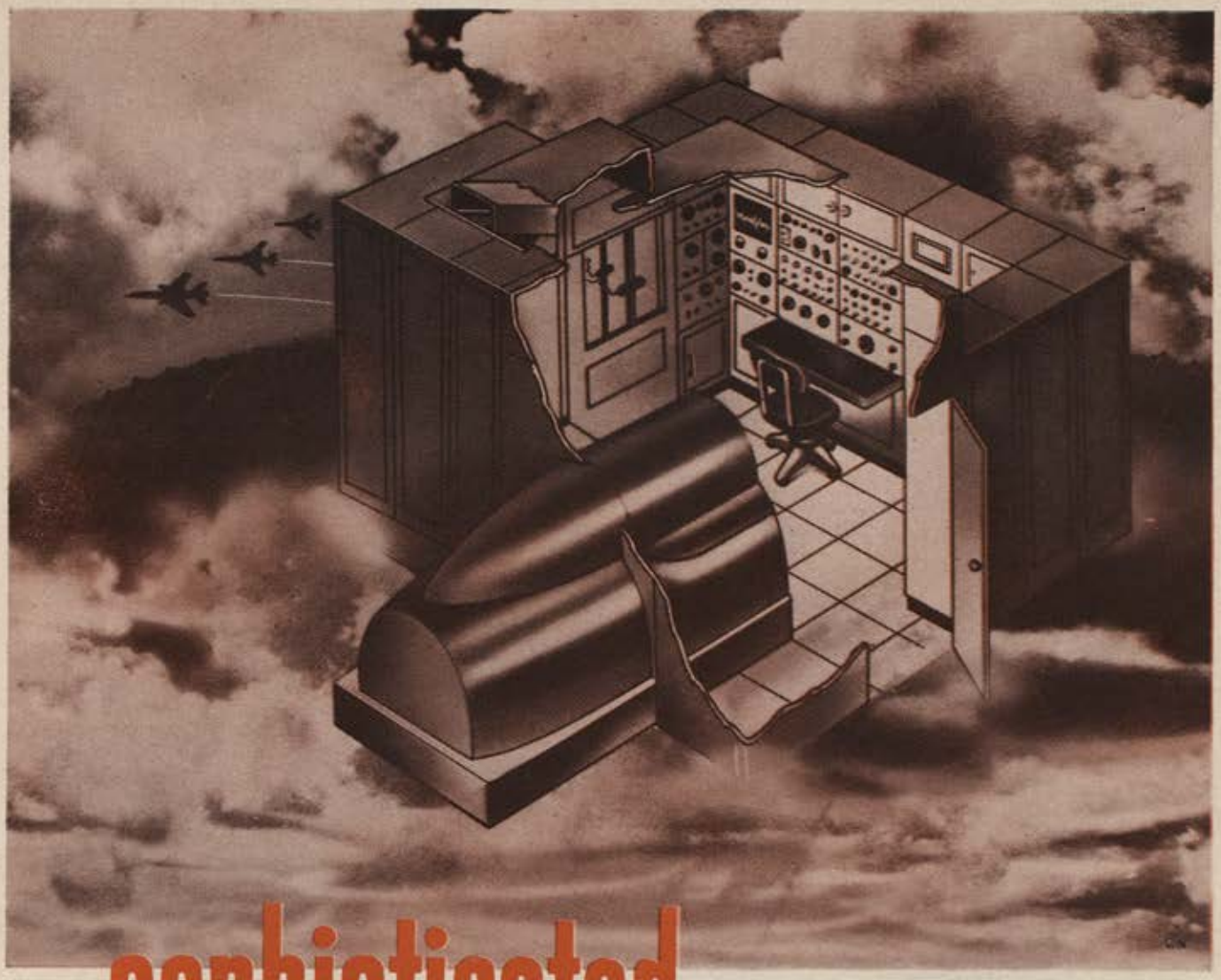
The plans are to hold the reunion in conjunction with AFA's 1959 Convention, September 3-6 at Miami Beach, Fla.

☆

It is reported that a Kremlin underling, when called on the carpet and asked why an order had not been properly executed saluted snappily and said: "Beats the hell out of me, Lieutenant. I'm not the regular Khrushchev."

☆

Among those on the roster of the Ground Observer Corps (*see page 120*) was ninety-year-old John Nance "Cactus Jack" Garner, twice Vice President under Franklin D. Roosevelt. Mr. Garner's reason for serving: "The least I can do is help keep my country what it is."—END



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AIR FORCE
JANUARY 1959

Now that we have supersonic aircraft flying essential training missions, the entire nation must start . . .

Learning to live with The SONIC BOOM

Claude Witze
SENIOR EDITOR

IF YOU'VE never heard a sonic boom, it won't be long before you do. And you won't have to visit an air show or live close by an air base. It may awaken you from your sleep, it may set the dishes jumping in the cupboard at any hour of the day or night no matter where you might live.

For the sonic boom has grown up. It's no longer an isolated phenomenon, a stunt performed by a diving fighter pilot to impress a crowd. The boom is becoming part and parcel of the day-to-day operations of the Air Force, an inescapable element of straight-and-level flight at supersonic speeds.

The isolated, one-shot boom has become a corridor of concussion, a noisy nuisance, but one that is essential to our nation's survival. It is unavoidable, and we must learn to understand and accept it just as we accept the rattle of street cars, the roar of trains and trucks across the countryside. We must learn to live with it for in today's unsettled world we cannot live without it.

The sonic boom, loud enough to rouse an average sleeper or scare an average baby, is going to shake some of America's biggest cities with no respect or consideration for the hour, the day, or the physical condition of man or beast.

But, except in rare cases, it will only assault your eardrums. It isn't going to crack the plaster or start any earthquakes. It may break a few windows. And that will be about all.

These are the blunt facts of life in the supersonic age, and the military services, particularly the Air Force, are confident that the American people will not complain if they know these facts.

The sonic boom problem basically is one of public understanding, with legal overtones when it is suspected or proven that property damage was caused by military aircraft.

At the outset, in the days of slower aircraft, it was possible to go faster than sound by diving a fighter plane, such as the North American F-86, and directing the boom at an air show crowd or the wastes of a desert. That was the point where the boom was a curiosity, one that got out of bounds from time to time and smashed some windows. The public got the general idea that the boom was created as a single clap of thunder when the pilot passed through the heavily publicized "barrier" that faced him when he reached Mach 1, or the speed of sound. It was commonly believed that this was the end of the noise,

(Continued on following page)

Transient sonic boom, left, is created by aircraft in dive, can be "aimed" by the pilot, who falls back to subsonic speed as he pulls up from earth's surface. Continuous sonic boom, right, actually is two shock waves dragged across the land. Width of the path along which the noise will be heard varies from a few miles to about 200 miles, depending on the size and speed of the plane, altitude, temperature, wind, humidity, and other factors. The world's best Air Force cannot maintain its supersonic capability unless it flies at supersonic speeds on practice missions.

that it would be heard again only if the plane slowed down to less than Mach 1 and then broke the barrier again.

The full truth is that an aircraft capable of supersonic speed in straight-and-level flight creates a continuous sonic boom, a sound that is not a single snap, but a roar that crosses the country like the opening of a zipper. It follows the flight path of the aircraft; if it were visible it would look like a cone; in fact, like *two* cones. One of them has its apex at the nose of the plane, the other at the tail. The cones are shock waves that travel to the ground at the speed of sound (about 762 mph). As each wave moves it is robbed of energy by friction of the air, a friction that is affected by temperature and humidity and such physical stumbling blocks as mountains or clouds. When the shock hits the earth, the wave is further obstructed by trees, buildings, cars, people, rose bushes, and outdoor movie screens.

The two shock cones are so close they almost always sound like a single clap of thunder. If they were real claps of thunder they would impose a pressure of about one-half pound on each square foot of the earth or the obstacles in the way.

What is the pressure from a sonic boom?

Not more than five pounds a square foot, ten times that of a thunder clap or five times the noise created in a boiler factory.

There is no doubt about it—this is noise enough to produce a public reaction, particularly if there is no understanding of how it was caused and why it is necessary. But the altitude of the plane, upward of 35,000 feet, and the loss of energy that muffles the shock on the way down will keep the pressure below the five-pound level. (These figures in pounds per square foot are all, of course, in addition to normal atmospheric pressure).

This means the boom is not strong enough to inflict structural damage on the flimsiest chicken coop. Tests have shown that it takes a pressure of seventy or more pounds to damage ground buildings. In fact, tests with nuclear explosions have shown that it takes 150 to 300 pounds a square foot to damage brick or frame building construction.

The strongest sonic boom pressure ever recorded was thirty-three pounds per square foot, measured on a mountain top, with the aircraft only 280 feet away.

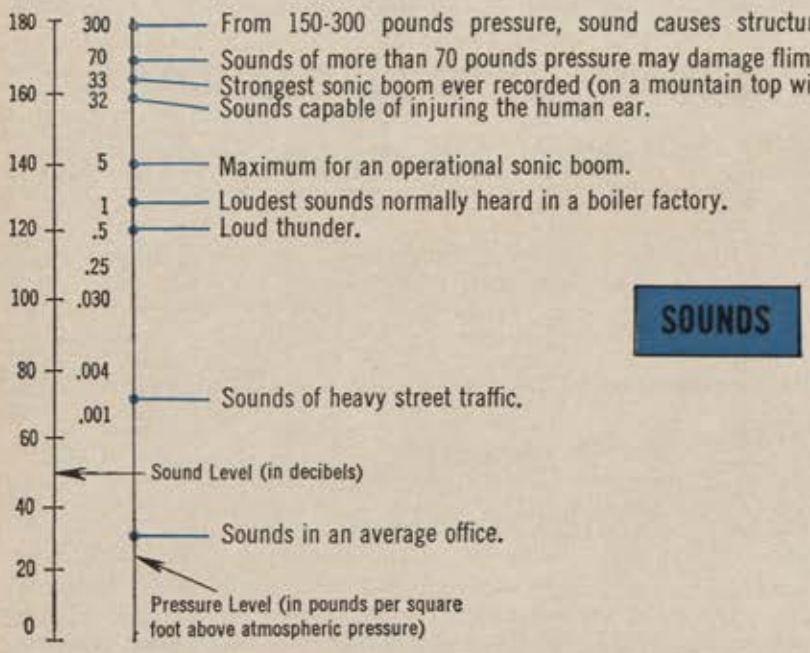
But when people hear a noise that is roughly ten times as loud as a thunderclap they immediately start looking for damage, and USAF's legal officers are faced with claims.

It is essential, under existing law, that USAF be concerned only with damage honestly caused by its own planes. In an area such as southern California, where as many as ninety supersonic aircraft may be in the air at a given time, this leads to serious complications, and conflicts. Those that are not USAF's responsibility most certainly were sent on missions by the Navy or the local aircraft manufacturers. The Air Force, then, must—to stay within the law—have no doubt that a USAF airplane caused damage.

Under existing law, claims must be settled by the perpetrator, USAF, Navy, or manufacturer. But it is difficult in some cases to identify the airplane that broke a window.

Last year a bill was offered in the House of Representatives that would authorize the Department of Defense to pay damages resulting from glass breakage caused by noncombat military operations, regardless of which service was responsible. The bill died in committee but is expected to be proposed again in the Eighty-sixth Congress. The bill is supported by USAF.

The Air Force has a general policy that is followed in facing demands for payment:



Here sound is described in terms of two common yardsticks: decibels (left scale) and pressure level (right scale). Tests show that noise does not get objectionable until it exceeds 128 decibels or about 1 lb. pressure. This is the boiler-factory level, and many sonic booms will exceed it. But a great many sonic booms resulting from routine USAF operations will not hit the maximum of 140 decibels or 5 lbs. pressure indicated on the chart. However, the crack of sonic booms will run as high as ten times the noise made by loud thunder. Somewhere between 3 and 10 lbs. of pressure, 138 to 148 decibels, large plate-glass windows will break, mainly because of flaws in the glass or stresses induced when it was installed. It takes more than 10 lbs. of pressure, upward to 148 decibels, to damage small glass panes.

• Plate and window glass may be broken by sonic shock waves. A substantial percentage of all window panes have internal stresses left there in manufacture or imposed when the glass was mounted in the frame.

• Light bric-a-brac may be shaken or vibrated from shelves.

• Loosely latched doors may be pushed open and damaged.

• There is a possibility of aggravation of existing plaster cracks only when extensive damage is present. Without extensive glass breakage, aggravation of existing plaster cracks is unlikely.

• Structural damage to foundations and load-bearing walls is practically impossible.

• No sonic boom pressure is strong enough to injure a person.

For a long time, with only a few aircraft capable of creating this kind of public distress, the Air Force managed to minimize the disturbance. A system of close control over flight plans and altitudes, avoidance of heavily populated areas, and a curb on speed have doubtless reduced some of the public reaction, but the flood of complaints still is rising fast.

The day is here, in 1959, when the sonic boom will become a part of our lives. It is a problem that no longer can be alleviated by the operations officer of a fighter or bomber wing.

The advent of Mach 2 aircraft in USAF and Navy operational inventories, on top of slower but still supersonic jet interceptors and bombers, will make such controls impossible. These aircraft create sonic booms in level flight, a *continuous* noise, following the entire flight path.

For the Air Force the problem first started to get critical in the New England area when Lockheed F-104 interceptors were made operational at Westover AFB, in Massachusetts. Following a strict flight pattern, laid out to avoid major cities in that area, the '104s have been operating out of a corridor that cuts over southern Vermont.

The public reaction included a flood of complaints. They were received by everyone from the local police to President Eisenhower, with the emphasis on that favorite whipping boy of the taxpaying voter—the congressman.

There are other areas: central Ohio, the St. Louis region, central Texas, and southern California. All of them involve military bases and aircraft manufacturing plants.

With all due respect to the residents of Vermont, who were introduced to the boom with a small, fast Air Defense Command interceptor, the biggest problem facing USAF in early 1959 is the Convair B-58 Hustler, our first supersonic bomber. Texans already know a bit about this bird, and most of them have learned to accept it, but there are times when it must fly over the rest of the country and when it does it leaves a path of aroused citizenry.

So far, the B-58's sins against the countryside have been minor, a disturbance created at irregular intervals by test pilots. Before this year is over, however, the airplane will be operational with the Strategic Air Command and flying regular practice missions all over the United States.

About thirty cities, many of them major metropolitan areas, will be used as targets in simulated bombing raids carried out at supersonic speeds. The cities will be chosen for excellent reasons that have to do with their terrain and climate and the physical characteristics of major structures, rivers, harbors, and the like.

It will not always be the same thirty cities. In each practice target area there will be installed a Radar Bomb-Scoring Site. The sites will be moved from city to city as SAC exercises necessitate.

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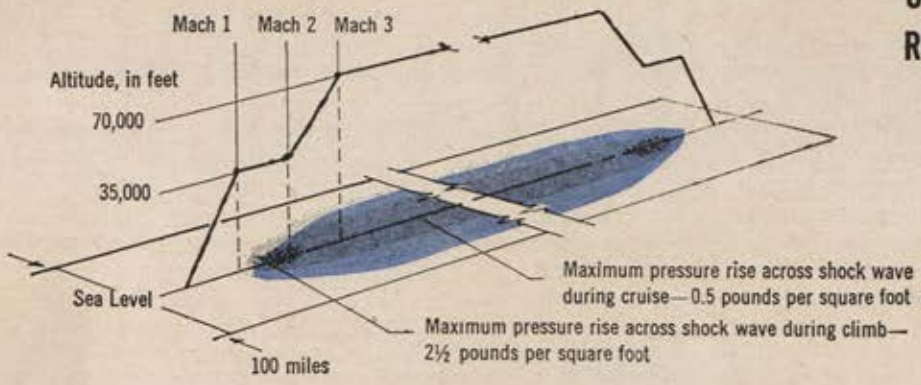


Cross Country Flight Plan to Reduce Noise, Mach 3 Aircraft

Here, in chart prepared by NASA, experts suggest that supersonic airliners of the future stay below speed of sound until they get 35,000 ft. of altitude, then go to 70,000 ft. before hitting Mach 3 or three times the speed of sound. This will reduce the pressure created to 2½ lbs. per square foot during climb and descent, with maximum of 0.5 lbs. during cruise. NASA says noise can be cut very little by altering supersonic plane's design.

In most cases there will be ample notice to the public, via newspapers and radio, of impending exercises. The residents will be told approximately when missions will be flown and assured that the noise will be no more than a short nuisance, not a menace to lives and property.

There will be other missions that come by surprise. These will be instigated by SAC Operational Readiness Inspection Teams who will send B-58 units out in realistic tests of their capability to respond to a sudden call for action. The surprise raids will be rare, but they will have major US cities as their targets.

The Air Force has had a few samples of what will happen if the B-58 carries out its supersonic mission without benefit of an advance community billing. There was a case last October in Milwaukee. It was a clear, cool night, the kind when the atmosphere greases the transmission of sound shock waves. Despite the fact that the aircraft was more than 50,000 feet in the air, it aroused a substantial part of the city and stimulated a flood of letters and editorial comment.

In another instance, a B-58 carried out a highly classified mission that originated in Florida, went up through the north central states, then south to terminate in Texas. Out of the fifty to seventy-odd complaints received by the Air Force that month from congressional offices, the USAF legislative liaison staff was able to trace almost the exact path of the B-58 over its entire supersonic flight.

Don't get the idea that the boom problem is going to remain forever the charge of men in uniform. The nation's airlines are giving it more and more attention as the transport designers turn from their first subsonic jets to the idea of a Mach 2 or Mach 3 passenger liner.

The National Aeronautics and Space Administration is conducting research on the problem. It is trying to find some way to eliminate the continuous sonic boom in the design characteristic of the transport. Currently, there is no hope of a solution. NASA has told the airlines—and the manufacturers—that the continuous boom will be created during the major portion of their flight plans with supersonic transports. The problem will be greatest during climb-out and descent to and from altitudes as high as 70,000 feet. At that height, NASA figures show, a Mach 3 aircraft would create a shock wave that could be heard, under optimum conditions, along a path that is 200 miles wide.

The airline problem, however, is several years in the future. The military problem is here today.

In recent years, USAF records show, most of the people made unhappy to one degree or another by sonic booms have assumed that they are not necessary. Probably because of the way they were introduced to the subject, with air show demonstrations and newspaper charts showing aircraft in a steep dive, they believe sonic booms are caused by aerial hot-rodders and clowns in cockpits.

Sonic booms are characteristic of supersonic missions flown for serious reasons. They are unavoidable. They are the Sound of Security.—END

Some Public Reverberations Are Louder Than Sonic Booms

The sonic boom is an old bugaboo to USAF installations, many of which have learned that there will be fewer public reverberations as the public is told what to expect. It's another case where secrecy is a mistake; the way to win approval is to tell the citizens what's going on around here.

They do this at Wright Air Development Center, for example. Not many months ago press and radio told residents in the area of Richmond, Ind., that WADC test pilots were going to create some sonic booms between certain hours on a given date. The only complaint received after this advance notice was from a lady who wrote in to say she was terribly disappointed. She listened all afternoon but heard no smashing of the sound barrier. Had something gone wrong with the test program?

Or, an office wag suggests, "When are you gonna drop the other shoe?"

There are scores of less amusing cases in USAF, congressional, and White House files.

One is the case of the rural resident who complained that the sonic boom had driven all the muskrats out of a neighboring swamp, thus ending his lucrative trapping business.

And the California resident who claims sonic booms over the Pacific started an earthquake that cracked his expensive swimming pool.

The state of New Hampshire has written to Washington, expressing concern about the "Old Man of the Mountain" profile at Franconia Notch State Park. The state fears it will be damaged by passing interceptors.

In another state, Maryland, the legislature has passed a resolution urging the Air Force and Navy to avoid breaking the sound barrier over Delmarva Peninsula, favorite home of chicken raisers.—END

HOW THE NEW JOINT STAFF IS ORGANIZED

ON THE next two pages AIR FORCE provides a Photochart of the organization of the new Joint Staff, now in its first month of operation at the Pentagon. The staff was created to carry out the intent of Congress and President Eisenhower as expressed in the Defense Department Reorganization Act of 1958.

As this magazine pointed out last month (*"How Sharp the New Sword?", page 41*), the Reorganization Act is a good thing because it is a step in the right direction, but it is not going to make unification a reality. There are a lot of questions already being raised by men who are skeptical to one degree or another, but it is far too early to pass judgment on the setup. First we must find out how it works—a test that will come in the next several months.

We must keep in mind at all times that the Secretary of Defense now presumably has "clear and direct" authority. This means he is the key man, and a great deal of our defense welfare depends on how well he does his job. This was foreseen on Capitol Hill when the bill was

under debate. Defense Secretary Neil H. McElroy was told that some congressmen did not question his ability and integrity, but they certainly had reservations about his successors, sight unseen.

Mr. McElroy also has a bevy of Assistant Secretaries of Defense, or vice presidents of his big organization. Under the new law these gentlemen are going to find it a little less easy to swing out of the policy-making role and start telling generals and admirals how to do their jobs. They now will be empowered to issue orders to a military department only if their boss has delegated specific authority in a specific area, and it must be in writing. They also have to issue all these orders through a service Secretary.

As one of the top witnesses pointed out during last year's hearings, if everybody knows Mr. McElroy is the boss, his vice presidents will share his responsibility, and he soon will fire men who don't carry out his orders.

With this kind of an intent, Gen. Nathan F. Twining, the JCS Chairman, now presumably heads a military organization capable of better military planning, faster decision making, and speedier compliance with orders. On the next two pages you will find photos of the top men in his staff of about 400 officers.—END

ORGANIZATION OF THE JOINT STAFF

The Joint Chiefs of Staff

Gen. Maxwell D. Taylor, USA

Adm. Arleigh A. Burke, USN

Chairman Gen. Nathan F. Twining, USAF

Gen. Thomas D. White, USAF

Gen. Randolph McC. Pate, USMC

Secretary, Joint Chiefs of Staff Brig. Gen. Harry L. Hillyard, USA

Director, Joint Staff Lt. Gen. Oliver S. Picher, USAF

Deputy Director, Joint Staff Rear Adm. Joseph H. Wellings, USN

OFFICE SPECIAL ASSISTANT TO THE JCS FOR NSC AFFAIRS

Rear Adm. Charles O. Triebel, USN

JOINT MILITARY ASSISTANCE AFFAIRS DIRECTORATE

Director Rear Adm. Joshua W. Cooper, USN

Western Hemisphere Branch
Far East Branch
Mid East & African Branch
European Branch

Director Brig. Gen. Jack N. Donohew, USAF

JOINT PROGRAMS OFFICE

JOINT ADVANCED STUDY GROUP

Col. Louis A. Ennis, USMC

Col. Robert E. Kirtley, USAF

Col. Herbert I. Stern, USA

Capt. Marcus L. Lowe, Jr., USN

J-1 PERSONNEL DIRECTORATE

Director Maj. Gen. George O. N. Lodoen, USA

Plans & Personnel Division Col. John F. Dunlap, USMC

Plans Branch
Management & Assignment Branch

Manpower & Management Division Col. Owen G. Birtwistle, USAF

Manpower Branch
Operations Branch

J-2 INTELLIGENCE DIRECTORATE

Director Maj. Gen. Robert A. Breitweiser, USAF

J-3 OPERATIONS DIRECTORATE

Director Rear Adm. Frank O'Beirne, USN

Plans & Programs Division Col. Eads G. Hardway, USA

Long-Range Plans Branch
Current Plans Branch
Programs Branch
Special Projects Branch

J-4 LOGISTICS DIRECTORATE

Director Maj. Gen. George O. N. Lodoen, USA

Theaters Division Capt. James H. Howard, USN

European Branch
Pacific Branch
Western Hemisphere Branch

J-5 PLANS & POLICY DIRECTORATE

Director Maj. Gen. Douglas V. Johnson, USA

Electronics Systems Division Col. Ira F. Stinson, USAF

Navigation Branch
Surveillance Branch

J-6 COMMUNICATIONS ELECTRONICS DIRECTORATE

Director Maj. Gen. James Dreyfus, USA

Communications System Division Col. Robert F. Frost, USAF

Circuit Engineering Branch
Operating Requirements Branch

Systems Support Division Capt. Theodore A. Torgerson, USN

Frequency Coordination Branch
Standards Branch
Procedures & Publications Branch

An AIR FORCE Magazine Photochart (December 15, 1958)

Plans & Policies Division
Capt. Ray E. Malpass, USN

Plans & Policy Branch
Security Branch
Photo & Survey Branch
Joint Intelligence Objectives Agency

Current Intelligence Division
Col. Felix M. Rogers, USAF

Current Intelligence Branch
Special Security Office, JCS-OSD

Estimates Division
Col. Hugh D. Wallace, USAF

Estimates Board
Estimates Branch
Technical Intelligence Branch
Collection & Dissemination Branch

European Command Division
Col. James W. Totten, USA

Western Europe Branch
Southern Europe Branch
U. K. and Northern Europe Branch

Pacific Command Division
Capt. Carlton B. Jones, USN

Pacific Branch
Far East Branch
Southeast Asia Branch

Middle East Division
Col. Thomas G. Roe, USMC (Acting)

Mediterranean Branch
Middle East Branch

Atlantic Command/ Caribbean Command Division
Capt. Bernard F. McMahon, USN

Atlantic Command Branch
Caribbean Command Branch

North American Alaskan Command Division
Col. Eugene L. Strickland, USAF

Alaskan Command Branch
CONAD-NORAD Branch
North American Branch

Long-Range Atomic Operations Division
Col. Sherman F. Martin, USAF (Acting)

SAC Branch
Atomic Operations Branch

Joint War Room & Joint War Room Annex

Capt. George C. Seay, USN

Lt. Col. John J. Pidgeon, USA

Col. Lester L. Krause, Jr. USAF

Transportation Division
Capt. Clifton Iverson, USN

Plans Branch
Operations Branch

Requirements & Capabilities Division
Col. Fred D. Stevers, USAF

Material Branch
Installations Branch
Petroleum Branch
Services Branch

Deputy Director
Col. Ralph E. Haines, Jr., USA

Plans Division

Short-Range Branch
Mid-Range Branch
Long-Range Branch
Mobilization Branch
International Plans Branch
Air Defense Branch

Deputy Director
Brig. Gen. Lewis J. Fields, USMC

Policy Division

Command-Functions & Organization Branch
Atomic Energy & Guided Missiles Branch
International Policy Branch
Regional Organization Branch
Research & Development Branch

Subsidiary Activities Division
Brig. Gen. Millard C. Young, USAF

Unconventional Warfare Branch
Information Branch
Psychological Operations Branch
Operations Coordinating Board Branch
Special Plans & Operations Branch

Security & Electronic Warfare Division
Col. Norman L. Tittle, USA

Security Branch
Electronic Warfare Branch

Plans & Policy Division
Col. Steven S. Cerwin, USA

Plans Branch
Policy Branch
Programs Branch

International Liaison Group

Capt. Richard R. Hay, USN

Col. Wesley C. Franklin, USA

A LOOK AT USAF's HEAD SHED

A camera glimpse of "E" Ring at the Pentagon shows how USAF's top generals keep house; each man's office fittings reflect his pet interests, his capabilities, claim to fame

Top Air Force decisions are made in this conference alcove opposite desk occupied by Gen. Thomas D. White, Chief of Staff. Potted plants, leather-covered furniture do not detract from the businesslike atmosphere of his office.

THIS is "E" Ring on the fourth floor of the Pentagon, over the River Entrance. The rooms off this hall, between the corridors numbered 8 and 9, are known to every member of the Air Force, but seldom seen by many of them. It is a place designated Hdqtrs USAF *on quick military documents, where decisions affecting millions of lives and billions of dollars are made almost every day. It is the top control center of what America and the free world hope is the strongest deterrent to war. The men who work here, for all their military experience and devotion to the job of keeping us free, carry on their task in a businesslike atmosphere, not unlike that found in the front office of a big corporation. Yet each office also is a personality.*—END

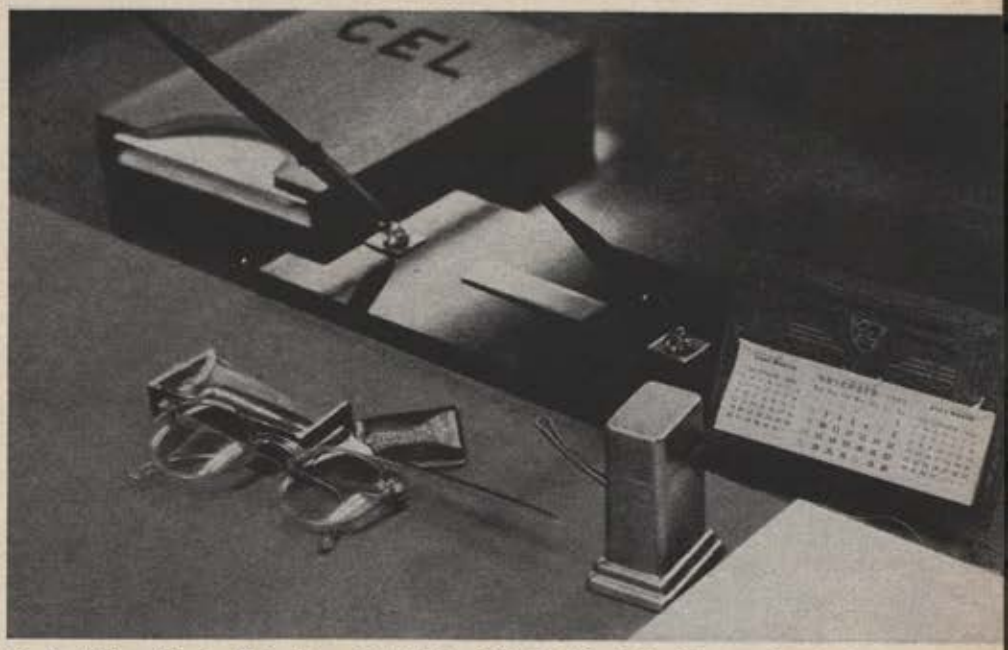
General White can swing chair to the left, face impressive battery of lines to every major USAF command. The telephone on the shelf, lower left, is a direct line to James H. Douglas, Secretary of the Air Force, who has his own office a few doors down the hall. The large interphone on top of the table is the general's "squawk box" over which he can speak directly with officers of the Air Staff. Window on the left faces Washington, across the Potomac.

Coffee table in General White's office holds these two winged horses, obvious versions of the famed Pegasus. They were presented to the general by the Italian Air Force (left) and the Royal Thai Air Force as tokens of esteem.

The Chief of Staff's bookshelf. At the left, *The Howitzer*, West Point's yearbook. Other volumes show a vital interest in Soviet Russia. Eighth in the row is titled "How to Get Ahead in the Air Force," shows little wear.

This is where the orders come from, behind these doors. Hall showcase contains models of USAF's current weapons.

General LeMay's office door usually stands open. Against far wall stands Harmon Trophy, awarded in 1958 for record jet flights to South America.



Desk of Gen. Curtis E. LeMay, USAF Vice Chief of Staff, holds matches, lighter, letter-opener, and eyeglasses, waiting for his return from visit to the field. Paper box with his initials was gift from his staff at Strategic Air Command.

The Vice Chief's signature, carved from wood, was presented by an admirer in Puerto Rico. The hand-carved box for his cigars, also a gift, will be opened many times each working day.

These pictures were moved to the Pentagon by General LeMay from SAC. Flanked by Napoleon's and Hitler's retreats from Moscow is a favorite quotation from Winston Churchill: "For good or ill, air mastery is today the supreme expression of military power, and fleets and armies, however necessary, must accept a subordinate rank. This is a memorable milestone in the march of man."

With her defense becoming increasingly geared to missiles, here's . . .

A Look at BRITAIN'S MISSILE

THE British guided weapons program, started later than guided weapon development in the United States, now shows concrete achievement. Two defensive weapons have recently entered service with the Royal Air Force, and one of these with the Royal Navy as well, while development is going ahead on Britain's first ballistic bombardment weapon.

Until this weapon, Blue Streak, is ready, the Douglas Thor is equipping the strategic missile elements of the RAF, in line with the Bermuda agreement concluded by President Eisenhower and Britain's Prime Minister Macmillan last February.

The first clear indication of the British government's policy with regard to missiles came last March with the publication of the 1957 Defense White Paper. This White Paper, published every spring, is a brief statement of the government's future intentions regarding the armed services. The 1957 Paper told of a breakaway from previous defense thinking—a breakaway which was confirmed by the 1958 publication.

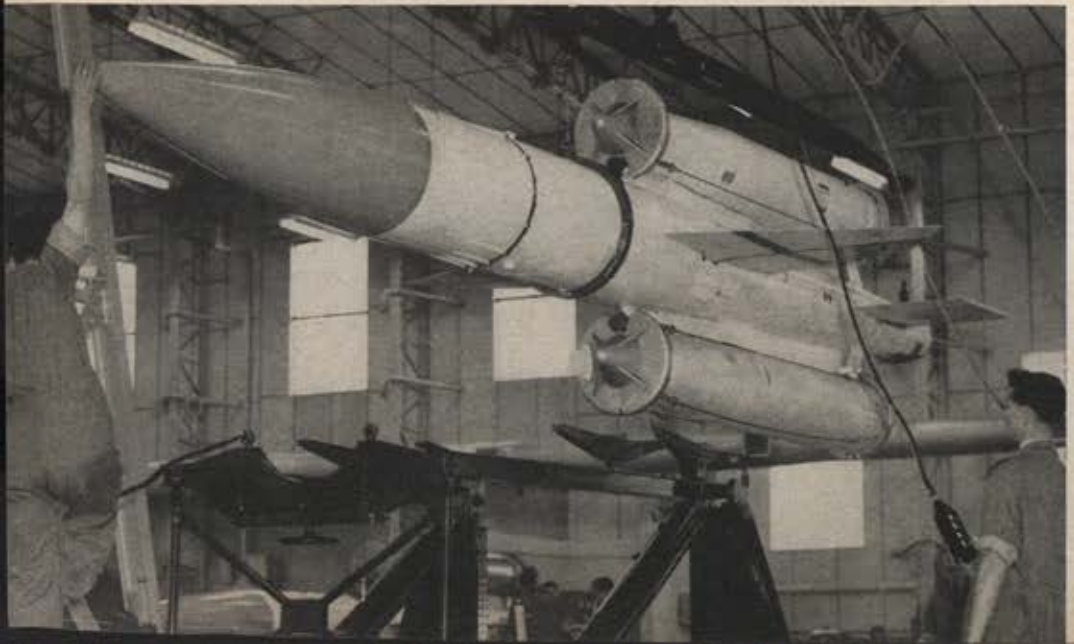
For the first time the impossibility of adequately defending British cities from nuclear attack was publicly admitted. The primary purpose of the air defenses was stated to be the defense of the strategic bomber bases of the RAF V-force, which at that time was just beginning to amount to a powerful deterrent threat. Air defenses, by implication, became themselves part of the deterrent, for their sole purpose is to give the bombers time to get off the ground to deliver the nuclear retaliation.

Here was a frank admission that in a nuclear war there can be no winner. Coupled with the emphasis on the nuclear deterrent was a rundown of the conventional forces, the abolition of conscription by 1960, and general defense economies.

One of these economies, hotly contested at the time, was the cancellation of a successor to the V-bombers, a supersonic bomber that was under development by A. V. Roe. The government felt that by the time this bomber could be in service, ballistic weapons would render manned bombers obsolete. Similarly, the English Electric Lightning, a supersonic mixed-power interceptor, was said to be the RAF's last manned fighter. Since these decisions were made, there has been much evidence of renewed thinking and service pressure to be allowed further supersonic, missile-carrying aircraft for both offense and defense.

Surface-to-air and air-to-air weapons are the first in service with the RAF. The Bristol Bloodhound is the standard surface-to-air missile and is now operational at the first guided missile location at North Coates, Lincolnshire, on England's east coast. In accordance with the official doctrine that defense of the V-bomber and ballistic missile sites is all that is possible, no antiaircraft missile sites are being built around major cities, as is being done in the United States.

The Bloodhound—like the USAF's Bomarc—is powered by two ramjets.



Above, Sting Ray target-illuminating radar, with missiles at ready beyond.

Left, Bloodhound air defense missile being assembled at North Coates site.

PROGRAM

Robert R. Rodwell

The Bristol/Ferranti surface-to-air Bloodhound missile with launcher at the North Coates, Lincolnshire, RAF Station site, first of a series of such bases.

It is a semiactive homing missile, accelerated to ramjet ignition speed by four solid-fuel boosters. It homes onto the reflected echoes of a pencil beam, target-illuminating radar, known as Sting Ray, which is itself alerted and beamed onto the target by a volumetric tactical radar. The first version of the Bloodhound has a reported speed of Mach 2.5, a ceiling above 60,000 feet, and a slant range of about forty miles. Primary contractor for its development was Bristol—responsible for airframe, Thor ramjets, and the solid boosters. Ferranti handled the guidance.

Bloodhound first reached the hands of the RAF in the summer of 1957, and since then intensive trials have brought it to operational readiness. It is operational in the sense that North Coates could fit immediately into the air defense network if the need arose. Service trials are currently running. These produce the kind of information that can only be gained in months of experience. Maintenance schedules are being drawn up, the effects of deterioration on missiles left for long periods on their launchers are being determined, and the best methods of integration of manned and unmanned interceptors are being evolved. The first air defense missile squadron was formally activated on December 1, 1958.

The present layout at North Coates is for three squadrons, each with sixteen launchers. This numerical breakdown may not be the final one for Bloodhound stations and may be modified in the light of lessons learned at North Coates. It does seem, though, that three squadrons will go to make up a standard missile wing.

Each wing will have a tactical operations room. The writer visited one of these a few weeks ago and was able to appreciate the high automaticity of the Bloodhound weapon

(Continued on following page)

system. Targets are initially allotted to the tactical operations room by the master early-warning control centers. Normally targets would be those raiders that evaded the outer, manned-fighter screen. Bloodhound mounts the inner defensive shield.

The controller, who is in ultimate charge, sits in the center of the first of three rows of radar consoles, arranged in steps facing a large electronic "tote" board across the front wall. He has before him a synthetic picture of the early-warning situation, relayed by microwave link, and has his own tactical radar picture. As targets are allotted by the master center, he passes these to the track allocator, who has the same two radar pictures before him. The track allocator does the initial tracking of targets, gives each a distinctive indicator mark on the radar scope, and feeds the target number and primary information on it into an electronic store. This information is reproduced, by means of colored light symbols, on the tote board.

From the track allocator individual targets are passed to the weapon-control teams, seated in the center rank of consoles. There is one such team for each missile squadron. These teams comprise a target-selection officer, two trackers, and a height operator, who determines altitude information from the height-finder element of the volumetric radar. All these people have the tactical radar picture before them.

Tracking information is fed to store, and the target-selection officer decides when the time is ripe to alert one or both of the missile sections (eight launchers each) under his control. He directs one of his two target-illuminating radars to accept the target, and receives a "target-engaged" signal when its pencil beam is locked on.

In the launching-control post, out by the squadron area, one of the two launching operators is bringing missiles to firing readiness. He indicates back to the operations room when the weapons are ready to fire, and the target-selection officer will give the "free to fire" signal. During this time the launcher of the selected missile, or missiles, will be swinging, following the radar bearing of the target as this is tracked by the Sting Ray illuminating radar.

When the missile is fired and the target destroyed, an indication to this effect appears on the tote board, and the electronic store channel is cleared, ready to accept information on another target. The target-selection officer can at any time interrupt or break off this sequence, or destroy the missile in flight if there is a necessity to do so.

Each missile squadron has two Sting Rays, one to each missile section and so can engage two targets simultaneously. Freedom from jamming is obtained by varying the frequencies and pulse rates of the individual Sting Rays, thus presenting an almost infinite number of combinations which raiders would have to jam. Each Bloodhound carries two receivers. The rear receiver is locked to the characteristics of its parent Sting Ray and in turn keeps the forward, homing echo receiver in tune. In this way the Bloodhound is kept from wandering onto the echoes of any other radar but its parent.

Space does not allow a full description of the structure or the development history. Suffice to say that Bristol began thinking about antiaircraft missiles in the summer of 1949, but when the development order was placed has not been revealed. Control is by means of pivoting wings, which give twist-and-steer control. Moved differentially, they roll the missile until the wings are at right angles to the line of intended maneuver. Then the missile is steered by movement of the wings in unison, which pitches the missile onto the desired course. This is nature's way: All birds and almost all fish steer their courses by something of the same method. The tailplane is fixed. Bloodhound is fired at a fixed elevation of forty-five degrees, with its wings locked, and adopts the correct interception climb after it has been accelerated to about Mach 1.6 by the boosters, the ramjets have ignited, and the boosters dropped away.

Bloodhound is the first British guided weapon to be ordered by a foreign country. The customer is Sweden, and the contract was signed last September. Sweden is outside NATO, but unofficially cooperates with NATO forces. Certainly the Soviets seem to regard the Swedes with some respect, if one is to judge by the 250 tactical missile sites which AIR FORCE has reported the Russians have aimed against them.

Another semiactive homing antiaircraft missile—the English Electric Thunderbird—was the subject of orders placed by both the British Army and the RAF in 1957. Thunderbird is complementary to Bloodhound and operates with the same Sting Ray radars. It is a fully mobile system, and its trailer-mounted launchers can be erected by trained teams in a few minutes. Bloodhound is semimobile but does require some fixed installations. The Army first ordered Thunderbird for key point defense in the field, and the RAF followed with an order in September 1957.

Presumably the RAF intends Thunderbird for deployment overseas, for the defense of individual bases.

Early test models of Thunderbird were liquid fueled, but the change to a solid sustainer was made midway through development to make operations in the field more practicable. Recent improvements in the specific impulses of solid fuels are said to have increased Thunderbird's range by thirty percent.

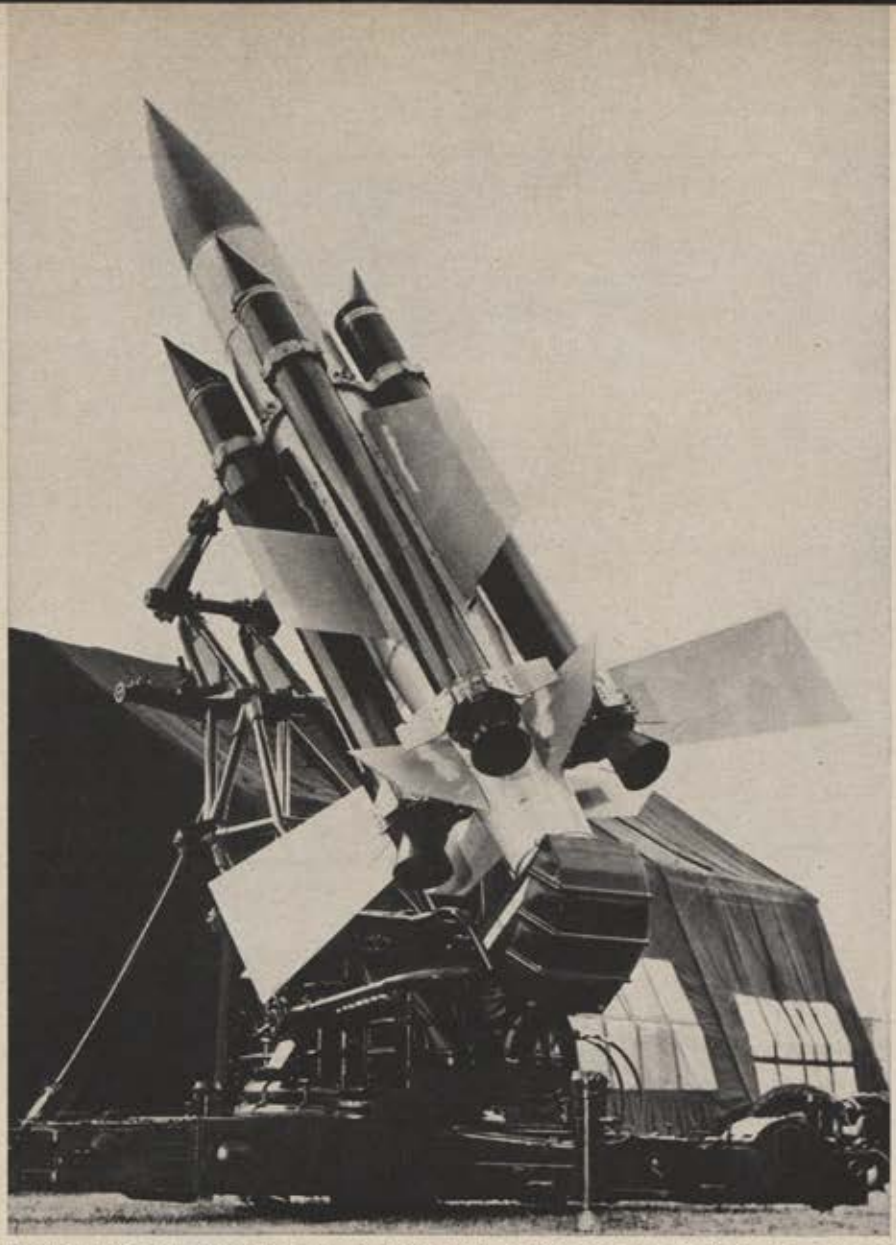
For all this, it is unlikely that the weapon has a range equal to that of Bloodhound, nor are its speed and altitude capabilities as great. It is believed to be better than Bloodhound, however, at low altitudes. Sweepback angle on the leading edge of its lenticular section wings is reconcilable with a Mach 2 shockwave pattern.

Thunderbird, like Bloodhound, has four solid-fuel wrap-round boosters—the classic British formula—which umbrella outward on their rear attachments at separation. The wings are fixed, and control is by means of the four tailfins, indexed in line with the cruciform wings, and which are pivoted at mid-chord.

English Electric has repeatedly claimed that the present Thunderbird, which is now reaching mobile units of the British Army, is only the first of a family of missiles to be developed from the same basic thinking. An improved version of Thunderbird was fired before the turn of the year. This almost certainly has greater range and altitude, and possibly fully active homing, to overcome the line-of-sight limitations of target illuminating radars.

What does seem certain is that both Thunderbird and Bloodhound, in their present forms, are "lead-in" weapons, due for speedy replacement by later series. It is likely that only one of these weapons will be selected for extended development, for stringent defense economies are now in force in Britain, and the government shows no willingness to finance two potentially competitive projects as it has done in the past.

First air-to-air weapon with the RAF, and with the Royal Navy, too, is the de Havilland Firestreak. It now



English Electric Thunderbird on launcher, which can be jacked up, put on wheels, and towed away inside ten minutes. Note the sharply outward-tapered booster nose cones, designed to force booster tubes outward for separation.

warhead, which renders even large miss distances fatal to the target aircraft.

Research on heat-seeking heads in Britain began at the Royal Radar Establishment after the end of World War II, when information came through of German I-R researches. The development contract was placed in 1951, and de Havilland decided then to concentrate its guided missile activities in the de Havilland Propeller Company, which had the experience, and the production facilities, for detail precision engineering. It is de Havilland Propellers which is now mass-producing Firestreak at a number of factories around Bolton in Lancashire, and is handling development of Blue Streak at Hatfield.

First firings of Firestreak, from the ground against ground targets, were made in 1954, and the first air firings in 1955. Main development firings, involving over 100 rounds, were made at Woomera, the joint UK-Australian rocket range in central Australia. Australian-built Avon-Sabres were the aircraft used. Targets were the Australian Jindivik jet-powered drones, which fly at about 600 mph at heights over 50,000 feet. Eighty percent successes were recorded in development firings.

The solid-fuel internal booster burns for about three seconds and accelerates Firestreak to a speed of Mach 1.3 above its launching velocity. After burnout it coasts until detonation by either its impact or proximity fuse. Average time of flight in test firings has been eight seconds.

It is a pursuit-course missile, committing its carrier aircraft to an attack from astern for the missile to home onto the heat emanations of the raider's jet pipes. The possible firing cone is quite wide—Firestreak is said to take out as much as 10,000 feet difference in altitude between carrier and target aircraft, so the fighter can fire from well below its prey. Range is variable, dependent upon the closing speed of the two

(Continued on following page)

Left, de Havilland Firestreak, infrared homing missile, is loaded on a Gloster Javelin all-weather fighter. Plastic covers missile's eight-panel glass nose. Right, two of the heat-seekers aboard an English Electric Lightning interceptor.

equips some squadrons of Fighter Command's all-weather and night-fighter force of Javelins, and it is fitted to a few Sea Venom interceptors of the Royal Navy aboard the carrier *Victorious*. This is to gain experience in handling the missile aboard carriers, before it becomes standard equipment when the twin-Avon-powered Sea Vixen interceptor enters the fleet's squadrons later in the year.

Firestreak, like the US Sidewinder, is an infrared homer, but there the similarity ends. It is larger than Sidewinder and about twice as heavy. (Estimated weight is 300 pounds to Sidewinder's known weight of 155 pounds.) Its makers claim it is a more sophisticated weapon, particularly proof against natural sources of infrared radiation like the sun. Much of its weight goes into its very powerful

aircraft, on altitude, and on temperature, and can be anything from less than one mile to about four. It can be ground launched against low-flying attackers and can be used as an air-to-ground weapon against heat-emanating targets.

When the pilot selects the number of Firestreaks to be fired, on his small control panel, cold and warm air supplies are tapped from the aircraft to cool the electronics and the heat-seeking head and to de-mist the eight-panel, tapered glass nose. The gyros are accelerated during this period, and the heat-seeking head begins to scan and acquires the target before the missile is fired. Immediately after firing, the fighter can break away.

In the Javelin and Sea Vixen, each of which carries four Firestreaks on underwing pylons, a conventional radar-ranging gunsight is used. But the Lightning, which is not yet in service, has a fully automatic fire-control and target-acquisition system—Airpass—developed by Ferranti. The Lightning carries two Firestreaks mounted on stub pylons from the lower fuselage, below the cockpit. It backs up this guided armament with forty-eight unguided two-inch rockets in retractable fuselage packs, and two Aden 30-mm. cannons.

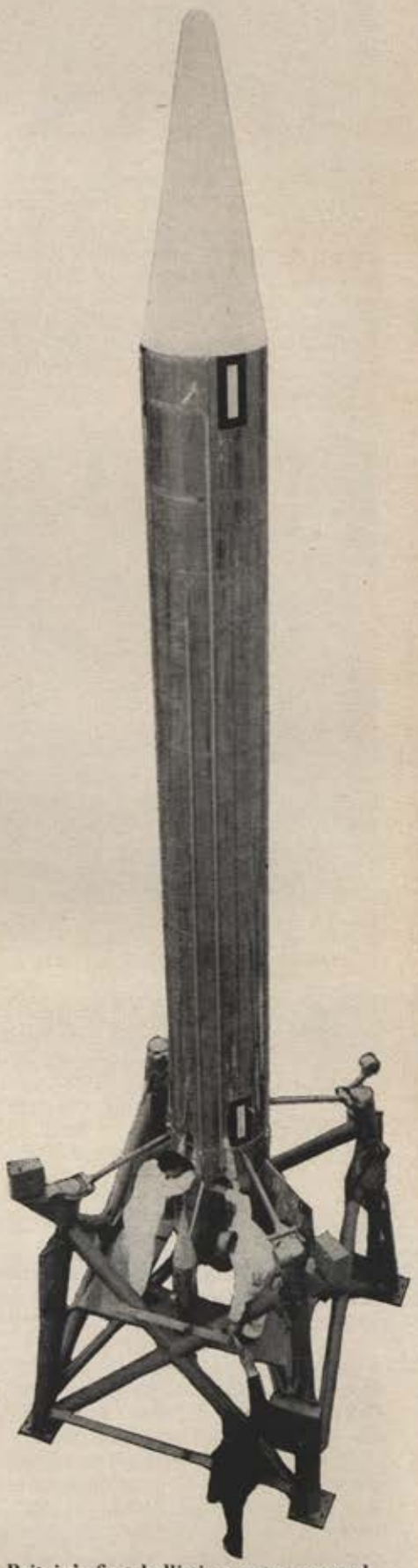
The necessity of air freighting development missiles 13,000 miles from Britain to Woomera has given de Havilland an opportunity to build in and thoroughly test the "transit ruggedness" of the weapon. Firestreak breaks down into two major subassemblies—the forebody, containing the intricate details, the heat-seeker, fuses, and guidance and control systems, and the afterbody, which stores the armament, houses the potentially dangerous explosive components—warhead, solid-fuel booster, and the compressed air bottle, which is the internal source of power. Bringing these two bodies from their stores, mating together, attaching the bolt-on wings and fins, and testing the systems takes two men only thirty minutes, after which the Firestreak goes into a "ready-to-use" store, from which it can be drawn, without further testing, at any time over several months.

An improved version of Firestreak, which will be a collision-course missile, is being developed. This version will be ready for service well within the lifespan of existing fighters, and it is being designed to counter a Mach 2 threat. This requirement gives the designers of an infrared homer a bonus in the matter of heat emanations, for at Mach 2 friction heat over the target airframe is sufficient to enable its use for homing, rather than the heat emanations of the jet pipes. This is the factor which makes a collision course possible and frees the missile from the limitations of an attack from astern.

So much for defensive weapons—now for bombardment ones. The RAF's first experience in guided bombardment missiles is being gained with Thor, which it is the first service to operate, since Thor has not yet been finally selected as the intermediate-range weapon of the USAF's Strategic Air Command. Aerodynamic cruise missiles, of the Snark and Mace variety, have been ignored in Britain, and all research in the bombardment field is on ballistic types.

The Thor program is a joint US-British venture, with the United States supplying the missiles, equipment, and technical aid, and retaining control over the nuclear warheads. The RAF holds operational responsibility. Thus, it is argued that no missile can be fired without the consent of both governments. Four RAF ballistic missile squadrons are being formed, under Bomber Command, and the first has been activated. Locations of the missile sites being built cannot be revealed, but they are, nonetheless, no secret. They are all in the eastern counties. Some Thor emplacements have been completed, and missiles are in position. These are "soft" installations, completely above ground. Blue Streak, which will be Thor's successor, is designed for underground installations.

Blue Streak borrows on American developments, for its powerplant is a North American Rocketdyne single-chamber unit, of the Thor/Jupiter class, reengineered and manufactured under license by Rolls-Royce. The ultra-lightweight pressurized steel construction of Blue Streak enables more fuel and oxidant to be carried, for the same power, than in Thor or Jupiter, so consequently its range is greater. For Blue Streak the term "long-range ballistic missile" has been coined, and probably means a range somewhere between the figures attached to the terms "IRBM" and "ICBM." Unofficially, the range is said to be 2,800 miles, which will take the missile to the heavy industrial concentrations far behind the Urals from bases in eastern England. Sperry Gyroscope is the contractor for guidance. Armstrong-Siddeley Motors recently publicly exhibited a small vernier rocket, the PR-23, with several hundred pounds' thrust, which is probably intended for



Britain's first ballistic reentry research vehicle, Black Knight, in prelaunch position, is 35 feet high, 3 feet wide.

Blue Streak's control. Its thermonuclear warhead will be wholly British.

If Blue Streak burns the same propellants as Thor—wide-cut gasoline and liquid oxygen—it will be a break from previous British practice, for lox has not found favor as an oxidant in Britain, and most liquid rockets have used high-test peroxide.

Blue Streak will be test fired at Woomera after static firings in Britain. It was at Woomera that Black Knight was successfully fired, to a height of about 300 miles, in the first attempt last September 7. Black Knight is Britain's first ballistic reentry research vehicle and is closely involved in the Blue Streak program. Multistage developments of Black Knight will probably be used in any British satellite-launching program. (With regard to satellites, there has lately been talk of a joint British-Dutch program, in which Britain will be responsible for the launching vehicles and the Netherlands for the satellites.)

Black Knight was designed at the Royal Aircraft Establishment and has been engineered by Saunders-Roe. Similarly its Armstrong-Siddeley Gamma four-chamber kerosene/peroxide engine has been developed from an RAE design. This gives about 20,000 pounds of thrust.

Air-to-surface weapons have not been neglected, and a standoff bomb, with the code name Blue Steel, is being developed by A. V. Roe as a latter-day shot in the arm for the RAF V-bombers. Specifically it will be used by the Mk. 2 Vulcan and Victor bombers, but its development is going ahead using Valiants and Mk. 1 Vulcans. This weapon is a supersonic cruise missile with a de Havilland Double Spectre kerosene/peroxide rocket; early test models may have turbojet engines. The Double Spectre is the outcome of long research by de Havilland on assisted takeoff rocket packs for the V-bombers, and it consists of two Spectres, mounted one above the other, developing together a thrust of about 16,500 pounds. One of its two components is a constant thrust unit, and the other can be throttled.

Blue Steel is about thirty-five feet long and has delta mainplanes at the rear, with small inboard control surfaces and fixed stabilizing fins above and below. (These are fixed fins as far as aerodynamics are concerned—the lower one hinges sideways for ground clearance when the weapon is in position under the fuselage of the bomber.) Small delta foreplanes control the pitch. It cannot be completely housed within the bomb bays of either the Vulcan or Victor and is only partially concealed. First test firings, from a Valiant, are said to have been made, and full-scale tests are now in hand at Woomera, using Vulcans as the carriers. Range is expected to be 400-500 miles, and the bomb will climb well above its launching height, perhaps to over 100,000 feet before diving on its target at hypersonic speed. Blue Steel's introduction to service is expected about 1961.

ABOVE: An Avro Mk. 1 Vulcan carrying the standoff bomb, which would be air-launched miles from its target. Operationally, the Mk. 2 Vulcan will be used.

RIGHT: One of the world's smallest guided missiles, the Vickers 891 antitank weapon, designed to be taken into battle by a single soldier.

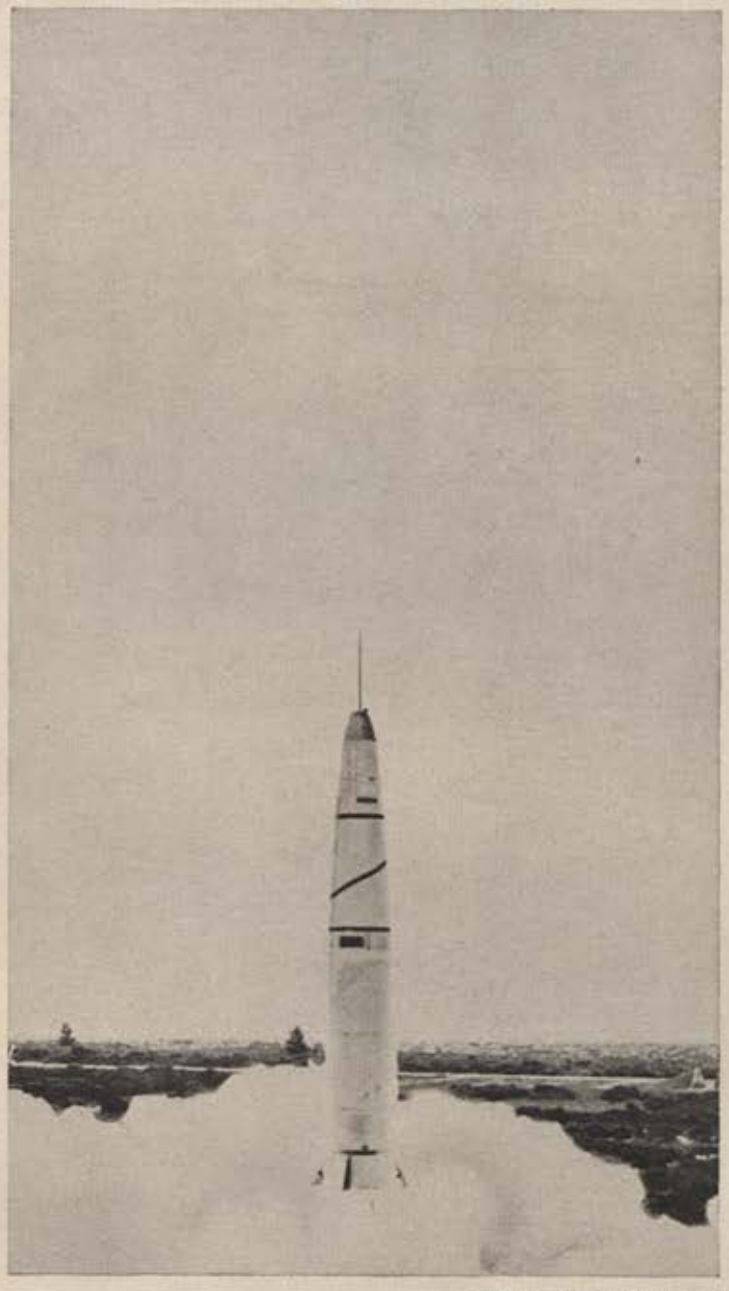
This survey has necessarily been restricted to those guided missiles that directly affect the RAF, but weapons of other categories, for use by the Army and Royal Navy, have been produced. Nevertheless, limitations of the budget available have caused many missile classifications to be ignored. There is, for instance, no mention of a British successor to the US Army's Corporal, with which some British Army artillery units are equipped. There is an obvious need for an air-to-ground tactical weapon for close support, and as yet there is no antitank weapon in service with the Army. A number of Malkara antitank missiles, developed in Australia, have been ordered for British Army evaluation, and Fairey are known to be working on another antitank missile.

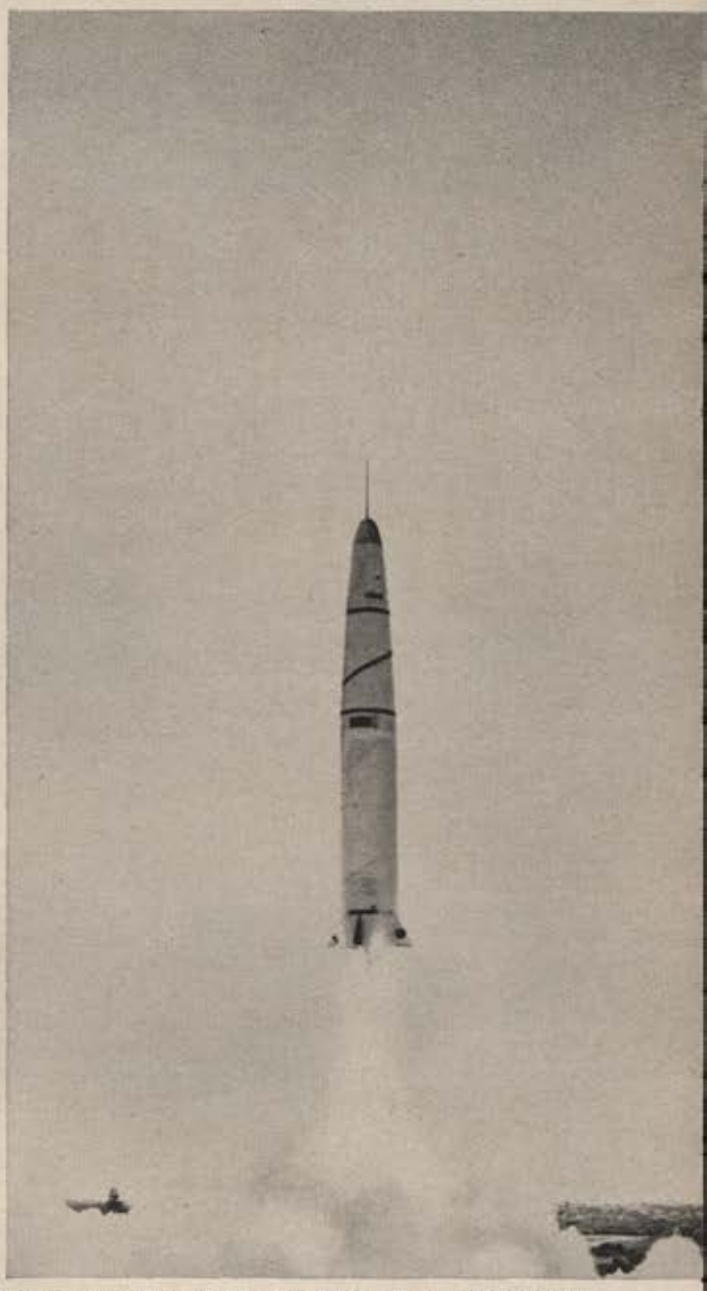
Meanwhile, two intriguing little wire-controlled weapons have been developed as private ventures—the Vickers 891 and the Pye P V. Both of these are designed to be carried into battle, launched, and guided *by one infantryman*. They are guided to their targets by means of an optical viewer, which transmits command signals through the wire. The Vickers 891, at less than three feet over-all, and weighing only about thirty-three pounds, is probably the world's smallest guided missile. There seems to be no official interest in either of these ventures.

For the Royal Navy a solid-fuel, radar-guided, antiaircraft weapon—the Armstrong Whitworth Seaslug—has been developed and extensively test fired from the trials ship *Girdle Ness*. Service use of Seaslug now awaits the completion of a new class of escort destroyers designed to operate it. Also for fleet defense is a small, short-range, radio-command antiaircraft missile being developed by Short Brothers and Harland, intended to replace the Bofors antiaircraft gun as the fleet's light aerial defense weapon.—End

Author Rodwell's last offering for Air Force *was the article "Farnborough '58," in the October '58 issue. His account of the polymorph Swallow appeared in the September issue, and in June '58 he described "The V-Force Partners of SAC." A staff writer for the British journal,* Aeronautics, *Mr. Rodwell specializes in military aviation writing. He has flown in many of the latest British and American military aircraft since he began his journalistic career in 1956. Last year he qualified for a Mach Buster's lapel pin when he flew faster than sound as a passenger in a North American F-100F Super Sabre.*

Today's air power in action:*





Thor starting one of its highly successful test flights from Cape Canaveral, Florida.

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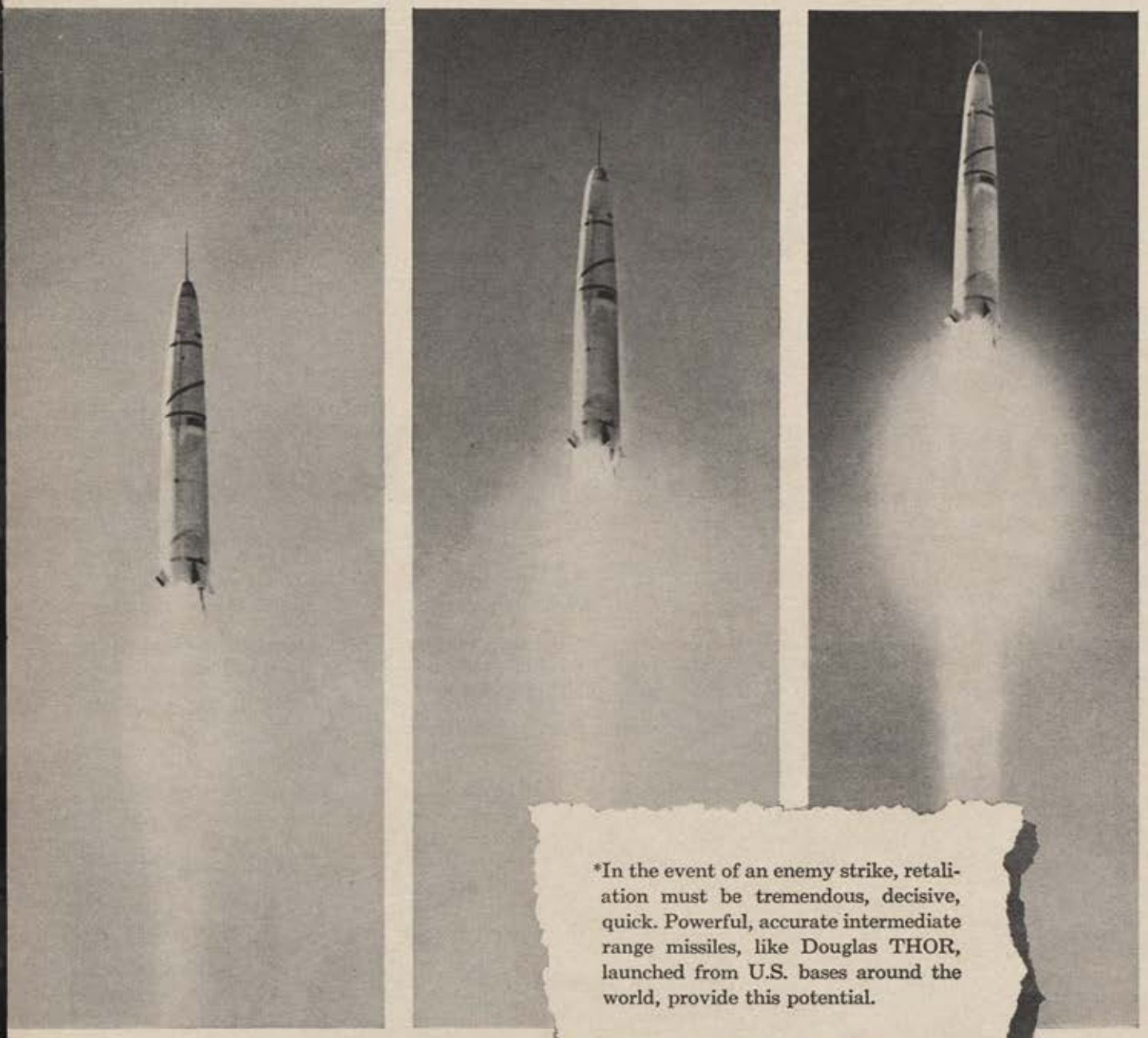

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AIRPOWER VS. SOVIET POWER POLITICS

USAF Chief of Staff, Gen. Thomas D. White (center), meets with Hubertus Prinz zu Loewenstein (left) and Dr. Volkmar von Zuehlsdorff, who returned to Germany last month after a 6½-week visit through the United States. During their visit the two Germans conducted research for their forthcoming book *Defense of the West*, which will be a German evaluation of NATO. The book will be published this year in Germany and later in England and (by the Columbia University Press) in this country. The authors are distinguished writers, lecturers, and educators who have worked together a number of times in the past. Their visit to the US was made on a German government grant under the auspices of the USAF and Generals Thomas D. White, Chief of Staff, and Lauris Norstad, Supreme Allied Commander, Europe.

Hubertus Prinz zu Loewenstein and Dr. Volkmar von Zuehlsdorff

FOR MORE than a decade now, airpower has been the steel curtain that put a stop to the forward march of Soviet aggression. This is certainly true of the NATO area. The Soviet Union, after swallowing up more than 100,000,000 non-Russian people since the end of the war and pushing its borders, including the satellites, westward by 1,000 miles, has not occupied one more inch of Western free world soil since NATO came into existence in 1949.

Ground forces and navies have played their part. They should certainly not be reduced. The German Bundeswehr in particular must be built up as rapidly as possible. However, without the tremendous striking force of strategic and tactical airpower in the background, NATO could not possibly have held its own against the vast numerical superiority of the Red Army.

Now the Kremlin once again is threatening aggression against free Berlin. Ten years ago it was American airpower, with British and French assistance, which stopped Soviet power politics. Under the impact of the airlift—the mightiest demonstration of air transport capabilities the world had ever seen—the Soviet leaders did not dare to launch an open attack and finally were forced to call off the blockade. It was a sobering lesson to them to watch the steadily growing stream of C-47s and C-54s, and finally the C-74s, capable of carrying fifty tons at a time, which kept coming in at Tempelhof Air Base, and Gatow and Teltow airports day and night, in sunshine, rain, or fog, during summer and winter, finally at the rate of one every thirty seconds, carrying food, clothing, coal, and industrial supplies, to a population of more than 2,000,000. It made the Soviets realize that should they foolhardily venture to fire the first shot, an air force of such powerful efficiency could just as easily carry a deadly load of weapons against an aggressor.

And it was also a warning to them that the Berliners, as all the nations of the free West, would readily take upon themselves all the hardships of a blockade, and even greater ones, rather than surrender their liberty. The common effort against a common foe brought the free nations more closely together and this gave life to NATO, the defense alliance among the peoples of the North Atlantic area. They signed their treaty in Washington on April 4, 1949, with Greece and Turkey joining in 1952, and West Germany in 1954.

Today Nikita Khrushchev apparently wants to take up where Josef Stalin left off. Dropping the "smile" of his initial years, when he was not yet firmly established in his position of power, Khrushchev believes perhaps that he can do better than his predecessor. Once again the West is being submitted to a test of its will and its capability to stand firm, and in this test airpower must play a paramount part.

One thing is certain. Unless the free world is prepared to fight for its freedom, war will surely be forced upon it. Everyone knows today that a totalitarian power cannot be appeased. But it cannot be provoked either—it makes war at its own appointed time. Weakness, not strength, would be the way to trigger off the Soviet war machine.

In the double talk note he delivered as a Thanksgiving present on November 27, Nikita Khrushchev declared that unless the Western powers were willing to negotiate with his obedient puppets in the Soviet zone of Germany—and that means recognize them as a "respectable" government—Moscow would turn over to them the control of the line of communications to free Berlin and wash its hands of the obligations it solemnly incurred by the London Four Power Agreement of 1944, and again after the Berlin blockade in 1949. Already some of the puppet officials have threatened interference with civil aviation to Berlin, and fighter planes, probably of "unknown origin," have been found buzzing around commercial American airliners.

Let us speak plainly. The responsibility for any act of this kind, even if it should be committed by so-called Soviet "German" planes, must rest squarely with the Moscow government. The simple fact is that there just is no such thing as a Soviet zone "German Democratic Republic." That regime is neither German, nor democratic, nor a republic.

Legally and factually it is a gang of Communist quislings doing the job they are told to do by the Kremlin. They have nothing in common with the people, who in that part of Germany are in no way different from those in the Federal German Republic, and who desire nothing more fervently than to regain the same democratic liberties as did their fellow countrymen in the West after Hitler's fall. They have proved this by their uprising on June 17, 1953, and every week 5,000 new witnesses to their unshakable loyalty to the West are coming over. Fleeing from an intolerable regime, they break through Soviet police cordons at the risk of their very lives.

If, however, Moscow should disclaim responsibility, then these acts of aggression are nothing but piracy, whether in the air or on the ground, and they should be dealt with swiftly and effectively, according to the well established rules of international law.

Some may think that in view of the terroristic power exercised by the puppet regime, this may sound legalistic—but it is not. It is, in fact, the only realistic approach. For these people with whom the NATO powers are supposed to negotiate are nothing but a totalitarian machine, with all its well known paraphernalia of terror, secret police, concentration camps, mock trials, and the rest. This sounds familiar, doesn't it? Indeed, here is an evil continuation of the totalitarian regime that surrendered in World War II, with nothing changed but the color.

As far as the Western powers are concerned, this regime still is in the state of unconditional surrender, and it will remain so until the people there, in accordance with the promises of the Atlantic Charter, can freely and without fear elect their own democratic form of government, as their compatriots in the Federal Republic and West Berlin did years ago.

As the picture is shaping up, what Khrushchev wants is to engineer the Berlin coup by remote control, as Stalin did in the case of Korea. In this way he believes he may be able to swallow up another bastion of the free world and break through the NATO wall, which so far has put a stop to Soviet expansion. His threats of armed intervention, should the West insist on its rights of free access to Berlin, are aimed at scaring off any determined stand on our part. If it works, he will have achieved his purpose; if not, he will have lost nothing. All this, of course, is merely a part of the bigger game. The attack on Quemoy and Matsu has been stopped—at least temporarily—by an American show of force.

Or take Lebanon, a gateway to Adana in a Soviet thrust against Turkey's southern flank. American and British action stopped it. There was an outcry, supported by all good fellow travelers in the West, who predicted the most dire consequences. Yet the Soviets did not dare to send one single soldier into Baghdad or Damascus. It is easy to see

(Continued on page 55)

...speaking of

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why. There is only one language the Kremlin understands, and that was spoken by the West in Lebanon and Jordan.

In June 1948 it was the suggestion of Lucius D. Clay, then American military governor in Germany, to send an armored train or a tank force through to Berlin to assert access by road and rail, with the Air Force standing by, and there are few to deny that this would have settled the issue. In a similar situation today, the same advice holds good. We must not be afraid of Khrushchev's threats; neither need we fear that the Western troops might be cut off in the city itself. Airpower would see to this. Another airlift could easily be organized. If the Soviet-Germans should try to interfere, fighter escort would be available, and there is always SAC's big stick in the background.

As the Soviets and their satellites have a numerical superiority on the ground, which NATO under present circumstances finds difficult to match, it is only by maintaining air supremacy that the balance can be tipped in our favor. In Europe, Gen. Lauris Norstad, himself an airman who has won the confidence of all under his command, regardless of nationality, could not hope to carry out his task without relying on airpower. The air units under his command are the Second and Fourth ATAF stationed in Germany, the Fifth and Sixth ATAF in Italy and Turkey, and Air North in Oslo, Norway, and—through the office of SAC-Zebra in Paris, under Col. William C. Lewis—he is in liaison with the Strategic Air Command. The line of demarcation between the continental ATAF and SAC runs roughly along the eighteenth Meridian East. In case of war this line obviously would have to be flexible.

There is still another problem. European air space, at present broken up into small packages, could do with wider horizons. The idea to set up a unified European Air Command, with NORAD as a model, has much to recommend itself. After all, the whole length of the Iron Curtain, from the Baltic Sea to the Czechoslovakian border, is less than the distance from Washington, D. C., to the SAC base at Westover, Mass. In the jet age national subdivisions of European dimensions (the Federal Republic, for example, from the Rhine to Kassel at the Soviet-German border is not more than eighty miles wide) are fast becoming an absurdity.

Pooling air space, resources, and manpower of all continental NATO nations would result in a more effective force of more and better planes, with a more balanced over-all composition, at less cost. If there is to be rivalry, let it be transformed from national ambitions to a sound competition between airmen and officers of various nationalities within the same European-wide air force. To achieve this is only a political problem and NATO already has gone a long way in bringing it closer to solution. Among the military there is almost complete unanimity that such a unified air force not only would be desirable, but altogether practicable.

As far as the new German Luftwaffe is concerned, integration into such a unified force will probably pose the least difficulties of all. Building from scratch, it was possible to abide from the very beginning by NATO standards. English is the sole language, not only in flight and for GCA, but from the first hour of instruction, for pilots and ground crew alike, even for those who never attended high school. Each wing, as fast as it is combat ready, is turned over to NATO. So far only three wings have attained that stage. This may not seem much and we often have been asked during our tour in this country why Germany could not move faster.

Let us say at once that we fully agree with Gen. Curtis E. LeMay's famous words: "I am not interested in excuses; what I want is to see results." In fact, we in Germany ourselves are most impatient of all to see our air force attain to the size of a significant contribution to the NATO defense force as speedily as possible.

It must not be forgotten, however, that a wide gap was left by the years between 1945 and 1955, when we could start afresh. There was no output during that time, either of flying personnel or of planes. We are glad that the Bundeswehr can buy the F-104, the fastest and highest-flying interceptor in ready existence today; and as a large part of them will be built in license by the Heinkel-Messerschmitt Südgruppe in Germany itself, our aircraft industry may eventually catch up. However, it still will take considerable time to train pilots capable of handling these planes in the large numbers required for an effective modern air force.

It is important, incidentally, that American safety rules developed over the years have been adopted also by the German air force. We were impressed by the meticulous care with which planes were examined and checklists gone through, not only by the ground personnel and crew, but by the aircraft commander personally. We watched and overheard by intercom how in a KC-135, coming down from 40,000 feet to prepare for landing, the pilots patiently went through this checking procedure, even during a descent at the rate of 4,000 feet a minute. There was never a flight, even if only for a few miles from Offutt AFB to Lincoln, when emergency procedures were not rehearsed, no matter how many thousands of flying hours the crew and passengers might have had to their credit. This procedure already has paid off abundantly.

As one ranking German air force officer told us, not one of his men trained in this country was lost, and in Germany itself training casualties were drastically reduced compared to figures in the pre-World War II Luftwaffe. Many of the new German pilots were trained in America, and they came back to Germany proud of their silver or golden wings and imbued with the spirit of the great alliance. Others were privileged to attend the Air University at Maxwell AFB, Ala. There is more to this than technical training. These men, like ourselves, have found in America a reception so cordial, and of such genuine comradeship, as to be more thoroughly convinced than they could be by words or treaty texts alone that this alliance is a living reality.

Although their own air force at home still may be in a development stage, they know that it stands not alone. They are an integral part of a common force which is backed up by such powerful instruments as the Strategic and Tactical Air Commands. We do not wish to "hand back" to our American audience (to use a collegiate expression) what we have just seen and heard at Langley AFB, Va., at Cape Canaveral, at Westover, and Lincoln, and at SAC headquarters in Omaha, Neb. Americans, at least many of them, know about it. But to all the European peoples in NATO (the captive nations behind the Iron Curtain by no means excluded) it is again and again a message of tremendous importance.

Here in the subterranean command center at Offutt AFB, with its famous red telephones and its immediate communication with some sixty bases all over the globe, which we saw in operation, is the key to their freedom—a guarantee for those who are in our camp, from the Aleutians to the last small village at the Soviet-German border, and a promise to the oppressed peoples beyond. There was wing after wing of mighty B-47s and B-52s, like eagles on the ground, ready to surge into the sky at an instant's notice, to carry their deadly load to the most distant targets.

(Continued on following page)

Barely nine minutes passed after the first siren sound of the "bravo alert" in which we were caught at Westover, until these bomber planes and their refueling support were ready for taxiing out to the runway.

One would wish that Khrushchev and his entourage might be given a chance to take a good look at the deterrent power of this striking force, all the better to learn their lesson that, should they ever venture into aggression, their regime and all its might would be wiped off the face of this earth.

However, there is another experience at SAC headquarters, in the Pentagon, at Cape Canaveral, at SACLANT in Norfolk, and among the Army at Fort Bragg and Fort Monroe. When a high State Department official asked us at the end of our journey through this continent what in a few words would be the essence of our impressions, this was our answer: It was the magnificent human element in all the services.

The efficiency, power, and devotion to duty is no doubt impressive beyond praise. But what gives strength to it far beyond its technical power is the closely knit community of these men, their spirit of comradeship, their discipline combined with gentleness, a chivalrous courtesy even in most difficult situations, from General Twining, Generals White, Luehman, Power, Sweeney, Bruce Clarke, Eckert, and Donnelly, and the Admirals Wright, Russell, and Boone, to name just a few among the many we had the privilege to meet, throughout the officers and noncoms to the youngest enlisted airman, soldier, and sailor—backed up by their wives and families who share in a less spectacular, but by no means less important way, the burden which these dedicated men have taken upon themselves to protect peace and liberty of us all. All this would not be possible without the strong ethical, in fact, religious, conviction we found everywhere among them, quietly but firmly, without big words.

This is the spirit which, far beyond the military mission, makes it understandable why today the men and women serving in this force are at the head also of a political development that is the challenge of our time. The community they have brought to life among themselves is at the same time a model for the larger community of free nations arising among us. Wherever we went we felt as if we were coming home. Here, within NATO, they are all working together without regard to uniform or nationality, intent only on serving the cause. We have witnessed this spirit at SHAPE and Fontainebleau in Paris, at the Channel Command in England, in Turkey, at Naples, and on the Sixth Fleet in our own country, and throughout the United States, which in itself already is a NATO community stemming from many nations.

When you go up to 40,000 feet and higher, cities and countries even are beginning to look small. Perhaps it is this widening horizon that has made the pioneers of the sky susceptible to a broader political view, transcending national boundaries. They are pioneering for political unity. Wherever they land on their far-flung missions within the free world, they are at home and so one day it will be with all the people who are members of the NATO family. On earth, as in the skies, freedom is indivisible.

When this is achieved, the sham "internationalism" of the Soviet bloc, imposed by force and resting on terror, will lose much of its grip. The longing for freedom instilled into man's heart by the Creator himself may then surge forward as a mighty force, breaking down the prison bars and iron curtains from within, until in God's good time the horizons of freedom will expand over all peoples and nations of the world, to the true limits of nature.—END

ABOUT THE AUTHORS

Hubertus Prinz zu Loewenstein was born in 1906 and attended high school in Southern Germany. He studied law, political science, and international affairs at the Universities of Munich, Hamburg, Geneva, and Berlin until 1933, when he emigrated to Austria to escape the Hitler regime.

In 1935 he moved to England, and in 1937 he came to the United States under the Carnegie Endowment for International Peace.

During the World War II years he taught and lectured on political administration, political science, and history at various American and Canadian universities, and also served as a correspondent for International News Service.

He returned to Germany after the war, where he became a lecturer at Heidelberg University. He also worked as a correspondent for Hamburg's Die Zeit.

From 1953 until 1957 he served as a member of the German parliament (Bundestag), representing the liberal Free Democratic Party, which was then staunchly supporting Chancellor Adenauer. When, about two years ago, that party switched its policy and became the opposition to the government, the Prince severed his political affiliation with the Free Democrats.

Since 1957 he has been primarily engaged in free-lance writing. He has written numerous books on German history, political science, and political administration.

The book he is presently engaged in writing about NATO is being coauthored by his secretary and literary collaborator, Dr. Volkmar von Zuehlsdorff.

Dr. Von Zuehlsdorff, who was born in 1912, studied law and political science at the Universities of Berlin and Innsbruck, Austria, with postgraduate work at the University of Vienna. He received his doctorate of laws from Innsbruck in 1936.

After Hitler seized power, Dr. Von Zuehlsdorff left Germany in May 1933, at twenty, one of the youngest German political exiles of the period.

He lived variously in Austria, Switzerland, France, and England until 1938 when he came to the United States to continue his opposition to the Hitler government.

Here he became Executive Secretary of the American Guild for German Cultural Freedom, an organization founded by Prince Loewenstein and headed by the late Gov. Wilbur L. Cross of Connecticut, to aid exiled German authors, artists, and scientists.

From 1940 to 1946 Dr. Von Zuehlsdorff was assistant to Prince Loewenstein in the latter's capacity as visiting professor of the Carnegie Endowment for International Peace.

He returned with the Prince to Germany in 1946, became a political editor of Die Zeit *in Hamburg, and, in 1957, ran for the Bundestag as a member of the conservative Deutsch Partei, a partner in Dr. Adenauer's coalition government.*

January • 1959

SPACE DIGEST

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SPACE DIGEST

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From the Editors...

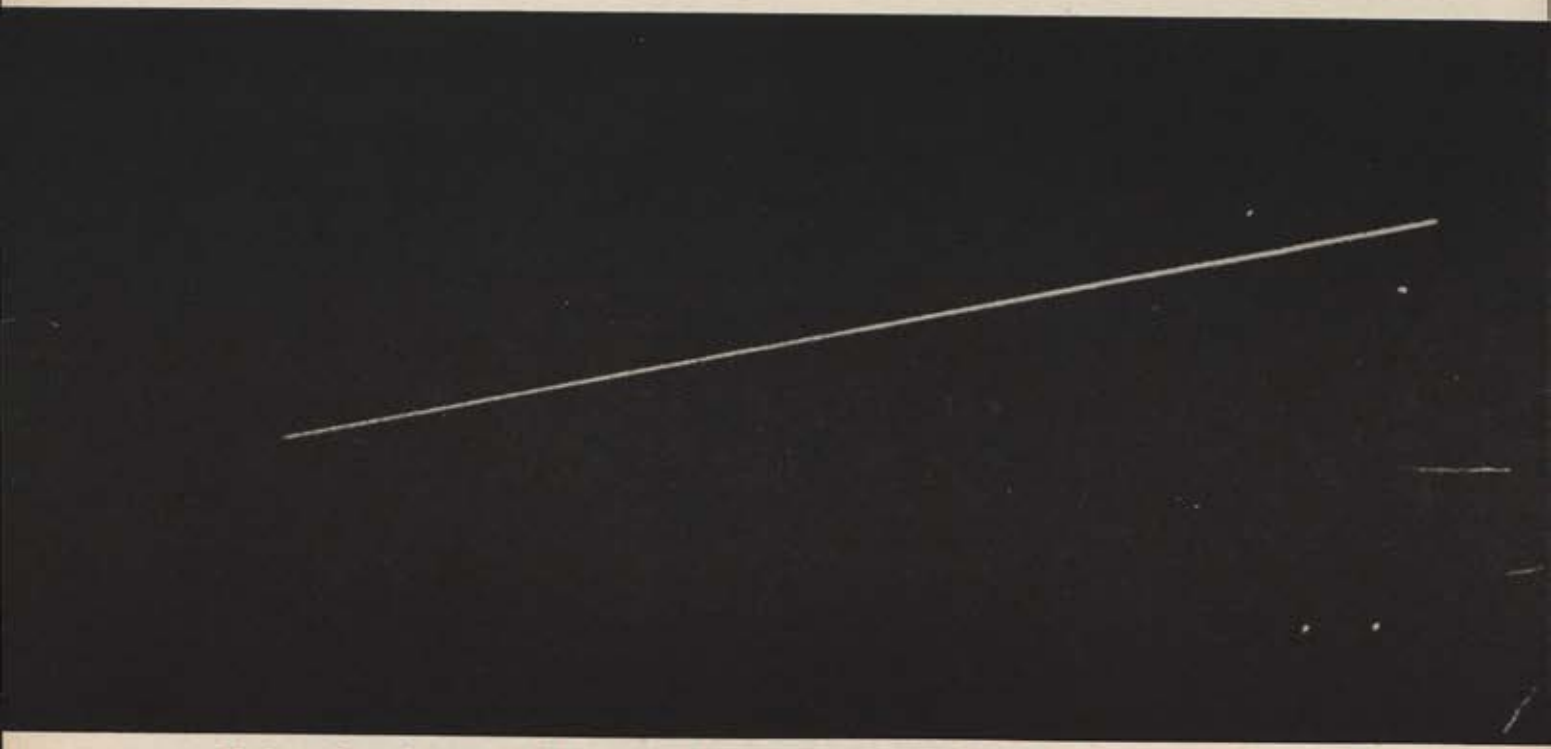
LAST month on this page we suggested that there are by no means absolute answers to the question: Why go into space? But, we pointed out, the prospect of enlarging our knowledge of the universe is reason enough to press on.

On the pages that follow you will find the ideas on space exploration of such authorities as famed writer-scientist Arthur C. Clarke, who tells the fascinating story of radio astronomy, science's newest ear to the universe; T. Keith Glennan, head of the National Aeronautics and Space Administration, who discusses tomorrow's world-wide weather prediction—available through satellites; and Dr. Hubertus Strughold, USAF's father of space medicine, who reports on the stages of space exploration.

Also, this issue of SPACE DIGEST includes a report on the long-range impact of Sputnik on the US space effort, a picture story on Russian plain-folk getting a glimpse of their national achievements, and photo coverage of the successful Atlas ICBM firing. In addition there are provocative discussions of the military applications of advanced technology and the possibility of man's finding a hostile universe.

These articles suggest just some of the answers to the basic question: Why astronautics?

In following issues of SPACE DIGEST we will continue to try to put the space age into some sort of perspective with candid studies of where we are now and how effectively we are crossing our newest frontier.



Flashing through the night sky, trail of Sputnik I symbolized Red space prowess at new age's dawn.

AS WE ENTER YEAR II OF THE SPACE AGE...

How Much of a Spurt SINCE

"If the US becomes a second-rate nation in space-flight, it will not be because we lack capable technical men or resources, but because we waste effort and time."

GEORGE SUTTON, FORMER PRESIDENT,
AMERICAN ROCKET SOCIETY

FIFTEEN months have elapsed since the "backward" Russians jolted us with the launching of their first Sputnik. The painful soul-searching that rent the air during those first dreary post-Sputnik weeks has faded into memory. The disquiet raised by the Soviet achievement and its implications has since 1957 given impetus to the worried group of legislators and scientific, industrial, and military people who have—under the existing ground rules—done their best to provide the country with an adequate space and research program.

Progress has been discernible, and there is undeniably a record of achievement that rates comparison with the heady advance of the Soviets. The school of thought in the Defense Department that used to consider basic research an expensive but rather useless hobby has given way to a somewhat harder-headed leadership. There has been much enlightened discussion in govern- and the press on the subject of reexamination of our educational system. Respected "independents" like Vice Adm. Hyman Rickover, father of the Navy's atomic submarine program, have spoken out strongly on the need for making our schools what they were originally intended to be —places where youngsters learned how to think, not primarily how to adjust themselves to the bumps of interpersonal relations to society.

On the hardware side, accomplishments have been respectable, too. We have fired (at this

writing) two lunar probes to respectable distances, discovered and told the world of the band of radiation that surrounds this planet, proceeded with the development and scheduled flight program of the USAF-North American X-15 research plane which will take man to the edge of space. At the end of 1958 the world heard of our plans for a continuing polar orbit satellite program, to be carried out under Advanced Research Projects Agency (ARPA) auspices from the newly completed West Coast USAF SAC launch site at Vandenberg AFB, Calif.

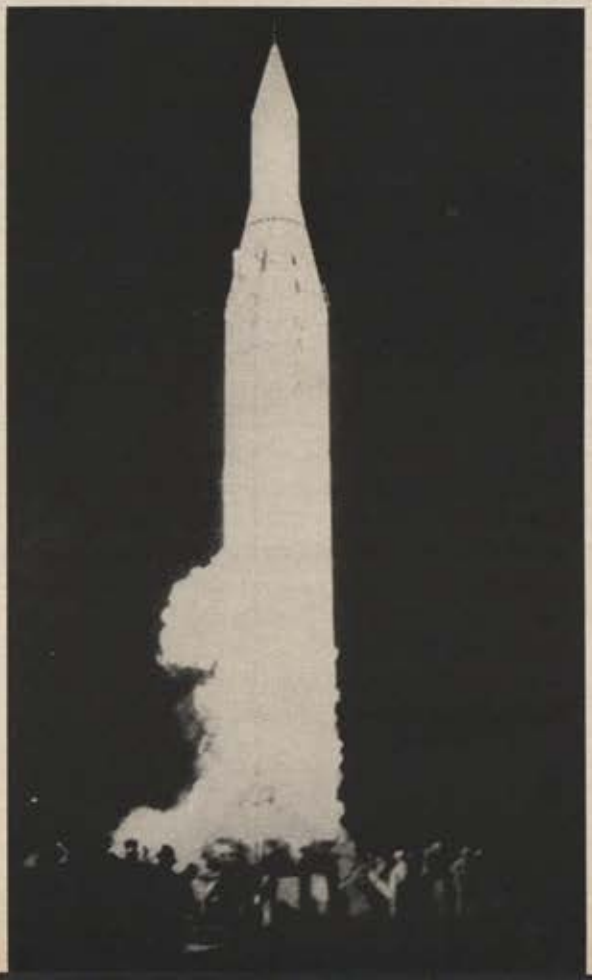
There is talk, too, of additional space probes, to be launched under the auspices of the National Aeronautics and Space Administration (NASA) to the vicinity of Mars and/or Venus in the coming two years. And industry is busy, at the behest of NASA, on the design of recoverable sealed capsules capable of carrying a man safely back from orbit. Also expected under NASA auspices are launchings of IGY-type satellites to obtain new data on the upper atmosphere

WILLIAM LEAVITT
Associate Editor

USAF's Pioneer I lunar probe, fired in October 1958, set new altitude record for US astronautics.

SPUTNIK ?

Year's end saw Army's Juno II moonward shot, Pioneer III. Pioneers were under NASA auspices.



and solar composition. Solid fuels and the million-pound thrust engine are under development, and research continues on the development of usable nuclear and even more exotic forms of propulsion for space vehicles of the future. The biomedical programs of the Air Force continue at a faster pace. To follow the newspaper accounts is to note how space—once the realm of dreamers—has become a household word across the land.

This whirlpool of activity has given rise to a less-than-valid appraisal of where we stand. After the shock of Sputnik and the "chins-up" assurances in late 1957 by the national leadership, there was, for a brief time, a new mood in the country. Thoughtful people acknowledged that the complacency that had led to the "technological Pearl Harbor" must come to an end. And from that acknowledgement emerged the mood that brought into being, first the Defense

Department's Advanced Research Projects Agency and later NASA from the nucleus of the old National Advisory Committee for Aeronautics, created with alacrity by an alarmed Congress.

Research and science in general came into new respectability. The continuing theme was acceleration of our scientific progress and application of more funds. And for our safety it was agreed that we must stay abreast of the Soviets.

On the political side, the Administration and Congress both began to match the constant Soviet clamor for "peaceful" uses of space with reasonable proposals of our own. And the realization that there is and must be cross-pollinization of technical capability, not to mention hardware, between "civilian" science and the military became evident in discussions of such items as why the original Vanguard project fizzled. Comparisons between the Russian and American approaches to the satellite programs proved to many observers how naive we had been in believing that a low-budget, separated IGY satellite program could produce the same kind of results as a program that used *all* the rocketry capability that could be spared from top-priority defense programs. The Russians taught us that lesson and were rewarded with a propaganda coup in the bargain.

Looking back on the era of disenchantment and recrimination that followed Sputnik I, it appears as one of the most thoughtful, self-appraising periods in our recent history. The resolve that emerged from those months, had it reached fruition, would have transformed the country—and today there would be little or no need to think much about Sputnik except as "the best thing that ever happened."

But something different has occurred. Instead of doing what we promised ourselves to do, we have continued, with but a few modifications, the situation that existed before Sputnik. We have given lip service to change, yet half-smothered the very people who could give us the total scientific program we want in a maze of confused authority and a welter of fiscal double talk.

An interesting example is the situation of the new NASA. If you visit NASA's offices in Washington, you'll find dedicated people who *want* to give the country a balanced space program, but who have to spend disproportionate amounts of their time in negotiations with other government agencies, military and civilian—discussions which, through no fault of the conferees, begin to take

Model of Sputnik III intrigues crowds at exhibition in Academy of Sciences Pavilion in Moscow.

on the appearance of diplomatic meetings between sovereign powers.

Or examine the NASA budget. A close look shows that of the approximate $300 million in FY '59 funds available to NASA as the nation's top civilian space agency, nearly a third had already been figured for the old NACA anyway, and that a considerable part of the remainder is really money transferred from the Defense Department's ARPA and the military services. Add to this the important fact of the decreasing value of the dollar and you get a true figure for the agency's spending money that is very modest indeed.

The same situation obtains in the military. Inflation alone has created a situation where even a nominally increased total budget in reality is able to buy less, not more.

But even more significant, in an appraisal of where we really stand in Year II of the Space Age, is the fact that much of what has been accomplished would have happened anyway—with or without Sputnik. The ballistic missile program, from which much of the space capability derives, was a going business, subject admittedly to on-again-off-again funding, before Sputnik. It still is. The Atlas ICBM, which shows much promise of being a powerful space vehicle, has been fired successfully full range (*see page 78*). But this achievement was bound to happen, even if some

Russians claim to have recovered dogs from straight-up shots. Display shows recovery gear.

of the people responsible had to work *without* authorized overtime pay.

What has really happened since Sputnik is that most people in the country now understand that a trip to the moon, for whatever purpose, is not an indication of madness but something "those scientists" really mean to accomplish—i.e., there has been an increase in public understanding of the role of science.

What has *not* happened, notwithstanding the new public interest, is the enormous acceleration of activity and direction that was promised to the nation in the first post-Sputnik days. Assurances by the national leadership and popular press do not alter this truth. No amount of euphemism can change the fact that we have still not faced up to the challenge of the new age. Nor can soothing words change the fact that unalterably opposed to us is a power that considers itself the wave of the future, willing and eager to harness its total energy to assure its hegemony. The supreme test of our own democratic system will be of its ability to meet this Soviet challenge.

Just as the Russians have used the main strengths of their totalitarianism to lurch ahead (*see "The Military Significance of Space" by Rear Adm. John E. Clark, Deputy Director of ARPA, on page 70*), we must be willing to use our own strength. As Admiral Clark points out, the Russians do not concern themselves with the academic problem of peaceful or military uses of space. They marshal their capability under a central authority, accomplish their projects, and get on with the job. In Sergeant Friday's phrase, "they stick to the facts!"

Their significant advantages are their ability to focus singly on objectives minus parliamentary discussion and to conceal their failures from the world.

But these are by no means insuperable advantages. And *our* democratic structure in no way precludes *our* focusing our efforts, *our* marshaling of capabilities in the new age.

Space technology offers an excellent example. We have divided our capability.

It is difficult to ascertain the exact reasons for this and our other failings. But at least part of the problem stems from two main sins—self-delusion and fear.

We delude ourselves—as we did before Sputnik—into believing that we can continue to concentrate on lawn care and life adjustment in a world where most people care less about democracy than about getting enough to eat.

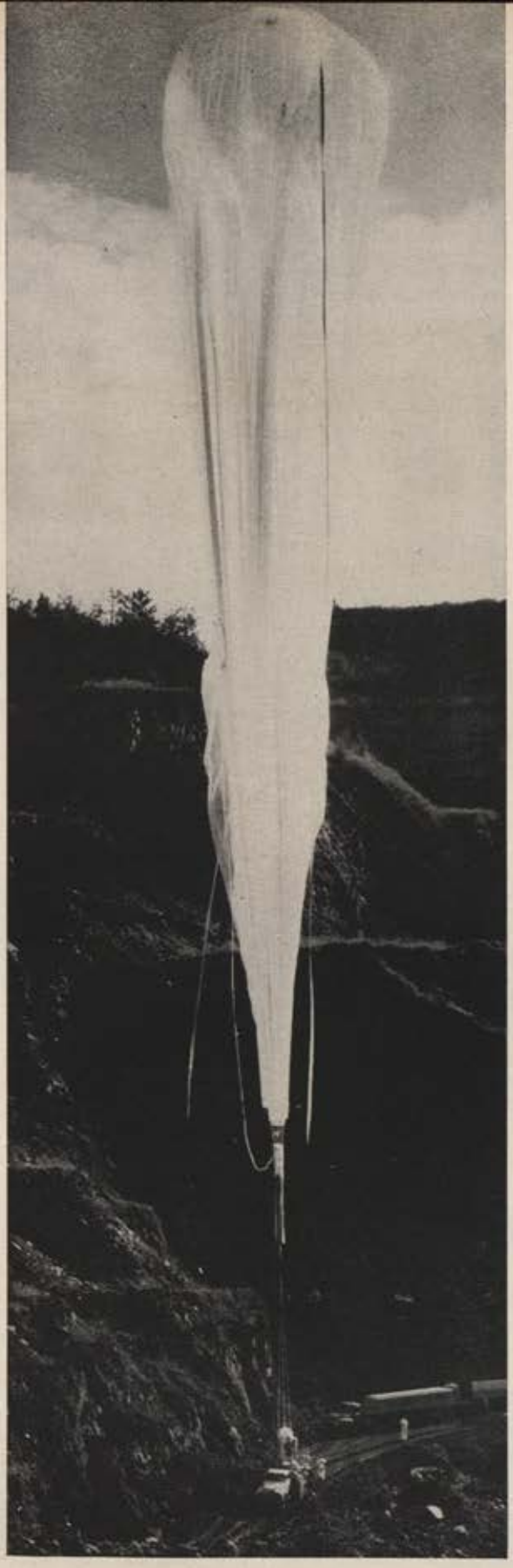
Our *fear* is more complicated than our self-delusion, because its strongest manifestation is in our leadership, not in the people. It is a fear of ourselves, of our own ability to accomplish hard tasks that cost much money, a fear of giving capable people the needed resources and authority to achieve objectives.

In this hesitant atmosphere, we are subjected to an unhappy picture of skillful, dedicated people in both civilian and military structures, trying to go ahead with programs of space technology, without a central focus of decision.

No historical analogy is ever perfect, but it is

T. Keith Glennan
Administrator, National Aeronautics and Space Administration.

Roy W. Johnson
Director, Advanced Research Projects Agency



Pre-Sputnik US achievement. In August 1957, USAF's Lt. Col. David G. Simons rose to 102,000 feet in Man High balloon, stayed aloft 32 hours.

difficult to imagine how the atomic programs of World War II could have been accomplished with as much speedy success today.

After the war there was a long, heated debate on how to get on with the atomic job. We asked ourselves: How can we serve both military and civilian needs? Can we compartmentalize the atom? The answer was no. We had to serve all needs, as events required.

That there is a continuing military interest and contribution to space technology is obvious. The Air Force's atmospheric mission leads logically into space. The first Americans into space will be trained airmen such as Capt. Robert White, who is scheduled to fly the X-15. The aeromedical experience of the Air Force will continue to be invaluable to the business of space conquest, and the missile capability obviously lends itself.

But the fact of this military capability should not cause an arbitrary division of space into military and civilian areas, as has happened. This

division has made it harder for the various sources of capability to work together.

The answer to such a dilemma is by no means easy. One approach might be the creation of a space and science budget, with top-level decisions on allocations for military and civilian needs. This might bring space and the general problem of scientific advance to its deserved priority as a subject for decision—not compromise—on the highest levels.

Even under the present system—or lack of system—the military and civilian space technologists are unable to attain the pace of progress that should be possible, because of the continuing hesitancy in decision making at the highest level. Whatever progress already made is the result of interchange, but interchange done in a confused atmosphere. As the stakes increase, the philosophy and resolution that back up the system, whatever it is, become increasingly crucial.—END

Right, North American X-15, a USAF-NASA rocket-propelled, experimental aerospace craft which will take its pilot, USAF Capt. Robert White, into space. First flights will be this year.

Below, famed School of Aviation Medicine "trip to the moon" experiment of 1958. Airman Donald Farrell is visible at left on closed-circuit TV.

MESSAGES
FROM THE INVISIBLE UNIVERSE

Radio waves, reaching the earth from vast distances, are clues to a greater cosmos

ARTHUR C. CLARKE

FOR thousands of years men have looked up at the sun, moon, and stars—and believed that they saw the universe. Within the last decade, we have discovered that they saw—even with the greatest telescopes—only one universe, and that another exists, invisible to the eye. This is the universe revealed not by light, but by the millionfold longer waves of radio. It has been a revelation indeed; today's astronomers are like blind men who have suddenly been granted the gift of sight. It will be years before they can fully interpret what they observe—or rather what their wonderful new instrument, the radio-telescope, observes for them.

The discovery of radio waves themselves is still less than a century old; it was as recently as 1873 that the great physicist James Clerk Maxwell predicted their existence theoretically and not until 1888 that Hertz first generated them in the laboratory. The swift rise of radio communication in the 1900s is one of the romances of modern technology, but for a long time it never occurred to scientists that nature, as well as man, could produce radio waves. It was true that brief bursts of "static," or electronic interference, accompany lightning flashes—as everyone knows who has ever listened to a radio program during a thunderstorm—but this was not considered to be of very great scientific importance, though it gave the meteorologists a useful tool for tracking distant storms.

The first man to suspect that we might be missing something was a Bell Telephone Laboratories engineer named Karl Jansky, who was trying to hunt down the source of the background noise which can be heard in any radio receiver when the volume is turned full up and no station is tuned in. Some of this familiar hissing or frying sound originates in the set itself, but part of it is

Ear to the invisible universe. This is the "dish" of the Naval Research Laboratory's radio-telescope at Maryland Point Observatory, Charles County, Md., largest steerable radio-telescope in the United States.

picked up by the antenna. In 1931 Jansky made the surprising discovery that part of this radio noise came from outer space, from the general direction of the Milky Way. This discovery would have earned Jansky a Nobel prize if anyone had appreciated its significance at the time; but—like some of the results of psychical research—it could not be fitted into the general pattern of accepted science. So, for almost fifteen years, it was virtually forgotten.

It took the radar developments of World War II to bring the facts of radio-astronomy so forcibly to the attention of scientists that they could no longer be overlooked. Early in 1942 the British Army's antiaircraft radar was suddenly and inexplicably jammed by a new type of interference. Naturally, the Germans got the blame, but it did not take long to discover that the trouble was a good deal farther away. The "jamming" was coming from the sun.

At the time, this was a well kept secret but immediately after the war the scientists concerned—mostly British and Australian—started following up this new line of investigation with great energy. They were much helped by the fact that large quantities of surplus radar equipment could be picked up for a song, and most of the first radio-astronomy equipment was built around converted radar sets.

A modern radio-telescope is, basically, a device for picking up and amplifying radio waves from selected small regions of the sky. Various types of directional antenna systems are used; some resemble TV arrays but the best known (and certainly most spectacular) are the huge parabolic bowls of which the 250-foot diameter instrument at Jodrell Bank, Manchester, England, is the largest example. This great mirror, which has tracked all the Sputniks and American satellites, concentrates radio waves in precisely the same way as the more familiar type of optical reflector—such as the 200-inch instrument on Mount Palomar in California—concentrates light waves. However, because of the much greater length of the waves used, even a 250-foot radio-telescope has a somewhat fuzzy view of the universe. Objects which are closer together than a quarter of the moon's diameter cannot be clearly separated, but appear to overlap. Even a small optical telescope can do a thousand times better than this, when it comes to resolving minute detail.

And unlike an optical telescope, which can produce dramatic and exciting photographs, the

British Information Service

World's largest radio-telescope, at Jodrell Bank, England, forerunner of bigger ones to come.

output of a radio-telescope consists of nothing but wavering lines on chart paper. The energy picked up by the bowl and concentrated at its focus is amplified by a very specialized apparatus which measures and records the strength of the incoming waves. (Sometimes the readings are tabulated automatically by electric typewriters, so that the telescope simply turns out columns of figures as it scans the sky!) Only experts, therefore, can interpret the results and say whether a sudden surge of power—recorded as a jump in the graph or an increase in the tabulated numbers—is due to local man-made interference or to some natural source, perhaps millions of light-years away.

These natural sources fall into several very different categories, and there are certainly many others still to be discovered. One of them, as the British Army's radar experts found to their discomfort, is the sun. However, the greater part of the time the sun is not a very powerful source of radio waves; if you listen to it on a sensitive receiver you will usually hear only a gentle sizzling. But occasionally, when the enormous dark blemishes known as sunspots cross the solar disk, the output of radio waves increases by many millionfold. Another potent source of radio emissions is flares—sudden eruptions of incandescent gas from the sun's surface, on a scale which makes our most violent H-bomb explosion about as impressive as the popping of a paper bag.

Precisely how these torrents and whirlpools of flaming gas, at temperatures of thousands of degrees, and moving at hundreds of miles a second, act as generators of radio waves is still being investigated by scientists. Their work will lead to a much better understanding of the sun, and it is also linked with research which before long may transform life here on earth. For the study of such

electrified gases is an essential step on the road to thermonuclear power—the release of the sea's infinite energy, to be extracted in the form of deuterium, for the use of all mankind. The sun started fusing hydrogen several billion years ago; now we are learning from its example.

That the sun was a source of radio waves did not surprise the astronomers greatly, though they were rather taken aback by the strength of its most violent transmissions. What no one could have foreseen, however, was that radio waves would also be received from far colder bodies, such as the planets Venus and Jupiter.

In the case of Venus, the earth's perpetually cloud-covered twin, the intermittent radio disturbances may come from something analogous to thunderstorms. Being nearer the sun, Venus is a good deal hotter than the earth and its weather must be—to put it mildly—tropical. In any event, the bursts of radio noise emerging from beneath the eternal clouds may give us our first definite information concerning conditions on the hidden surface of the planet.

The case of Jupiter is much more mysterious. This giant planet, its diameter ten times that of the earth, is a hundred degrees colder than the most frigid Antarctic night—so cold, indeed, that most ordinary gases are liquefied. Yet from somewhere deep down in the turbulent, half-frozen slush of methane, ammonia, and hydrogen, through which move floating islands bigger than our planet, are radio sources of immense power, generating millions of times more energy than terrestrial thunderstorms.

Very feeble radio waves have also been detected from the moon and Mars. These, however, are merely the waves that are produced by any object not at the absolute zero of temperature, simply through heat vibrations of its molecules. The radio waves which come from Jupiter and the sun are vastly more powerful than can be explained by this "thermal" effect and must have a completely different origin.

But the greatest of all radio transmitters in the universe are far more remote than sun and planets, and their investigation leads us back to Jansky's original discovery. If our eyes could respond to radio waves as they do to light waves, most of the sky would appear covered with a faintly glowing mist. The glow would concentrate into a bright band closely matching the position of the Milky Way, but scattered over the heavens would also be hundreds of individual points of radio "light," some of them extremely brilliant. These were originally, and rather naturally, given the name "radio stars," but it was soon found that most of them did not coincide with any outstanding visible stars. The astronomers were suddenly confronted with an entirely new picture of the sky, and the attempt to find the origin of the radio emanations (or discrete sources, as they are now more noncommittally called) is one of the most fascinating scientific detective stories of the past decade.

Some of these radio sources—millions of millions of millions of times more powerful than any transmitters built by man—are filaments of heated gas, expanding and twisting through space with great velocity. They may be the debris of exploding stars; indeed, this is known to be the case for one of the most powerful radio sources; the Crab nebula—remnant of a cosmic catastrophe which the Chinese astronomers observed as a brilliant but short-lived new star in A. D. 1054.

These swirling gas clouds calling attention to their existence by the roar of their radio voices are merely local eddies in that whirlpool of stars, the galaxy. Though they are far larger than the solar system, being many light-years across, they are still very small on the cosmic scale. And as radio transmitters, they cannot be compared with the most stupendous source of radio energy yet discovered.

This lies in the direction of the constellation Cygnus, but it is a million times farther away than the cross-shaped group of stars which outlines the figure of the flying swan. It is pouring out radio waves at the unimaginable rate of 1,000,000,000,000,000,000,000,000,000,000 (thirty zeros) megawatts; for comparison, a very high-powered radio transmitter may broadcast one megawatt. When this intense source was discovered, barely ten years ago, the astronomers were baffled because the best telescopes could find nothing visible to account for it. Eventually, photographs taken at Mount Palomar by Baade and Minkowski revealed a tiny smudge of light which has now been interpreted as one of the most awe-inspiring phenomena yet discovered. It is nothing less than the head-on collision of two galaxies.

This is indeed a phrase worth savoring with the mind, but the word "collision" is a little misleading. It will take millions of years for the two great systems of stars to sweep through each other, and

If radio-drenched Cygnus were inhabited, its beings would probably never learn of electromagnetism.

it is most unlikely that even a single pair of stars will actually come into contact, so vast are the distances between them. It is the violent interaction between the tenuous gas clouds between the stars which generates this tremendous pulse of power. Even from 270,000,000 light-years away, it dominates the radio sky.

Conditions must be very peculiar in a region so drenched with radiation as the Cygnus radio source. Radio communication would be as impossible as a quiet conversation in a jet-engine test cell. It is difficult to see how the inhabitants of any planets in these colliding galaxies could even discover the laws of electromagnetism, in the presence of such a roaring background of power.

And this leads us naturally to a question which many people would like to ask, but which the astronomers are chary of answering. Is there any evidence at all of signals due to intelligence among the radio noise pouring down from space?

Not yet; nor could it reasonably be expected in the present early stage of this new science. The natural radio transmitters scattered round the sky are quadrillions of times more powerful than any that even the most advanced civilizations could possibly build; against the cosmic cacophony, the voice of intelligence could be only the faintest of whispers. Our own radio signals now fill an expanding sphere of space more than a hundred light-years across; Marconi's first transmissions have already traveled fifteen times farther away than the nearest star. But long before they leave the solar system, our most powerful broadcasts fade so far below the background of interstellar noise that they are as undetectable as words that were spoken yesterday.

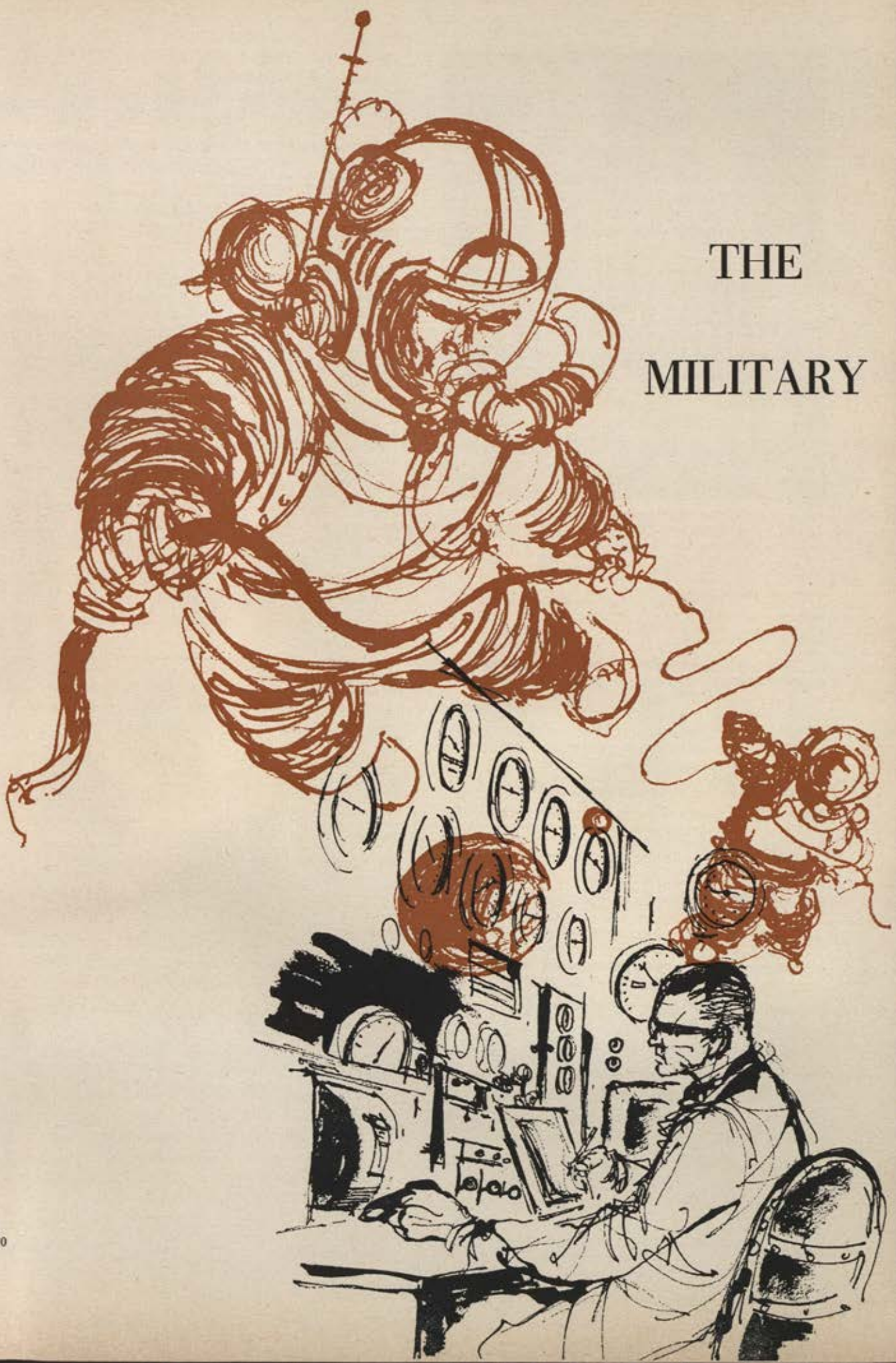
No receiver, however sensitive, can pick up signals once they have sunk below the noise level. And if we ever do detect intelligent signals from space, the beings that produced them may no longer exist—such is the slowness of radio waves, compared with the immensity of the universe. That soundless thunderclap from the colliding galaxies in Cygnus started on its way before the great reptiles trampled the earth.

Yet though they may deny it with some indignation, many radio astronomers must cherish the secret hope that some day they will detect signals which do not have a natural origin. The telescopes already built—even the 250-foot Manchester giant—are the products of the very first decade of radio-astronomy. One day they will be superseded by far larger instruments. . . .

These will not be built on the earth's surface, but will be assembled in satellite orbits, where the absence of gravity will permit the use of paper-thin materials and ultralight construction techniques. Clear of the man-made interference which now drenches our planet, they will be able to gather far more energy than today's antenna systems and, what is equally important, will be able to focus with much greater precision upon selected small regions of space. We can be certain that these vast instruments will bring us much nearer to a true understanding of our universe; and we can hope that, one day, they will tell us that we are not alone in its immensity.—END

Mr. Clarke, the author, is a well known British scientist and writer, whose many books include The Exploration of Space, The Making of a Moon, Exploration of the Moon, *and* Interplanetary Flight. *Among his popular science-fiction offerings are:* Childhood's End, The Sands of Mars, Expedition to Earth, Earthlight, *and* Reach for Tomorrow. *The article above appeared originally in the New York* Times Magazine *for November 30, 1958, and is reprinted here with permission. Reprint permission has also been granted by the author and the author's agents, the Scott Meredith Literary Agency, Inc.*

THE MILITARY



"We must have the courage to look to the future, and to invest in it through research"

SIGNIFICANCE OF SPACE

REAR ADM. JOHN E. CLARK, USN
Deputy Director,
Advanced Research Projects Agency

THE role of technology in the conduct of military operations has risen fantastically in relatively few years. The fighting power of the armed forces, as never in the past, now depends on the attainments of technology, on the potentiality for the mass production of new kinds of weapons, and on the level of the technological preparation and the education of the many-millioned masses of the population.

The question of the role of science and technology in modern war is one of the key questions in military affairs.

The physical and mathematical sciences, particularly the discoveries in physics made in the last decades, have especially great significance for military technology. The development of work in the spheres of electrical and magnetic fields led to the creation of radio technology, which provides for communications between the armed forces and the command, for automatic guidance of equipment at a distance, and for the means for radar detection of the flying objects projected by the enemy.

Learning to harness the energy contained in the nuclei of the atoms of a number of chemical elements has permitted the construction of atomic weapons of awesome power and the construction of ships with atomic propulsion, and the approach to the creation of atomic-powered aircraft and space rockets.

Giant strides in the basic knowledge of chemistry, of astronomy, of ballistics, of aerodynamics, led to the realization of the long-range rocket capable of flying several thousands of miles and of rising to heights far into space, leading to artificial earth satellites. These satellites, together with their scientific value, may well some day have a tremendous military significance. From them it will be theoretically possible to carry out nearly all the basic military operations such as reconnaissance, communications, damage assessment, weather prediction, bombardment—and far more precisely.

Often research, which at first glance seems to be of no anticipated special significance militarily, works out in practice to accomplish a revolution in technology and exercises a revolutionary influence on weapon systems. As an example, one might refer to the research in semiconductors like the germanium crystals. Research has shown that the semiconductors can replace many types of electronic tubes in complex radio technical and electronic instruments. This permits the making of both very compact and reliable radio devices.

From this arise great possibilities in the manufacture of guided and automatic weapons and other important types of modern military equipment.

Even such sciences as celestial mechanics and astrophysics have now acquired decisive significance for military affairs. Celestial mechanics until recent times has been interested in calculating the motion of celestial bodies. Now this science is employed to calculate the flight of long-range rockets and artificial earth satellites. Astrophysics is concerned in part with the study of the physical characteristics of cosmic space. Information about these characteristics is now used in order to forecast the environment within which artificial satellites and rockets must work.

It is necessary to know how cosmic rays would act upon their delicate mechanisms, what the temperature of the rockets would be when heated by the sun, and what would happen in the event of their collision with a meteorite. The research of astrophysicists regarding the condition of the matter within the sun and the stars at temperatures of millions of degrees and pressures in billions of atmospheres has great significance for the correct understanding of the essence of the atomic explosion.

The light and the radio waves emanating from stars, planets, and cosmic nebulae can be employed for the automatic guidance of very long-range unmanned aircraft, thus assuring very great accuracy in the guidance of their flight to a given target.

Mathematics and the associated theoretical mechanics have long had essential significance for the development of weapon systems. Many questions of mathematics and mechanics have received their scientific development in connection with the solution of the elements of artillery fire.

Guided and self-homing missiles are swiftly replacing guns and some types of aircraft. They have special components making possible the change of direction of the flight of the missile in flight. This is achieved in various ways. One can place instruments in the missile which sense the target and guide the missile to it, or have the missile ride a radar beam, or by following the target path one may direct the missile to it by radio command.

These things are done on the basis of a new sphere of science called cybernetics, the theory of the guidance of machines and mechanisms with the assistance of automatic devices. This science obviously has great significance for the automati-

zation and mechanization of commercial production.

Everything up to this point leads to but one conclusion: War is no longer an art but a science. Technology and science in warfare have advanced so fast and far—and are advancing faster and farther—so that in any kind of war, be it limited —which is far more likely—or all-out nuclear, that side with the highest order of technology and science on its side will prevail.

In past wars there has been time after the war started to initiate and carry out massive, expensive crash programs in technological fields. In the last great war such things as radar, influence fuses for antiaircraft guns, and atomic bombs were developed during the course of the war. If we aren't ready to use advanced technology and have in hand superior weapons if any war starts in the future, we may not survive the first operation.

In past years, tactical and strategic plans were our most jealously guarded secrets. Today our secrets should be our scientific knowledge of weapon systems.

But one can't keep scientific secrets unless one has them to keep.

What are the Russians doing about scientific matters?

First, it is quite important to understand that the Soviets, in rather marked contrast to the cultures of the West, regard the sciences as being *fundamental* rather than *incidental* to the entire cultural-social life of the nation. This is a very profound difference between the status of the sciences in the free world cultures and in the Soviet Union. It is important for us to understand this feature if we are to understand where and how research and development is being run or where it is going.

The second feature has to do with the control exercised by the Soviet Academy of Sciences.

The Soviet Academy of Sciences, founded by

Peter the Great is almost 250 years old. The Academy today is the largest scientific organization in the world. It has over 20,000 people in its membership and staff, of whom 1,600 are considered to be technical workers. Of these 1,600, about 600 are full professors. They represent the top scientists in the Soviet Union in the many fields of science. And their job is to direct the nation's research and development.

Another responsibility, not as clear-cut, came in a series of decrees throughout the 1920s. The Academy was charged with integrating and directing the entire national effort in research and development. Despite many internal struggles and the heavy hand of Soviet bureaucracy, these top scientists are responsible for seeing that the research and development programs of the nation are in line with the political objectives of the Soviet leadership. In a monolithic structure, this probably has certain advantages.

The third thing which the Academy has been able to do because of its prestige, its influence, and its position, has been to raise the social lot of the teacher, the scientist, and the professional engineer to the very highest social strata in the Soviet Union. And as a part of this effort to establish high prestige for scientists, the Academy has insisted that most top scientists also teach school. This practice is a very general one throughout the Soviet Union. If you are a scientist in a laboratory, you are generally also a part-time teacher in that laboratory or in a school.

With continuing hope in the essential good in man, the United States has lived in a glass house during the International Geophysical Year. Recognizing that penetration of the secrets unfolding before us requires the efforts of philosophers and scientists the world over, the United States has sought a truly international effort.

And what has this meant to the USSR, the other national participant in earth satellite launchings? It has meant great benefit to itself with little return to others in kind. We should ask ourselves *why*, and we should keep putting this question to ourselves until we make the honest answer. Why are we told little or nothing about Soviet launchings, launching equipment, experimental results, and the like? Why do the Soviet leaders and scientists play coy and superior in an international effort, purportedly devoted to all mankind?

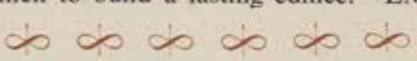
We don't like the real answer because it means a long pull effort during which consumer sacrifices will be made. It means a devotion to research which will grant progress at the expense of present day luxuries. It means intense work, resolution, and character, expended perhaps over our entire lifetimes, and a few generations beyond us. Nevertheless, the answer has not changed since the Communist Manifesto, it has not changed since Stalin, it will not change after Mao and Khrushchev.

Communism has short-term tactics, it does not have short-term strategy. Its strategy is domination of all there is to dominate, whether on earth or in space. Until Communism as a way of life has faded from control over key areas on this earth, the United States and the free world must go forward by giant steps, on the long legs of advanced research.

There has been great concern throughout the free world that space will not be used strictly for peaceful purposes. There has been no such concern evident in the Communist camp. Again, *why?* And again, let's face up to the answer. The Communist leaders know beyond a shadow of a doubt that the free world longs with all of its collective heart to keep free space free. They rely on this longing. They abet it with hollow pronouncements, while pursuing secure programs under strict military discipline. Their few scientists who are not also generals receive laurels and medals, speak eloquently, but apparently are isolated from the actual space programs of the USSR and the absolute military applications securely tied thereto.

Is there anyone here who doubts the grave military and political implications of a Soviet man circling the earth in a space vehicle beyond our power to counter? Does anyone doubt the military profit inherent in a manned lunar base? I can assure you, there is no doubt in Moscow. . . .

The United States will launch more satellites this year and in the years to come. But we must digest the fact that the Russians are ahead of us in this field because of our late start. These years will not be made up overnight and the surest way to remain forever behind is to be panicked into crash programs of a glamorous nature, and neglect the basic work that will provide the foundation upon which to build a lasting edifice.—END



This material is from Admiral Clark's address on December 9 before the Aberdeen Proving Ground chapter of the Armed Forces Management Association. Now Deputy Director of ARPA, the admiral was formerly Director of Guided Missiles Division, Office of the CNO.

WHY should enormous sums of money be spent on the investigation of space, when no apparent material gain will be forthcoming?" "Why should useful citizens be allowed to throw away their lives in pursuit of a useless scientific experiment?" "Has not man already overstepped himself in the great scientific discoveries of this generation?" "The probing of space represents further interference with the secrets of nature which may well lead to man's ultimate oblivion."

Such comments are often made, and the writer will attempt to explain why many eminent scientists and laymen believe that space exploration is a natural development of man's insatiable thirst for knowledge and must be carried out to the utmost of man's ability.

Zoological and medical investigations have shown beyond doubt that physically man differs but little from the higher animals. The essential difference between *homo sapiens* and the higher animals appears to be "thinking man's" ability to reason and create systems of thought. Underlying all man's achievements of civilization and science is his desire to probe the unknown. It was this passionate desire to know what lies beyond the horizon that led to the discovery of new continents and ringed the earth with systems of communication. Without this inquisitive desire to learn where, how, and why things exist, man degenerates to a state of mental stagnation, as can be well illustrated by the aborigines of Australia, whose life and customs have not apparently changed much since very early in human history. Behind man's thirst for knowledge lies a prime motive, or driving force, which, although he may not realize it, is based on his ever-present desire to solve satisfactorily the meaning of his existence, and of his place in the universe.

Man is gifted with power to reason, a factor which places him far above any animal. To suppress this power in any way is morally wrong. Reasoning can only lead to truth if facts are known, and unbiased scientific investigation is the only sure means of obtaining these facts. It is obvious that, if man's wonderful gift of reasoning is to be fully exploited, most scientific investigations must proceed without restriction, especially in man's future endeavors to conquer space.

It is difficult to realize the exciting thought that the advent of space exploration is so near that there may be young people alive today who will be privileged to live in an era when some of the most baffling mysteries of the universe may be at least partially solved. . . .

What is the meaning of [our] universe? Where does the human being and life fit into [its] vast plan? Can we believe that an ordered dynamic universe working and moving to definite laws can have been created for no reason whatever? Man, being what he is, demands that there must be a purpose in the existence of the gigantic system. Is life part and parcel of this system, or is life completely alien to it? It may well be that life on this earth is existing in a hostile universe, the purpose of which has nothing whatsoever to do with life. We may recoil at this idea, but the possibility must be faced, because the answer to this question is of such fundamental importance that, if known, it could have tremendous repercussions on philosophical and religious thought.

Many learned men have expressed the opinion that the origin of life on this earth was the direct result of a chance combination of atoms and molecules under favorable conditions. This combination is thought to have resembled a complex protein-type molecule capable of utilizing surrounding molecules in order to duplicate or reproduce itself. It has been suggested that the possibility of such a chance combination is so remote that even if there were hundreds of millions of planets similar to the earth, not more than one would be likely to produce life. However, we must not delude ourselves about this; if a rudimentary life form created by chance is assumed, then there is overwhelming evidence to show how this entity could have developed into more complex forms, culminating in the production of higher animals and finally, man.

If the above theory is accepted, then there is little doubt that man is indeed living in a hostile universe, in which life is not part of the scheme of things, but is in fact an abortion of nature. If this is the case, then it is a terrible and hollow joke that man should have developed the power of thought and reasoning only to prove himself a freak of nature. This purely cynical and materialistic point of view is not necessarily subscribed to by the writer, but since scientific inquiry cannot take religious and philosophical beliefs into account, it is necessary to show what sort of conclusions can soon be arrived at by relying only

Will Man Find a HOSTILE UNIVERSE?

A. R. ACRAMAN, B.SC., A.R.I.C.

on the limited amount of scientific knowledge.

If life, as we know it, exists elsewhere in the universe, then conditions must be present to sustain it. Such conditions, as far as we know, can only exist on planets which revolve round a parent sun. The secret of the successful continuity of life is its adaptability to prevailing conditions. If this were not so, life on earth would have been liquidated at a very early stage of its development. Life is not a stagnant phenomenon but is constantly changing with conditions and environment. Because of this plasticity it is possible that once life has been created under suitable conditions, it can remain in existence under almost any future condition except that of extreme heat or extreme cold, providing conditions change slowly enough for some form of evolutionary adaptation to be accomplished. With this in mind, the possibility of life surviving on any other planet cannot be dismissed completely. It is not yet known for certain whether there are any planetary systems existing other than round our sun. This surprising lack of knowledge is due to the fact that planets, having no light of their own, are only seen when they reflect light from their parent sun. As the nearest star is several light-years away, the reflected light from any distant satellite would be too weak to be observed by any telescope located on earth.

With the development of manned artificial satellites out in space, scientists will be able to install telescopes so large that the details of some of the nearest star systems will be clearly visible. On earth, the effective range of an astronomical telescope is limited by the filtering and refractive effects of earth's atmosphere. Telescopes in space will not be subjected to these limitations; it will therefore be possible to prove conclusively whether or not the nearest stars have planetary systems revolving round them. If only one other planetary system can be discovered, the universe is so vast that we could logically conclude that a planetary system is quite a regular occurrence, and the universe could be considered as containing hundreds of millions of possible abodes of life.

If such planets do exist, we could never hope to reach any of them by space travel as it is currently envisaged, because these journeys would take many thousands of years to complete. Unfortunately, therefore, definite proof of the existence of life on these far-away planets is not likely to be forthcoming. Seekers of the truth are not daunted by this, because, fortunately, we always have the planets of our own solar system, which, by comparison, are relatively close to earth, and during the conquest of space a number of these will undoubtedly be investigated at close range.

Of all the planets in the solar system, Mars offers conditions nearest those of earth. Mars has an atmosphere which may possibly contain a very small amount of oxygen, and has a limited quantity of water. The planet spins on an axis in a similar manner to earth so that seasonal climatic changes occur. As Mars lies approximately 140,000,000 miles from the sun compared with the earth's 93,000,000 miles, the seasonal temperature variations take place considerably lower down the scale than on earth. For example, the equatorial temperature of Mars is approximately equivalent to that of a May day in central England. From this brief summary of Martian conditions, it seems probable that some life forms could live there. Many astronomers do in fact believe that life of a kind does exist on Mars. Considerable evidence has been put forward in favor of this theory; for example, certain parts of the planet's surface are known to undergo seasonal variations in outline and color. This can be explained by

This provocative article is reprinted with permission of the author and the British Interplanetary Society from its publication Spaceflight *for October 1958. Mr. Acraman's article is an outstanding example of an interesting array of ideas presented in the same issue of the magazine. Among the other astronautical subjects covered in the October* Spaceflight *are the relative merits of space stations as launch sites for interplanetary travel, Russian views of astronautics, the possibilities of hydroponics in astronautics, a valuable glossary of astronautical terminology, and an excellent, detailed table of all earth satellites launched through last August. The British Interplanetary Society was founded in 1935 and includes many British and foreign rocketry authorities. It publishes both the nontechnical* Spaceflight *and a* Journal. *Full particulars on membership or subscriptions may be obtained by writing to the Secretary, British Interplanetary Society, 12 Bessborough Gardens, London, S.W. 1, England.*

postulating the existence of plant-like forms which change their color as the seasons change, in a manner similar to many of our own plant species. The real solution will be forthcoming only when the planet has been visited by man.

In all probability, the first heavenly body to be investigated will be earth's own satellite, the moon. This is one of the least likely places in which we expect to find life. There is no appreciable atmosphere and no water. The surface consists entirely of nonheat-absorbing material which reflects almost all the heat and light from the sun. Because of this, the surface temperature during the lunar day is hot enough to boil water, while at night the temperature drops almost immediately to far below the freezing point. Despite these terrible conditions, a number of authorities on the subject believe there is a faint possibility that a low form of life may exist in certain craters on the moon. This assumption would explain the appearance of certain dark irregular patches on the walls of some lunar craters, the shape of which appear to change from time to time. If this is true, it portrays a startling example of the tenacity of life and life's ability to survive appallingly adverse conditions.

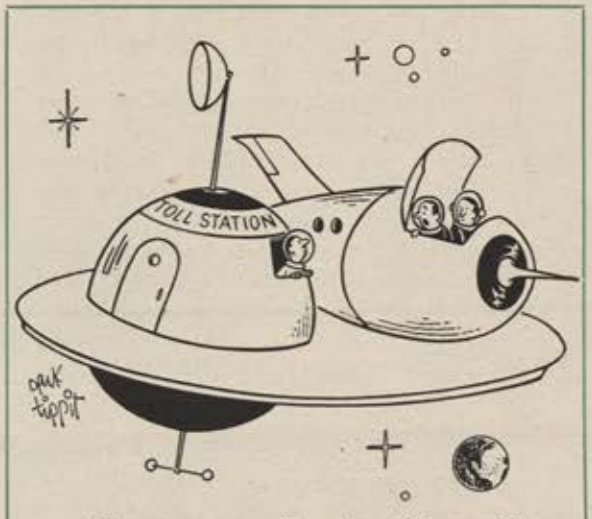
The motives which inspire man to delve into fundamental scientific research depend basically on his innate desire to explain the nature of the universe and life's position in it. Before any sound universal scientific philosophy can be founded, the true nature of matter, energy, and life must be explained. Whether or not these questions will be answered may depend on the success or failure of man's future conquest of space.

The question which concerns man personally is the explanation of the part life has to play in the universal plan. It has been shown that life may be alien to the universe, existing temporarily in a hostile universe as a parasite on earth. On the other hand, life may be present as a natural sequence which is found to occur if conditions are favorable. If life in any form whatsoever is found on any other planet the consequences would be profound; for this might be in some ways regarded as man's *greatest and most wonderful discovery of all time.*

If the presence of life is discovered elsewhere in the planetary system, we can logically conclude that life is not just an unhappy accident of nature, but a natural consequence of nature, that the phenomenon of life is not a fugitive in a hostile planetary system, but part of a natural order governed by universal laws.

Should it be proved beyond doubt that life exists on any solar planet other than earth, and we discover by means of space telescopes that other planetary systems exist, then we can but conclude that many of these planets are also abodes of various life forms. No longer could we then think of the universe as a massive dynamic system bearing no relation to life; on the contrary, we should be forced to admit that in all probability this universe of inconceivable dimensions is teeming with life of all kinds. If this is true, how much more wonderful the universe will seem. We can attempt to imagine the diversity of life forms, and conditions under which they may live. Each abode of life would have its own evolutionary history culminating in its present end product. Some of these life forms may possess intelligence comparable with our own. What is even more likely, many different entities throughout the universe may have far exceeded our own standards of intelligence, and may even have solved the most vital secrets of nature and the meaning of the universe.

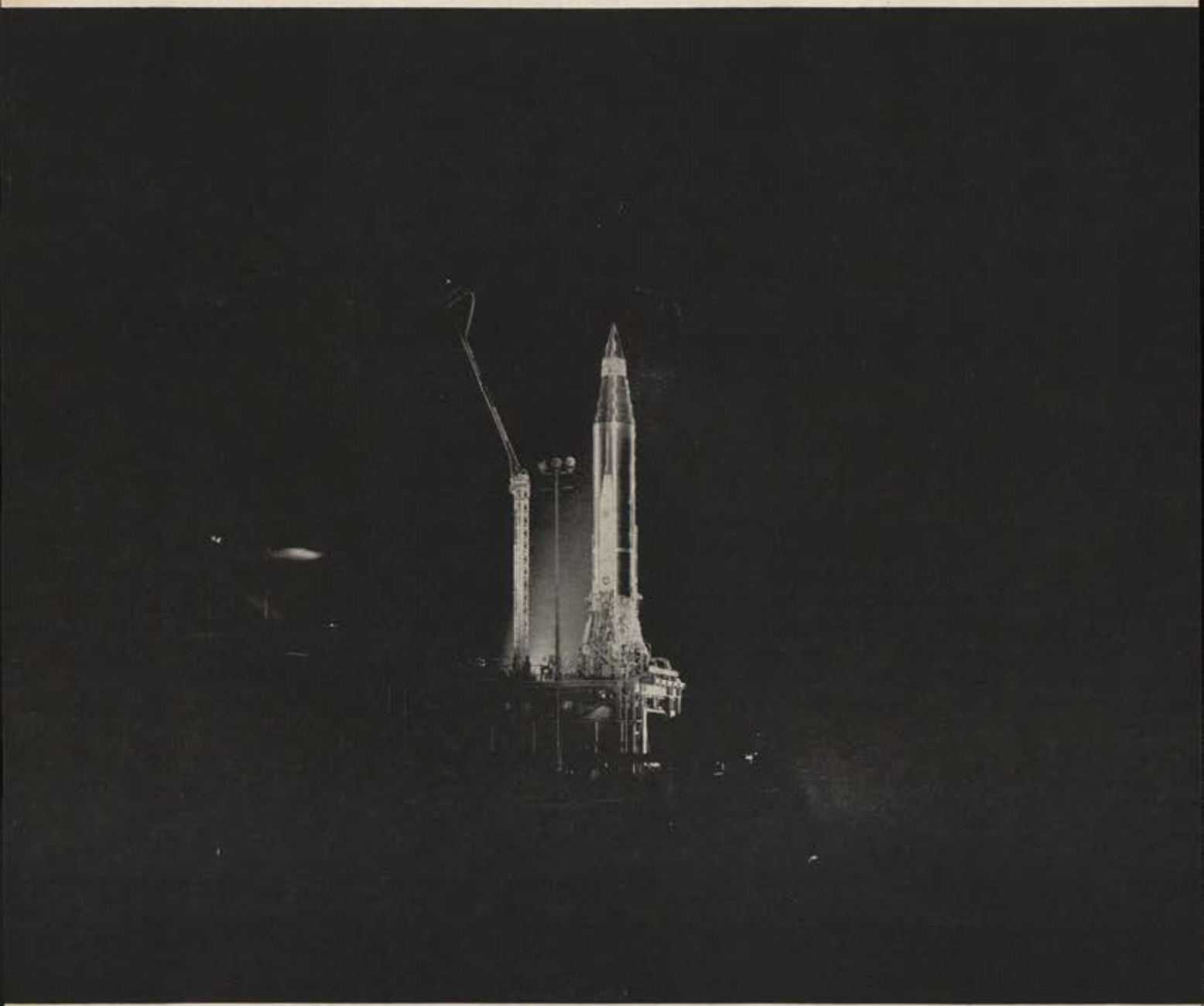
The day when ultimate knowledge of the universe is gained by man may be very far off, but the writer believes that by the pursuit of knowledge by scientific methods, the truth of life and the universe will eventually be found. It may take thousands of years, but some day, in a much enlightened age, men will cease to hate one another and join together in a common universal philosophy, for seeking the truth.—END



"Do you accept Travelers Cheques?"

Space Age missile

ATLAS



Before the launch, the "beast" stands cold, 100 tons of steel, more than 40,000 parts—and all will work.

AWAY *makes the full trip*

USAF's biggest push into the space age took place at 9:27 p.m., on November 28, 1958, from Cape Canaveral, Fla. There were some 360,000 pounds of thrust at work to carry the Convair Atlas intercontinental ballistic missile its full range of 6,325 statute miles into the South Atlantic.

The accuracy of the shot, relatively unheralded in press reports the next day, was amazing. An unofficial report, straining with modesty, said the missile landed within thirty miles of its predicted target. The exact figure remains classified, but there are indications that it is substantially lower than thirty miles.

Significance of the shot goes beyond the obvious observation that it matches a feat the Russians say they accomplished in August of 1957.

The Atlas may prove to be the DC-3 of the missile and space era, the most practical vehicle for America's early attempts to put heavy satellites in orbit.

Early last month the Defense Department's Advanced Research Project Agency (ARPA), announcing the Project Discoverer satellite series, said Atlas will be used as the program advances. For this work a high-energy upper stage will be added, providing boost for a payload weighing as much as 10,000 pounds.

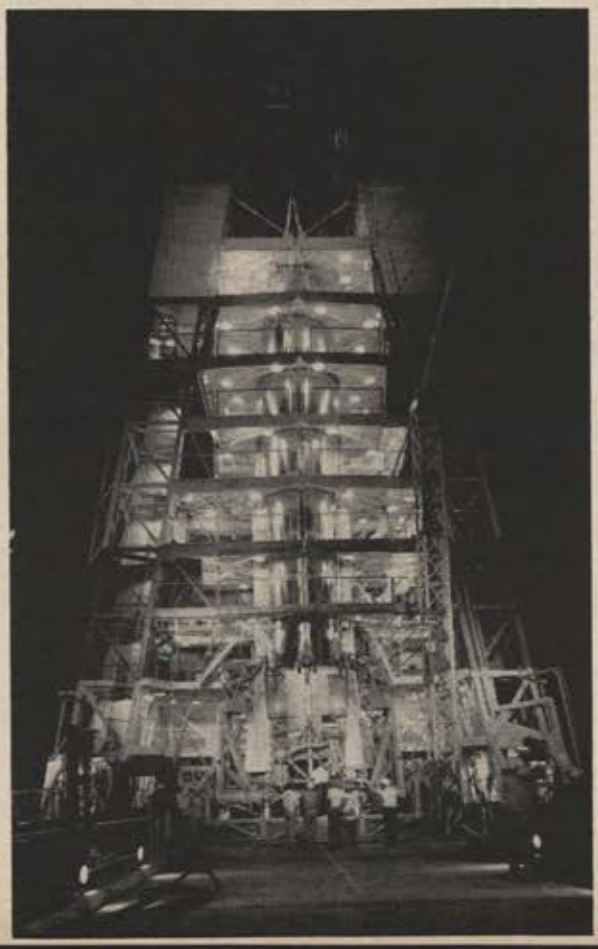
Almost as if in reply to the USAF accomplishment, reports came out of Russia in early December that the Reds have an ICBM with a range of 8,700 miles. Most experts believe this not only is possible, but probable. They assume the Soviet weapon is the same one announced in 1957, but is now carrying a smaller payload for a greater distance. Thrust, also, could have been increased.

Atlas, of course, is capable of the same choice. When the project was started back in 1946, Atlas roughly paralleled the air-breathing Snark and Navaho guided missiles in the basic requirements of range, payload, and accuracy. The range at that time, with relatively primitive and heavy nuclear charges, was about 5,000 nautical miles.

The amount of progress we have made in developing progressively lighter warheads naturally has not been disclosed. But it is certain that great progress has been made and equally certain that this gain will add to the range capability of Atlas. And the effort to improve engine thrust is a continuing program.

From the standpoint of America's missile capability in the weapons race, Atlas will add to the deterrent power of the Strategic Air Command. The ICBMs are due to attain operational

Closeup, before removal of the gantry crane, shows Convair and Rocketdyne launching experts on job. Platforms are servicing areas for prelaunch check.



First flames make the launching pad a fiery nest.

capability before the end of 1959, first at Vandenberg AFB, not far from Los Angeles. Other launching bases are slated to be built at Cheyenne, Wyo., Omaha, Neb., Spokane, Wash., and Denver, Colo.

From these SAC sites, it will be possible to hit almost any point in the Soviet Union, a fact that has an important bearing on the evident determination of the Defense Department to curtail planned production of the Thor and Jupiter intermediate-range ballistic missiles.

The Atlas achievement may, in the long run, have as much significance in the diplomatic world as it has to the military arsenal. It is becoming clearer that the touch of blackmail seen during the Suez crisis—when Russia spoke menacingly about its missile capability—is growing into an important factor in the cold war.

There is no way to measure the impact of Atlas in that situation. But the fact that it is here and on the eve of true operational capability should give comfort to the nation. Because of past errors, the Atlas intercontinental ballistic missile may be late, but it is not too little.

—CLAUDE WITZE

USAF Atlas Placed in Orbit

The significance of the Atlas ICBM put into short-term orbit around the earth just as this issue of SPACE DIGEST *went to press is that the US now is close to being able to put a man into space. A single additional booster on Atlas can probably place a human in orbit—once the manner of safe reentry is solved—or even permit escape from earth's gravity. But the marvel of guidance demonstrated by the ARPA-USAF launch of December 18 is equally significant. The Atlas reportedly was guided into orbit by its own system, indicating that this mighty ICBM now can be counted on not only to hit any point on earth's surface but any "point" in near space as well. And, as a bonus, the Atlas is demonstrating the value of satellites in a global communications system.*

She's off! 360,000 pounds of thrust lift the "bird."

SPACE *and the Weather*

T. KEITH GLENNAN

Administrator, NASA

OVER THE years great progress has been made in [long-range weather prediction], but there are definite limits to what we can hope for in weather prediction so long as our observations must be made entirely from within the earth's atmosphere.

One example is the way the behavior of the air masses over the oceans often determines the weather over the inhabited land masses. These great areas of water, as every schoolboy is taught, cover more than two-thirds of the earth's surface. We know so little about how the world's weather is generated over these vast ocean masses and over the polar areas that we are unable to forecast the resulting weather accurately. This is particularly important in the case of devastating typhoons and tornadoes. We have made some progress in our aerial study of hurricanes that form in the Caribbean, but the cost to expand this kind of effort around the world would be great, and the information obtained insufficient to warrant the added cost.

With properly instrumented satellites, the meteorologists can watch storms form and move and disappear, all around the world on a twenty-four-hour basis. They can study also the physical processes that *make* our weather . . . how the earth's surface absorbs heat energy from the sun in varying amounts, and how the heat circulates. . . .

By observing, measuring, and then understanding these complicated heat-transfer processes, the meteorologists expect to be able to predict normal and abnormal weather, including the onset of destructive droughts, catastrophic windstorms, and flood-producing rains. Beyond all this, they dare dream about the day when, finally, they will have fully comprehended the meaning of their new knowledge and may then be able, to an extent, to modify the weather. Calculation of [savings] of several billions of dollars [by US Weather Bureau Chief, Dr. Francis W. Reichelderfer] was premised on the value of more accurate, longer-range weather and storm forecasting. The value of weather control would be incalculable.

The use of satellites in communications also offers the prospect of great advantages and economies. In this area . . . there is such keen interest that several of our most profit-conscious electronics companies are spending money of their own to ensure, if possible, that they have the competence to ensure their participation in such satellite operations. . . .

But what of the longer pull? What is the payoff prospect there? Let us face the fact that the space bill will be one that is counted, year after year for a long time to come, in the hundreds of millions of dollars. Unfortunately, as Norman Cousins has pointed out, this activity will take its toll of young lives, as well. I don't know all the good that will result, and I doubt if any man alive today can give really specific answers.

In this connection I am reminded of the story they tell about Michael Faraday, the English physicist, whose pioneering work in electromagnetics had such a profound effect upon our later understanding of electrodynamics leading to the development of useful electric power. It was about a hundred years ago that Mr. Faraday is supposed to have been asked, in the British Parliament, about the value of his electromagnetic experiments. His answer, so the story goes, was, "I can't tell you what it'll be good for. But I'll tell you this: One of these days you'll be taxing it." . . .

To quote another very wise man . . . a member of the President's Space Council, Dr. James H. Doolittle:

"I can't tell you precisely what of great value will come out of our moving into space to probe the secrets of the universe. However, I have the conviction, and in this I find myself in the company of some very wise men, that a century from now, perhaps much sooner, people will say that this venturing into space that we're planning now was one of the most practical, intelligent investments of our national wealth to be found in history. If we in the United States take the wisely bold action necessary to lead in exploiting the possibilities of space technology for science, all mankind will benefit."—END

This material is from the remarks of Mr. Glennan at the annual banquet of the Fort Worth, Tex., Chamber of Commerce, on December 8, 1958.

The Evolution of Space Exploration

SPACE operations may be classified in accord with the properties of the environment, the characteristics of motion and pertinent velocities, and the destination of the flight. The evolution of human flight —as it is today, as it may be tomorrow, or as it might be in a more or less remote future—we may then see in four stages:

1. For the past fifty years we have been in the stage of atmospheric flight. Its characteristics are very well known: propeller and jet propulsion; the lower regions of the atmosphere as the flight zones; pressurized cabins; subsonic and supersonic speeds; generally normal gravitational conditions; distances of geographic dimensions; and flight durations of fractions of a day. *Status of the craft:* airplane.

2. We have now entered the next stage: space-equivalent flight. The characteristics are: jet and rocket propulsion; the partially space-equivalent regions of the atmosphere; sealed cabins; supersonic and hypersonic speeds; the gravity pattern—multiples of G, reduced G, and nullified G; operational range of geographic dimensions; flight duration from minutes to several hours. *Status of the craft:* airplane plus projectile. The craft of the Century series and especially those of the X-class—like the Bell X-2 and the North American X-15—are the prototypes belonging to this stage of space-equivalent flight or space-equivalent operations.

3. As soon as it is possible to push a manned vehicle into an orbit with orbital velocity, we will have manned orbital flight or manned satellite flight. The characteristics are: totally space-equivalent regions of the atmosphere or circumterrestrial space; sealed cabins; orbital velocities in a geocentric orbit or in the earth's gravisphere; the gravity pattern—multiples of G and long durations of nullified G. *Status of the vehicle:* biosatellite. The smaller research satellites with and without animals in the International Geophysical Year are the first step in the direction of manned satellite operations or circumterrestrial space operations.

4. The final stage will follow as soon as the attainment of escape velocity makes escape operations possible beyond the gravitational control of the earth. The characteristics of gravispheric escape operations are similar to those of satellite operations except that the vehicle now enters the gravispheres of other celestial bodies and may circumnavigate the moon or other planets, or may even land on them. In this final stage of space operations the vehicle will have attained spacecraft status.

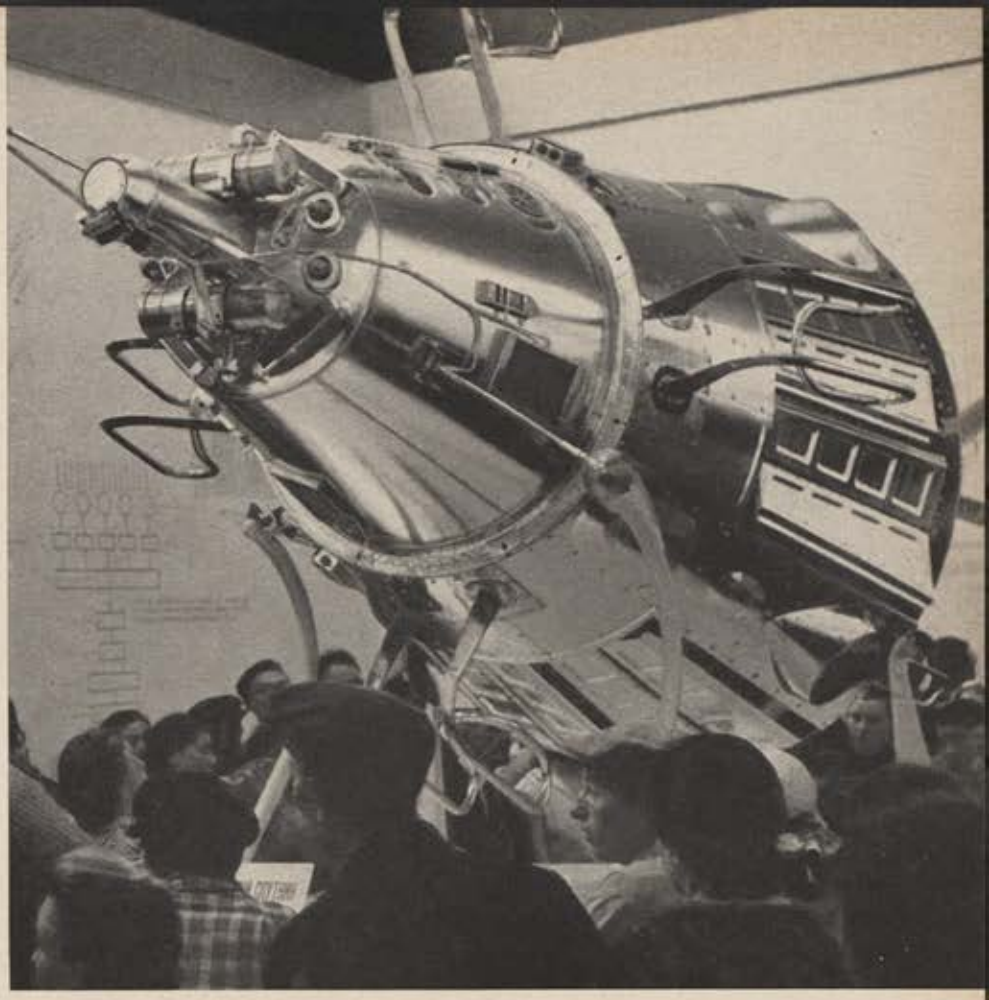
There may be some transitional stages between these four basic stages of space operations, such as satelloid flight, i.e., a powered satellite for flights in the regions below the mechanical border of the atmosphere.

This classification gives a realistic perspective of the stage at which we stand today and of the development possibilities we may expect in the future. The timetable of that development will be determined by space technology, but in any event space medicine must and will be prepared to meet and cope with all these possibilities.

This selection, by USAF's Dr. Hubertus Strughold, first appeared in Air University Quarterly Review *and is reprinted here with special permission.*

The Russians Look at Their Sputniks

Photos by Richard E. Stockwell



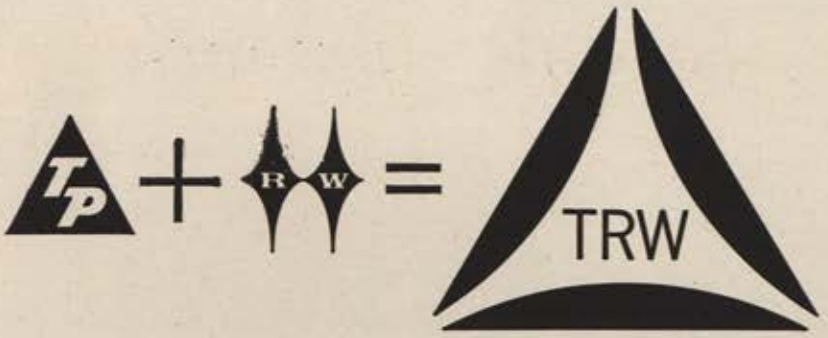
Gleaming model of Sputnik III wows plain-folk crowds in Moscow.

THAT the Soviets don't miss a bet in impressing their people with the prowess of Russian astronautical science is evidenced by these photos of the heavily attended public exhibition in Moscow of Sputniks orbited to date. An estimated 50,000 persons a day, plain people ranging from teenagers to grandmothers, view the display and marvel at the charts and photos explaining Sputnik missions and performances. Staged in the Academy of Sciences Pavilion in the Red capital, the Sputnik show's emphasis is on scientific accomplishment, and military applications are not expressed. To add to the interest and provide answers for the unsophisticated, there are guides on hand to give explanatory lectures. As the pictures indicate, the earthbound Sputniks are realistic full-scale models of the hardware that went into orbit.—END

Sportshirted space enthusiast is one of thousands viewing space show, hearing provided lectures.

Left, a gleaming model of Russia's first Sputnik.

second in a series



THE MERGER

The legal act of merging two companies into one does not of itself change the sum total of their capabilities. Thus, today the competence of the Ramo-Wooldridge Division for the development of electronic systems for military and commercial applications is indistinguishable from that of its predecessor organization, The Ramo-Wooldridge Corporation, while the skills of the Thompson Products group of divisions in the design and large-scale production of precision devices also remain unchanged. Soon, however, effects of the merger will begin to appear. One early effect will be an important addition of manufacturing strength to Ramo-Wooldridge programs, several of which have passed out of development and are in the prototype or manufacturing phases. Conversely, the special skills of Ramo-Wooldridge scientists and engineers in certain fields can usefully supplement the services that the Thompson Products divisions offer to their customers.

The formation of Thompson Ramo Wooldridge Inc. is intended to provide an unusual capability for the development and production of the complex electronic and mechanical devices and systems required by today's expanding technology.

Thompson Ramo Wooldridge Inc.

Main Offices • Cleveland 17, Ohio
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DIVISIONS AND PRODUCTS

TAPCO: Missile and aircraft auxiliary power systems, ground support systems, fuel systems, pumps, accessories, hydraulic systems, pneumatic systems; electronic control systems, microwave switches; frame structures, pressure vessels. Jet engine compressor blades, rotors, stators, and impellers; turbine buckets, rotors, and stators; structural and fabricated components. Rocket engine cases, nozzles and pumps. Nuclear reactor control rods, pumps, accessories, and core structures. Precision investment and continuous vacuum cast parts for aircraft, missiles, jet and rocket engines. Vacuum cast super-alloy ingot, billet and mill shapes.

RAMO-WOOLDRIDGE: Electronic reconnaissance and countermeasures systems, infrared systems, analog and digital computers, air navigation and traffic control, anti-submarine warfare, electronic language translation, information processing systems, nuclear energy applications, missile electronics systems, advanced radio and wire line communications.

AUTOMOTIVE and INDUSTRIAL PRODUCTS: Valves and associated parts for all types of internal combustion engines. Steering linkages, front wheel suspension ball joints, hydraulic cylinders and pumps, cylinder sleeves, piston rings. Truck retarders. Diesel engine turbochargers. Rock drill bits and drill rods. Alloy pistons for automotive and aircraft; impact extrusions, permanent mold and die castings. A wide variety of automotive replacement parts distributed nationally and overseas through 7,000 distributors.

CONSUMER PRODUCTS: High fidelity amplifiers; FM-AM radio tuners; magnetic tape recorders; stereophonic sound systems, public address and intercommunication systems. Television cameras for industrial and broadcast purposes; complete low-power television broadcasting stations.

THE THOMPSON-RAMO-WOOLDRIDGE PRODUCTS CO.: Digital control computers and associated equipment for automatic control of industrial processes, data logging and computation, pilot plant operation and process research, test facility operation, and general computational use.

PACIFIC SEMICONDUCTORS, INC.: Germanium and silicon diodes and transistors, high voltage rectifiers, subminiature rectifiers, voltage variable capacitors.

Number of employees: 22,000
Estimated 1958 Sales: $335,000,000
Plants in Los Angeles, Bell, Culver City and Long Beach, *California.* Denver, *Colorado.* Michigan City, *Indiana.* Cambridge, *Massachusetts.* Warren and Portland, *Michigan.* St. Louis, Manchester and Sullivan, *Missouri.* Cleveland, Euclid, Willoughby, Minerva, and Columbus, *Ohio.* Danville and Harrisburg, *Pennsylvania.* Roanoke, *Virginia.* St. Catherines, *Ontario.*

Notes on the Scientific Approach

The following selection was found among the papers of the late Dr. Kenneth S. M. Davidson after his death last year. It is reprinted with permission from *Aero/Space Engineering*, November 1958, the journal of the Institute of the Aeronautical Sciences, of which Dr. Davidson was a Fellow.

THE natural sciences, in their essence, are expressions of the human spirit, like music or literature. Man has always been curious about nature and the universe around him. He has always been led on, irresistibly, to explore things he does not understand. Often, in the process, he has discovered something quite different from what he expected, and a new line of thought has been opened. So it has always been, and so it must inevitably go on. There is no other way known. The best scientists all agree on that. They agree, too, that if science is to flourish, the prime need is a healthy sense of free enquiry. It is not that scientists consciously balk at restraints more than anyone else. It is simply that they stop functioning under restraints. The only choice one has is to give them their heads and get what they can give, or hold them on a rein and not get anything.

There is nothing new in this. It was understood in a groping way when Charles II of England founded the Royal Society in the 1600s. It was well understood in the German universities before the first World War. It is thoroughly understood by a great many people today in all parts of the world. Furthermore, there is a great deal more scientific work of high caliber being done today than ever before in history. Why, then, should there be so much talk about it at this precise time?

One straightforward reason is clear enough. The influence of scientific discoveries on military affairs has been growing at a prodigious rate since the early days of the second World War. At the same time, military affairs have continued to have an urgency about them and have been drawing very heavily on the accumulated background of scientific knowledge. Most scientists foresaw at the end of the war that something ought to be done to ensure a continuing supply of new knowledge. A little was done. Now there is concern that it was not enough.

But this does not go to the heart of the matter. There has even been talk of "crash programs" to make up for lost time. There is no such thing as a crash program in science. Science is a habit of mind, a sensitive awareness of the physical world which, with enough hard work now and then, leads to new concepts or new combinations of old concepts. When crash programs have produced startling practical results, they have been programs to exploit what was known or nearly known, not to discover the unknown. The groundwork of science was already well laid before they were started. This is true of radar, synthetic rubber, atom bombs, penicillin, in fact, of the whole list. The rate of scientific discovery can surely be accelerated by bringing to bear a greater number of trained minds. It is certain that they exist potentially, but it takes time to train them. Some say a generation, beginning now. It might be done in that time, certainly not in less. It will not be done at all without deep understanding of the nature of the problem and a measure of patience. It can be nurtured, like all things of the spirit. It cannot be forced.

This may be a hard lesson. But the stakes are high.

Scientists are as much alive as any other group to the needs of the world. They know the urgency of expanding the scientific community of the free world. They have been preaching it. Now they want to make sure it is realized.—END

Speaking of SPACE

If you're planning to go up, out, over, or perhaps just drop down onto the moon some day, don't go until you've read Dr. Dinsmore Alter's superb little book called *Introduction to the Moon*. Dr. Alter, recently retired director of the Griffith Observatory, has written an excellent "Baedeker" of the moon, fascinating to moon gazers and serious selenologists, with more than sixty plates as illustrations.

Dr. Alter's philosophy of space exploration is that it is part of man's inevitable development, and perhaps more important in detail than we now are able to realize. He says: "In the life of a man there must be some instant. . . . which is more important than any other in determining his future. The decision or the happenings of that instant affect all which follows.

"The same type of critical moment may well have come to the race or may have passed. It may not be until hundreds or millions of years afterward that the instant is recognized." Our reaching for the moon, our attention to the details of its existence, says Dr. Alter, is an example of this phenomenon.

From the invention of clothing, the control of fire, the making of artifacts, from cave drawings, the use of metals, development of weapons, through concepts of calculus and relativity, Dr. Alter leads us to the decision of the present: "If man occupies the moon, what use shall he make of it? . . . The moon offers to man research opportunities in physics, astronomy, and other sciences which are so much greater than earth can offer. . . . What he can develop there can prepare him truly to become a citizen of space.

"The moon *must* be used exclusively as a laboratory of science for the benefit of this and of all future generations of mankind. There *must* be no diversion of its potentialities to any other purpose, private or national." He fails to mention how this might be achieved should the Soviets get there first.

In further chapters he succinctly traces the history of early lunar cartographers and speculates on the space station, the first lunar explorers, and the details of a permanent lunar base. He staunchly predicts:

"Man must force his way to [the] inhospitable surface of the moon. He must carry with him his own localized environment. . . . Those who have faith in the race feel certain that it will be done, and an increasing number believe that we shall begin to occupy the moon within this century. . . . What man does on the moon will be just a prelude. . . . The race will stand with the gate slightly ajar, ready for an age of exploration and travel that until the last few years was considered to be merely within the domain of science fiction."

The photos used are the Moore-Chappell series made with the thirty-six-inch reflector at Lick Observatory and the sixty-inch reflector at Mt. Wilson-Palomar. Best-seller material on counts of lucidity, coverage, illustrations, and Dr. Alter's obvious authority in the field, *Introduction to the Moon* is available from Griffith Observatory, PO Box 27787, Los Angeles 27, Calif., for $1.65.

GEORGE "MOON" MEYERS—By Jack Tippit

". . . and wait'll I tell ya about this lunar Jayne Mansfield I met!"

Have you heard the music of the spheres? The singing stars? Feeling a bit empty? You may be a little ahead of the rest of us, according to Donald H. Andrews, Professor of Chemistry, John Hopkins University, writing in the December *Scouting*.

"The same experiments which are giving us atomic power are also giving us atomic vision: We can look inside the atom and see that there is something there beyond the material. We can see through to a new horizon of the spirit.

"If we were to enlarge an atom to a balloon the size of a football field, then step inside it, we would see some twenty luminous balls about the size of footballs circulating like planets around the sun. The

footballs are the electrons and the sun the atomic nucleus. . . . The rest of the atom is only empty space. Since you are made of atoms you are mostly nothing but empty space, too. If the atomic holes could be squeezed out of you, you would be smaller than the smallest speck of dust—the ultimate in 'reducing.'

"A series of remarkable discoveries has given us a new picture of the atom. Let's step back inside our football field atom, wearing powerful glasses and an imaginary electronic hearing aid. We turn up the volume on the hearing aid and become aware of sounds like great rolling organ music all about us, intermingling melody and harmony like a hundred vast pipe organs playing at once. Our atom sings, and it is answered by music in the neighboring atoms in this vast assembly that makes up the human body. In a word, atoms are not matter but music; and since we are made of atoms, we are music too."

Television viewers across the country may soon be seeing an excellent half-hour, color documentary film on the thorny medical problems of getting delicate man off the ground and into the hostile reaches of the upper atmosphere and space.

The film, "Vertical Frontier," produced with the cooperation of the Air Force by Robert J. Enders, Inc., of Washington, D. C., for the Winthrop Pharmaceutical Laboratories, tells, in understandable terms, the exciting story of the dedicated band of civilian and military scientists who since World War II have been concentrating on the problems of human endurance in such areas as acceleration stress and the design equipment to provide tomorrow's spaceman with an environment he can take with him into space.

The picture, featuring excellent footage of such famed aeromedical achievements as the rocket sled rides of Col. John Paul Stapp at Holloman AFB, N.M.; the balloon ascent by Lt. Col. David G. Simons in 1957; and the celebrated simulated "trip to the moon" by Airman Donald G. Farrell in 1958, concentrates on problems of atmospheric survival, but touches, too, on other questions, such as radiation, use of algae for oxygen supply, and isolation. Its producers have done an expert job of continuity. The musical score is tasteful and notably not overdramatic. To supplement Air Force footage, Enders camera crews went on location to Wright-Patterson Air Force Base, Ohio; Randolph AFB, Tex.; and to the Washington Zoological Gardens, where they obtained live shots of one monkey that survived the early Aerobee experiments with rocket-firing of animals in New Mexico.

Planning the recently premiered space-medicine film "Vertical Frontier," narrator Matt Warren, recently retired Air Force Surgeon General, Maj. Gen. Dan C. Ogle, and producer Robert J. Enders talk over dialogue for the introductory scenes.

Appearing in the opening scenes are recently retired USAF Surgeon General, Maj. Gen. Dan C. Ogle and Winthrop Lab president Dr. Theodore G. Klumpp. Technical advisers included Lt. Col. Ray Towne, USAF, and Maj. William K. Douglas, USAF (MC), both of the Surgeon General's office. The film was written and produced by Howard A. Enders of Enders Productions.

Premiered in early December in Washington, "Vertical Frontier" will be distributed in the Air Force and will be made available to television stations in the US and to service and church groups.

"The Story of Palomar," a sixteen-mm movie in color with sound is available from the California Institute News Bureau, 1201 East California St., Pasadena, Calif. Running time forty minutes; rental, $25 for a day's showing, $5 for each additional day.

Trips to the moon are literally an old story at the Library of Congress. In an exhibit called "Space—Its Past, Present, and Future Exploration," Marvin MacFarland, head of the Aeronautics Section of the LC Science and Technology Division, brought together materials from the rare books collection, the manuscript division, and historical prints and photos for a unique display of man's efforts to reach the bleak and arid moon.

The strong attraction of the moon to earth-bound man is illustrated in stories and drawings of early proposals for journeys to or around its hostile clime. Documenting the history of aeronautics, as the first steps in lunar travel, are the notebooks of the Montgolfier brothers, Tsiolkovsky, Igor Sikorsky, Robert Goddard, and the Wright brothers. An unusual pre-

view of Sputnik I is the cover of a 1927 issue of *Die Rakete*, a German rocket magazine, which shows an earth satellite in orbit, with the title "In ½ Slunden un die Erde"—An Hour and a Half Around the World!

A space age teaching aid, "How to Develop a Teaching Unit on Rockets and Space Travel," has been published by the Materials of Instruction Committee of the National Aviation Education Council.

Written by John Sternig, Assistant Superintendent of Schools, Glencoe, Ill., this free leaflet is intended to help teachers keep up with the rapid advances in science and technology in these challenging times. Free, upon request from NAEC, 1025 Connecticut Ave. N. W., Washington 6, D. C.

Translations from the *Current Digest of the Soviet Press*, published weekly by the Joint Committee on Slavic Studies (1735 South State St., Ann Arbor, Mich.):

From *Sovetskaya pechat:* commenting on the US translation program of the Soviet journals: "Do aviation workers . . . need foreign literature? . . . The price of subscriptions to translations of our magazines in the USA is considerably higher than ordinary subscription rates; the readers' interest in the successes of Soviet science is a factor that is taken into account."

From *Pravda*, special correspondent A. Azizyan writing "At the Construction Site of the Novosibirsk Scientific City":

"The forest tract adjoining the Ob Sea [in northwest Russia] will contain fourteen scientific institutes: hydrodynamics, geology and geophysics, atomic physics, inorganic chemistry, automation and electrometry, mathematics, thermal physics, catalysis, applied mathematics, organic chemistry, chemical kinetics and combustion, genetics and cytology, experimental biology and medicine, and economics and statistics. There will also be a complete university, housing, cultural, and service facilities and a scientists' club."

"A Career in Astronomy," prepared for the American Astronomical Society by Otto Struve and Gibson Reaves, is a practical pamphlet for future star gazers. It lists career qualifications, some of the colleges and universities offering undergraduate majors in astronomy, requirements for graduate study, actual working areas for career astronomers, current salaries, and a bibliography of books and periodicals useful in gaining an understanding of the problems of astronomy. Altogether excellent guidance for a youngster who wishes to investigate this limitless field. Write to the American Astronomical Society, Box 2023, Yale Station, New Haven, Conn.

"Introductory Physics," a series of 162 half-hour lectures and laboratory demonstrations on sixteen-mm. film designed for classroom use at the senior high school or freshman college level, can be bought in color or black-and-white from *Encyclopaedia Britannica Films*, 1150 Wilmette Ave., Wilmette, Ill.

The series was shot while Dr. Harvey White of the University of California was presenting a daily educational television course in Pittsburgh during the 1956-57 school year. Students viewed three lectures and two lab periods a week. Dr. White assigned homework and the classroom teachers helped their classes prepare for the next day's lesson. Teachers' manuals and student workbooks are available, although any good text or workbook may be adapted.

Cost? $13,000 for the black-and-white film; $25,000 for color.

A similar course, introductory chemistry, is now in preparation, with lectures by Dr. John Baxter of the University of Florida.

Space research tools—

Bibliographies—What and Where:

The Literature of Space Science and Exploration, compiled by Mildred Benton of the Library Branch, Technical Information Division, US Naval Research Laboratory, NRL Bibliography #13, September 1958, available through the Office of Technical Services, US Department of Commerce, Washington 25, D. C., as PB 131755 for $4. Covers 1903 to June 1958; books, journals, government research reports.

Bibliography of Space Medicine, compiled by Charles A. Roos, chief of the Document Section of the National Library of Medicine, Public Health Service, US Department of Health, Education, and Welfare. Request from Director of the NLM. Covers space medicine from 1928 (Valier, M. von Medizin und Raumschiffahrt. *Rakete* [Breslau]) to 1958; journals, reports, holdings of the USAF Office of Scientific Research Library.

An Airpower Bibliography, 1955-1956, Raymond Estep of the Documentary Research Division of Air University, Maxwell AFB, Ala. Includes airpower literature from books, periodicals, speeches, interviews, and documents. AU-252-57-RSI.

Aviation Medicine—1953 Literature, Bibliographic section of the Science and Technology Division of the Library of Congress, published by and available from the Aero Medical Association, 2642 University Ave., St. Paul 14, Minn., at $5. Covers the 1953 publications in aerospace medicine.

The National Academy of Sciences is now accepting subscriptions to the Academy's *IGY Bulletin*. This monthly publication is the official journal of the National Academy of Sciences' US Committee for

Aircraft Proximity Warning System utilizes modulated beams of light to detect the approach of aircraft from *any* direction as far away as 5 to 7 miles.

Voice Messages ride "silent" beams of light between control tower and aircraft.

COMMUNICATIONS
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Astrodyne built this capability by bringing together in one productive group an elite corps of scientists, engineers, and technicians. Men with experience in research, design, and manufacture of superior solid propellants for JATO units, gas generator charges, and large boosters were teamed with others who had pioneered in the development of the largest rocket engines in use today.

This experienced team now is at work on the development of large-scale cast propellant motors, the design of advanced lightweight rocket hardware, and the formulation and testing of high-energy propellants with optimum physical properties for ballistic missile applications.

Inquiries are welcomed on all phases of the solid propellant field—from preliminary design to quantity production.

ASTRODYNE, INC. McGREGOR, TEXAS

the International Geophysical Year. In it are recorded the programs and results of the IGY, primarily in terms of US participation but including highlights of other nations' activities.

The first issue of the *IGY Bulletin* was published in July 1957 and publication will be continued through June 1959. The subscription price of $4 covers the complete set. Order from Publications Office of the National Academy of Sciences, 2101 Constitution Ave., N. W., Washington 25, D. C.

Technical Translations is a new publication of the Office of Technical Services, Department of Commerce. In cooperation with the Special Libraries Association and incorporating that outfit's *Translation Monthly*, *Technical Translations* is designed to be *the* journal listing translated information in the US and available to science and industry. Order from OTS: $12 a year, single copy 60¢.

Athelstan Spilhaus has some brave suggestions on ways to improve this earth we're temporarily stuck on. In *Satellite of the Sun* (The Viking Press, New York, 1958), an erudite, gentle essay on geophysics for the nonscientific reader, Dr. Spilhaus, Dean of the Institute of Technology, University of Minnesota, lists among future uses of our developing knowledge the possibility of air conditioning the outdoors.

"Already we have made attempts to seed clouds by putting dry ice . . . into them, and holes have been punched in thin cloud decks so that airplanes may find their way through to land. Similar methods may succeed in stimulating rain. Ways may be found to keep clouds over one place, to cut out the sunlight where it is not wanted, and to extend the growing season of plants in colder latitudes by creating thermal blankets. We have the means to increase evaporation from the sea . . . to retard fresh-water-pond evaporation. . . . We may be able to cause snow surfaces to spread or to evaporate and melt. . . . Some scientists think we may eventually find a way to influence the major climatic conditions on earth."

Maj. Gen. Bernard A. Schriever, Commander of the USAF Ballistic Missile Division, stressed the urgency in maintaining our defensive posture in a speech to the National Geographic Society in Washington, D. C.

"The manned bombers of SAC will continue to be the backbone of our deterrent power until such time as we attain complete operational capability with significant numbers of our first intermediate and intercontinental ballistic missiles. For a certain period thereafter our missiles will supplement rather than supplant the manned bomber. There will follow for the foreseeable future a missile and bomber 'mix' as an aerospace retaliatory strategic force in which the capabilities of ballistic missiles and manned aircraft are combined.

"Whatever the form of our deterrent power, we must never forget that the Communists have been emphasizing, since the end of World War II, the decisive importance of the new science and technology, as applied to weapon systems. Sputnik III was cogent proof of Soviet progress in this area. . . .

"Our Air Force ballistic missile program provides our country not only with the hardware, the facilities, and the scientific and technical and management personnel . . . for ballistic missiles. Our program also provides the foundation for most of space exploration for some years to come.

"Now our transcendent task is to project our thinking forward . . . to the 1960s and crystallize plans . . . to take full advantage of the momentum and the knowledge and the production capabilities we have already achieved . . . if we are to build our deterrent power into a new power for peace."

The unstable stars, those which show irregular variability which is not sufficiently violent to be classified with the nova phenomenon, are being classified, based on the characteristics of their light-curves or on variations in the properties of their spectra. Michael Ovenden of the Glasgow University Observatory, writing on astronomical developments in the British quarterly review of scientific thought, *Science Progress*, advances the theory that these are young protostars. The hypothesis that they are forming within interstellar matter leads to the speculation that "these unstable stars may, in the future, provide us with the possibility of observing directly nuclear processes that hitherto we had supposed to be confined to the deep and inaccessible interiors of the stars."

"The recent report that the Soviet Union had successfully launched a space vehicle on or about September 24, which had been tracked to the vicinity of the moon, and beyond, appears to be unfounded."

This was the report of Edward Gamarekian, science reporter for the Washington *Post and Times Herald*, writing on a *Missiles and Rockets* magazine story on the launching and tracking of a Russian space vehicle.

"Equally unfounded," said Gamarekian, "are current reports that the mysterious radio signals being received from outer space are coming from secretly launched Russian satellites and space probes." A check with the AF and the FCC showed that when the radio signals lasted long enough to be traced, they were found to originate from transmitters on the ground.—END

SPACE *Lines*

Dr. Paul E. Klopsteg is the new chairman of the National Academy of Sciences—National Research Council's Committee on Atmospheric Sciences. Dr. Klopsteg has retired from his position as Associate Director (Research) of the National Science Foundation, with which he was associated for many years. He was named as Special Consultant to the Director of NSF for a year.

Three new members appointed to the Committee on Atmospheric Sciences are Dr. Fred L. Whipple, Chairman of the Department of Astronomy and Director of the Smithsonian Astrophysical Observatory at Harvard; Dr. Michael Ference, Jr., Chief Scientist of the Science Laboratory of Ford Motor Co.; and Dr. John Tukey, Professor of Mathematics at Princeton.

The National Academy of Sciences, a private organization of more than 550 distinguished scientists, was established in 1863 under a congressional charter signed by President Lincoln. The Committee on Atmospheric Sciences was organized in 1956 to bring together meteorologists and scientists in related physical and geophysical fields to view the present position and future requirements of meteorological research.

Dr. Klopsteg, who succeeds Dr. Lloyd V. Berkner, now chairman of the Academy-Research Council's Space Science Board, was Director of Research at the Northwestern Technological Institute, Evanston, Ill., and is president of the American Association for the Advancement of Science for 1959.

Juno II, US Army space probe vehicle that carried the Pioneer III one-fourth of the way to the moon on December 6 under NASA supervision. The shroud protected the upper stages from atmospheric heating.

On December 6 the four-stage Army rocket topped by the Pioneer III lunar probe, was launched from Cape Canaveral, Fla., to 66,654 miles above the earth at a maximum velocity of 23,900 mph over a period of thirty-eight hours and six minutes. Cause for the failure to escape earth's gravity was given as the rocket engine of the modified Jupiter IRBM, which stopped burning 3.7 seconds short of its planned burning time. The result was a deficit in velocity that could not be overcome when the three solid-fueled upper stages fired. The two-foot-long, thirteen-pound nose cone arched downward and disintegrated upon reentry through the atmosphere over North Africa.

Dr. Wernher von Braun, ABMA's missile developer, in a television interview the next morning, suggested that the "failure" would actually yield extra data, since the missile went through the cosmic-radiation areas twice, once going up and once coming down.

Recent Soviet reports of volcanic activity on the moon could make sense, according to Irish astronomer Ernst J. Opik, visiting professor of astrophysics at the University of Maryland. Dr. Opik suggests that a meteor that crashed into the moon many thousands or even millions of years ago would still be very hot, even though buried some fifteen to twenty miles below the surface, and could have caused volcanic activity. The meteor, which probably produced the crater Alphonsus, could have been kept hot by radioactive elements in the moon, notably uranium, thorium, and potassium, the doctor believes.

Dr. Opik, educated at the Moscow Imperial University and the University of Estonia, is now an astronomer at the Armagh Observatory in Ireland and editor of the *Irish Astronomical Journal.*

Thirteen research advisory committees are being formed by the National Aeronautics and Space Administration to replace the twenty-eight technical committees and subcommittees of the NACA that were scheduled to go out of existence last Decem-

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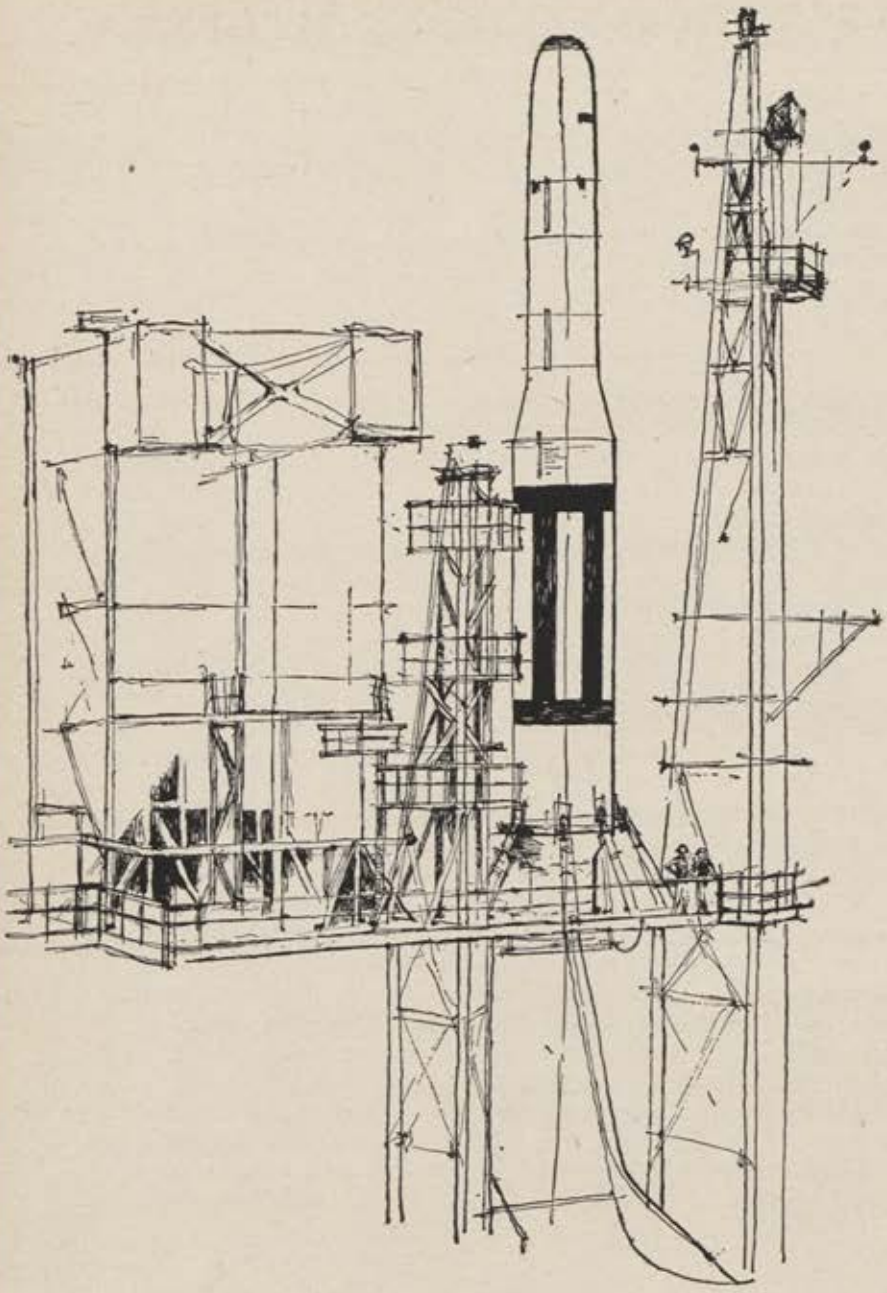


SPACE LINES CONTINUED

ber 31. Dr. T. Keith Glennan, NASA Administrator, also announced formation of a new Special Committee on Life Sciences to advise the NASA on human factors and on the medical and allied problems of NASA's manned space vehicle program.

The committees will review research in progress, and recommend problems that should be investigated by NASA or other agencies.

The National Aeronautics and Space Administration has announced plans to launch space probes at the rate of eight to twelve a year beginning in 1959. The new agency has been given the responsibility for continuing the nation's space research program after the end of the International Geophysical Year on December 31, 1958. The space probes will involve satellites and instrumented projectiles that will be shot to the vicinity of the moon and to such nearby planets as Mars and Venus.

The Convair Atlas ICBM was successfully test fired for the first time over the full intercontinental range, a distance over 6,325 nautical miles, on November 28 *(see page 78)*. Approximately 360,000 pounds of rocket thrust drove the Atlas over the Atlantic Missile Range from Cape Canaveral, Fla., to a point less than thirty miles from the preselected point of impact.

Col. Richard D. Curtin, Deputy Commander for Military Space Systems, Ballistic Missile Division, has been named to head Project Discoverer, a series of ARPA-sponsored missile launchings from Vandenberg AFB, Calif., over the Pacific Missile Range.

The first Discoverer vehicle will be a two-stage rocket, the main stage a modified Thor IRBM; the second stage is a new vehicle produced by Lockheed with an engine by Bell.

The first Discoverer satellites are expected to weigh about 1,300 pounds, including the second-stage vehicle, which will orbit as an integral part of the satellite after burnout.

The first nine shots are expected to use Thors. The Atlas, which is expected to be available this year, is planned for the following twelve shots. —END

Soviet Spacepower

Predicting what the Soviets will do next in space is a tricky business. When Sputnik I went up, there were many guesses about the next Soviet move. Nonetheless, despite all the crystal gazing, everyone was caught flat-footed by Sputnik II and its space-traveling dog, and certainly no Westerner was prepared for the enormous size of Sputnik III.

But despite all the poor guessing and lessons that should have been learned therefrom, prognostication remains fashionable. Even official government intelligence sources join in the game. Not long ago (and reported in this column) was the claim, evidently leaked from government sources, that the Soviets had tried four moon shots to date. Now the claim is being denied through the same channels.

There have been other claims for the Russians, many from private sources, including assertions that they are testing rocket engines of a million pounds of thrust, that they will have a manned expedition on the moon in two years, and so on.

Moscow adds to the general confusion. Russian popular science writers are as imaginative as any in the world, and many in the West are inclined to read a tone of official confirmation into such pieces—which are really designed mainly to inspire the Russian popular interest in science. It takes a lot of imaginative, inspired writing and other things to get the rural and land-minded Russian young men and women to dream and work toward making achievements in astronautics.

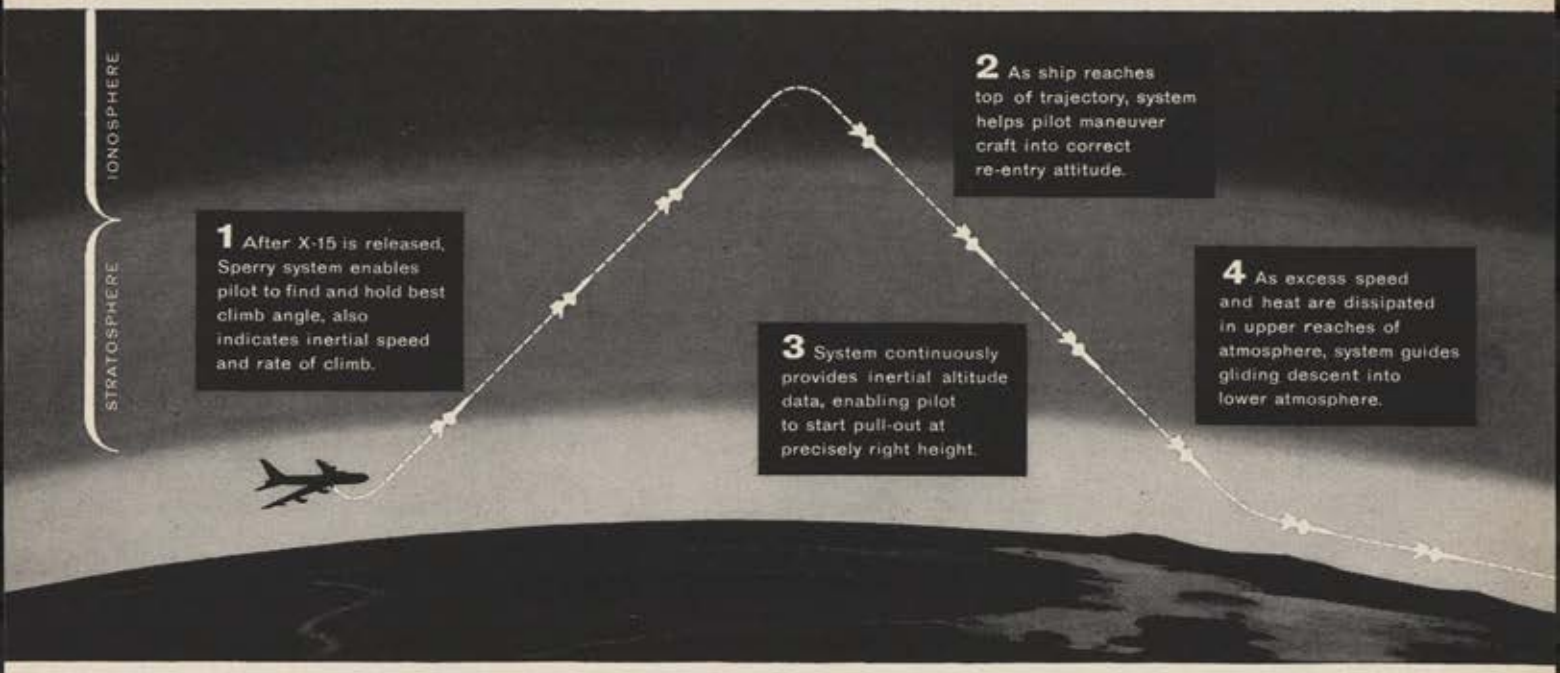
Even today, scientific thought in the USSR is limited pretty much to a small, high-powered elite in Leningrad and Moscow. In those two cities are the key members of the Soviet Academy of Sciences, which directs most of Russia's higher scientific programs.

This column wishes to avoid the mistakes of its contemporaries. We won't make any flat predictions as to what the Russians will do next in the way of demonstrating a capability for spacepower. We will, however, point up trends and parameters which seem worthy of comment.

Some basic considerations need first to be taken into account. One is that the essential Communist goal still remains world domination—using all available means. A second is that they have and will continue to use power when it appears that the risk is not too great. A third is that Russia's economy, science, and technology are limited. The USSR cannot investigate and develop *all* weapons technology, but must limit itself to a few approaches which are the most promising. Fourth, the USSR, for reasons already cited and as a matter of policy (spelled out in detail in the new economic plan for the USSR, announced November 15), will not undertake projects solely for the sake of science but rather will limit

HYPERSONIC X-15, powered by a mighty rocket engine, will follow bullet-like trajectory during flight, similar to path of ballistic missile.

WEARING SPECIALLY-DESIGNED SPACE SUIT, X-15 pilot is protected against environmental extremes as he maneuvers the rocket to the edge of space.



X-15 WILL THRUST 100 MILES INTO SPACE UNDER CONTROL OF NEW INERTIAL SYSTEM

Strapped firmly into his cockpit, an Air Force pilot soon will ride the North American X-15 rocket research ship 100 miles and more into the sky at speeds above 3600 mph—over a mile a second.

A highly advanced Sperry inertial system, developed in conjunction with the Flight Control Laboratory of Wright Air Development Center, will supply control data for this historic venture. When the pilot and his revolutionary craft drop from a B-52 jet bomber, the inertial system will give him data for maneuvering and navigating the X-15 with extreme accuracy. As the stainless steel research plane flashes outward through the thinning atmosphere, the Sperry system will "show" the pilot how to correct for even the smallest deviation from flight path. It will display flight information on specially developed instruments; at the same time feeding the data to ground and airborne recorders for a permanent record of the flight.

An important additional contribution of the Sperry system will be to guide the pilot in bringing the X-15 safely back into the earth's atmosphere. During this critical phase of the flight, attitude of the X-15 on re-entry must be precisely controlled to avoid exceeding its structural limitations.

On this daring journey into space, the super-sensitive Sperry system will have to function perfectly under conditions ranging from extreme acceleration to complete weightlessness, through temperature swings that may heat the X-15's exterior to 1,000 degrees in a few seconds.

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research and development activities to areas of "immediate practical value."

One project looms large when the above considerations are taken into account. That is to get a man into space. Such a project is a frequent topic in both the scientific and popular press in Russia. It was hinted at late this past summer when the Soviets sent two dogs a considerable distance through space and achieved a safe recovery. How the dogs were recovered was not reported, but probably not by the familiar parachute which the US and USSR have used to recover animals from more or less straight-up shots into space.

More and more, in their technical pieces, the Russians speak of one technique for returning a man to earth from outer space, which they call "the rational use of atmospheric resistance," to quote Prof. G. V. Petrovich, who has written a number of pieces on the subject. "Evidently a gliding descent will be the main means of landing space flyers not only on earth but also on other planets with a sufficiently dense atmosphere. Gliders of minimum weight for landing a crew on the surface of the planet will be necessary equipment on many spaceships and stations outside the earth."

Once they have solved the basic problems of safe rocket launchings and landings back on earth for man, the Russians say they will turn "next to setting up manned satellites equipped with air-conditioning and stocks of food and oxygen and carrying crew replacements. Regular communication will be maintained between the manned satellites and the earth for the transfer of equipment, supplies, and crew replacements. Flights from the earth to the satellite should be carried out by means of rockets and descents to earth should be made by gliding through the atmosphere, with almost no expenditure of fuel."

What importance do the Russians place on putting a man into space? These days they are inclined to speak of scientific achievement when they really have military applications in mind. A man in space in the era of ICBMs would give the Communists a very great advantage. A manned space satellite could be used to assist them in guiding ICBMs through their trajectories. Or, once an attack had been launched halfway around the world, a manned satellite could perform important reconnaissance and inspection missions. In the missile age reconnaissance and inspection will become more important than ever. If a manned satellite were large enough, it could be used as a launching platform from which nuclear weapons could be sent against the US, or could track and intercept any retaliatory effort undertaken by the US.

One of the most important symptoms of the importance the Russians place on manned satellites are the statements made in the Soviet press about "aggressive circles in the United States," which for "several years" have been directing work in the United States on the development of reconnaissance and military satellites carrying complete crews into outer space.

They have nothing on the late Dr. Goebbels.

Russian atomic airplane? Such is the report—that one has been seen flying in the vicinity of Moscow.

Strong voice in Soviet science is the famed Russian physicist, Peter Kapitsa

However, there is some reason to doubt that it really is an atomic-powered airplane. In the first place, only some eighteen months ago Russia's best known physicist, Peter Kapitsa, was complaining of the new decentralization plan for Soviet industry. The basis of his complaint was that such decentralization might result in handicapping the development of such things as an atomic-powered airplane. It is not likely that problems that apparently loomed so large a mere year and a half ago have since been solved.

Secondly, unless the Soviets have found a most unusual way to reduce radiation, it is not likely that they would be flying an atomic-powered airplane in the "vicinity of Moscow." It simply would spew too much radioactive material over the area. If such an airplane is flying, more likely it is the airplane that is to be adapted to an atomic powerplant, which hasn't yet been installed. Very likely it would be powered by chemically fueled turbojets for flights near the ground; the atomic reactor would be used only for high altitudes, and at some distance from Moscow.—END

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CF-100'S ARE ON GUARD IN CANADA—AND IN EUROPE WITH NATO AND THE BELGIAN AIR FORCE

Formosan laborers in field seem almost oblivious of gleaming F-104 visible in background.

Starfighters on FORMOSA

John G. Norris

TAIPEI, FORMOSA

ONE DAY last September during the heat of the Quemoy crisis, when the question of success of the Red blockade and possible American combat intervention hung in the balance, radar operators on both sides of the Formosa Strait blinked their eyes.

An aircraft blip moved across their radar scopes faster than anything they had ever seen. Quick calculation showed that it was traveling twice the speed of sound. On Formosa, top American and Chinese Nationalist officers smiled and reassured lower-ranking military men who hadn't gotten the word.

The 1,400-mile-an-hour Lockheed F-104s had arrived on Formosa!

It was probably several days—after their presence on Formosa was announced—before Red Chinese air commanders on the mainland knew definitely what their early-warning network had picked up moving so fast over the Strait. They, of course, knew about the F-104 Starfighter—sometimes called the "missile with a man in it"—and they must have been pretty sure that the blip was an American fighter.

We can't know for sure exactly what the reaction was in Peiping. But almost certainly the arrival of the USAF's hottest interceptor influenced the Reds' decision to stay away from American planes and ships protecting —outside the three-mile limit—the Chinese Nationalist supply ships running the Red artillery blockade. The presence of these planes doubtless also contributed to the Reds' ultimate backdown.

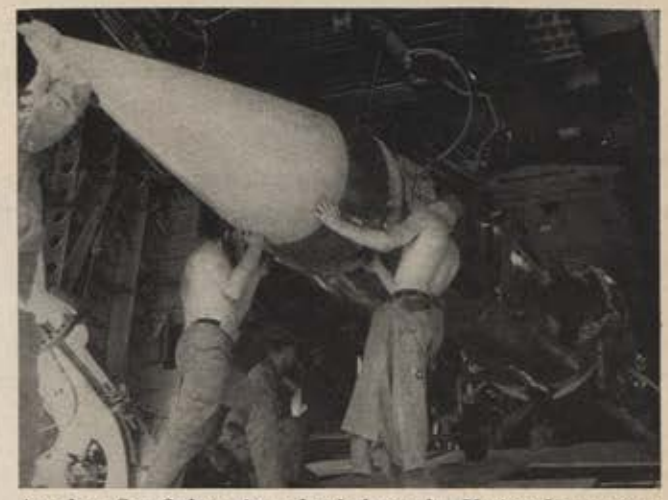
Red Chinese pilots, flying superior-performing MIG-17 fighters, had been taking a bad licking from Chiang's crack USAF-trained airmen flying obsolescent North American F-86 Sabrejets, and they hardly wanted to tangle with a plane that is more than twice as fast and holds the official world's speed and altitude records of 1,404 mph and 91,249 feet.

This Peiping reaction, of course, was precisely what Washington wanted. It was the one reason why the first F-104 was rushed into the Formosan skies only twenty-four hours after it had landed on Formosa inside a Douglas C-124 Globemaster. Air Force mechanics worked through the night putting its wings back on and getting the first Starfighter ready to fly.

When 1st Lt. Crosley J. Fitton made

(Continued on following page)

F-104, part of the USAF force deployed to Formosa, gets going over, will be ready to "go" if warm war gets hot.



Another Starfighter is unloaded on the Nationalist stronghold after airlift from US aboard Douglas C-124 transport.

STARFIGHTERS ON FORMOSA

CONTINUED

that first flight over Formosa and the western part of the Strait, so soon after arrival of the partially dismantled plane, many of the military men in the know must have been surprised. One of the nice things about a fighter deployment overseas in this manner is that the planes arrive ready to fly except for a few things like bolting on the wings.

The F-104 deployment, plus other reinforcements of American muscle in the area, marked another striking instance in which mobile airpower—and seapower—was successfully employed to further American foreign policy. The earlier flight of a Tactical Air Force Composite Air Strike Force (CASF) from California to Far East bases, the movement of a Marine Air Group from Japan to Formosa (and its replacement in Japan by another such group from Hawaii), the bolstering of the Seventh Fleet, the shipment of an Army Nike-Hercules battalion from Texas to Formosa, and movements of Pacific Air Force units in the area all contributed to the desired show of American power and determination.

Gen. Laurence S. Kuter, Pacific Air Forces commander, views the across-the-Pacific USAF deployment in such a relatively short time as a dramatic demonstration of the rapid advance of airpower. He recalled in an interview that when he was a young pilot it took his squadron of Keystone bombers six weeks to move from the US to Panama. General Kuter praised the successful rapid movement of Century series fighters from California to bases on Formosa, Okinawa, and the Philippines by "young men three years out of flying school" without mishap, even when they had to refuel in the air four times.

Actually, the CASF deployment, commanded by Brig. Gen. Avelin P. Tacon, commander of the 831st Air Division at George AFB, Calif., could have been made even faster if the need had been great enough to justify additional risks. The first elements of the force left August 28, arriving in the Far East on August 30—a week after the Reds opened their heavy bombardment of Quemoy. The first F-100s took off August 30 and arrived September 2.

But there was other air strength on the scene. Some Thirteenth Air Force F-100s, based at Clark AFB in the Philippines, were at Naha, Okinawa, taking part in an air gunnery meet, when the shooting started. Within twelve hours, the first of them were in Formosa.

In their attempt to impress the Red Chinese, the Thirteenth Air Force moved in some F-100s and F-86Ds that were almost ready for overhaul and replaced them in a few days. One reason was to make a great show of force with the limited air strength available by such movement of fast planes in and out of Formosan fields, where the traffic could easily be observed by the Red Chinese warning system.

To assure absolute reliability required by the tense situation, F-104s were testflown after their arrival on Formosa.

While the bulk of the Air Force units deployed from the States flew in under their own power, the most dramatic and newsworthy part of the aerial reinforcement was the F-104 movement. TAC has made many CASF overseas training movements, and made its first possible combat deployment in a similar situation when the Middle East crisis developed last summer. Deployment of the 83d Fighter-Interceptor Squadron was the first such emergency movement overseas of an Air Defense Command unit, which are not expected to be as mobile as TAC and SAC units.

Secret orders to prepare for an overseas move were given the 83d Squadron at Hamilton AFB, Calif., the day after Labor Day. The commanding officer, Lt. Col. John W. Bennett, was on leave, fishing in the north California mountains and couldn't be reached immediately. Maj. Carl H. Leo, his executive officer, worked out plans for the deployment with Western Air Defense headquarters and other commands.

Military Air Transport Service provided the C-124s and worked out details of loading for the transpacific move. For WESTAF—MAT's Western Division—this was only part of the big job handed it of supporting the Far East buildup. At the end of the week Colonel Bennett returned, and the squadron learned of its orders and started moving out. The first C-124 arrived at a Chinese Air Force base on Formosa late on September 10, the rest arriving within a week. By late in the month the unit was integrated in the joint air defenses of the island.

At first there was a lack of housing. Sergeants and airmen working on the F-104s took turns sleeping in the noisy, lighted hangars as work went on around the clock to make the aircraft operational.

A separate support squadron formed from Air Force personnel in the Far East was created to handle messing, medical, and other needs. A tent city was built for the enlisted men. Officers and some noncoms fared better, as the Chinese turned over a billet for their use, comparable to temporary USAF housing in many overseas spots.

After things quieted down on Quemoy, waiting on five-minute alert in the bamboo shack near the "hot pad" became boring. Torn from the comforts of Hamilton Field, griping in the group became inevitable, and the chant of pilots and airmen, "56, 57, 58, I hate this lousy place," was picked up by Chinese GIs and the ever-present children, most of whom didn't understand what they were singing. Later, the 337th Fighter-Interceptor Squadron

(Continued on following page)

At George AFB, Calif., staging area, F-100 pilots of crack 388th Tactical Fighter Squadron, Cannon AFB, N.M., are briefed by Col. Arlie J. Blood, commander.

Officers of USAF PACAF and their Nationalist Chinese Air Force counterparts at work during crisis at the US-Taiwan Joint Operations Center on Formosa.

Armed with deadly Sidewinder missiles, Starfighter, which, only shortly before, landed after airlift from the USA, prepares to take off for vital test flight.

Crewmen stand by as one of the pilots of the 83d F-I Squadron gets ready to taxi his Starfighter out for a test flight. The 337th has replaced the 83d.

was sent to replace the 83d, manning the same F-104s.

At this writing nothing had been reported, but pilots have been a bit concerned over the practice of GCI sending Chinat F-86s off from one end of the strip, necessarily into the wind, while the powerful F-104s are allowed to start downwind. The long strip has a hump in the middle, obscuring the view, and more than one American has wondered what he would do if he met another plane coming at him halfway down.

° ° °

Support of the USAF units moved into Formosa from the United States and other Far East bases was made much easier because a hard core of supply elements already existed. A Matador squadron has been here for some time, planes of Maj. Gen. Thomas S. Moorman's Thirteenth Air Force, and Lt. Gen. Robert W. Burns' Fifth Air Force have been moving in and out of Chinese bases in preparation for just such an emergency, and of course the USAF section of the Military Assistance Advisory Group, under Maj. Gen. Fred M. Dean, has been supporting the crack Chinese Nationalist Air Force.

A command snafu existed at the start because many of the units moving in were part of the Thirteenth Air Force. Adm. Harry D. Felt, Pacific commander in chief, solved the situation to the apparent satisfaction of all by giving Vice Adm. Roland Smoot, Taiwan Defense Command chief, operational command and making General Dean his deputy. General Dean is also General Moorman's deputy. General Tacon became General Dean's deputy.

Throughout the Formosan buildup, American commanders were careful not to weaken the Fifth Air Force, based opposite Soviet Siberia and northern China. US strength in that area, in fact, was bolstered.

For Communist airpower in the Far East, even after the USAF augmentation, still vastly outnumbers the air strength of the United States and its allies.

Red China's air force now totals about 3,000 planes, of which nearly 2,000 are jets—more than 300 IL-28 light bombers and from 1,600 to 1,800 fighters, more than half of them MIG-15s, and most of the rest MIG-17s.

The Soviet Far East Air Force totals more than 4,000 planes, including about 100 Badger medium jet bombers, about 500 IL-28s, and 1,600 jet fighters. The latter are mainly MIG-17s, but also include MIG-15s and MIG-19s. There are some 240 all-weather fighters. Add to this a North Korean air force, which includes 100 IL-28s and 300 MIG-15s.

Against this array, USAF had at peak something over 600 first-line combat planes in the Far East. There are more than two wings of F-100D fighter-bombers, about two wings of F-86D all-weather fighters, a SAC B-47 wing in the Marianas, the F-104 squadron, an F-101 squadron, and nearly 100 B-57 bombers.

In addition there are two Marine air groups, Navy carrier planes now sharply cut from the 500-plus total at the peak, the Chinese Nationalist Air Force of some 400 F-86s and F-84s, and considerably lesser forces in the Korean and Philippine air forces. As this went to press, USAF confirmed that the CASF would be withdrawn.

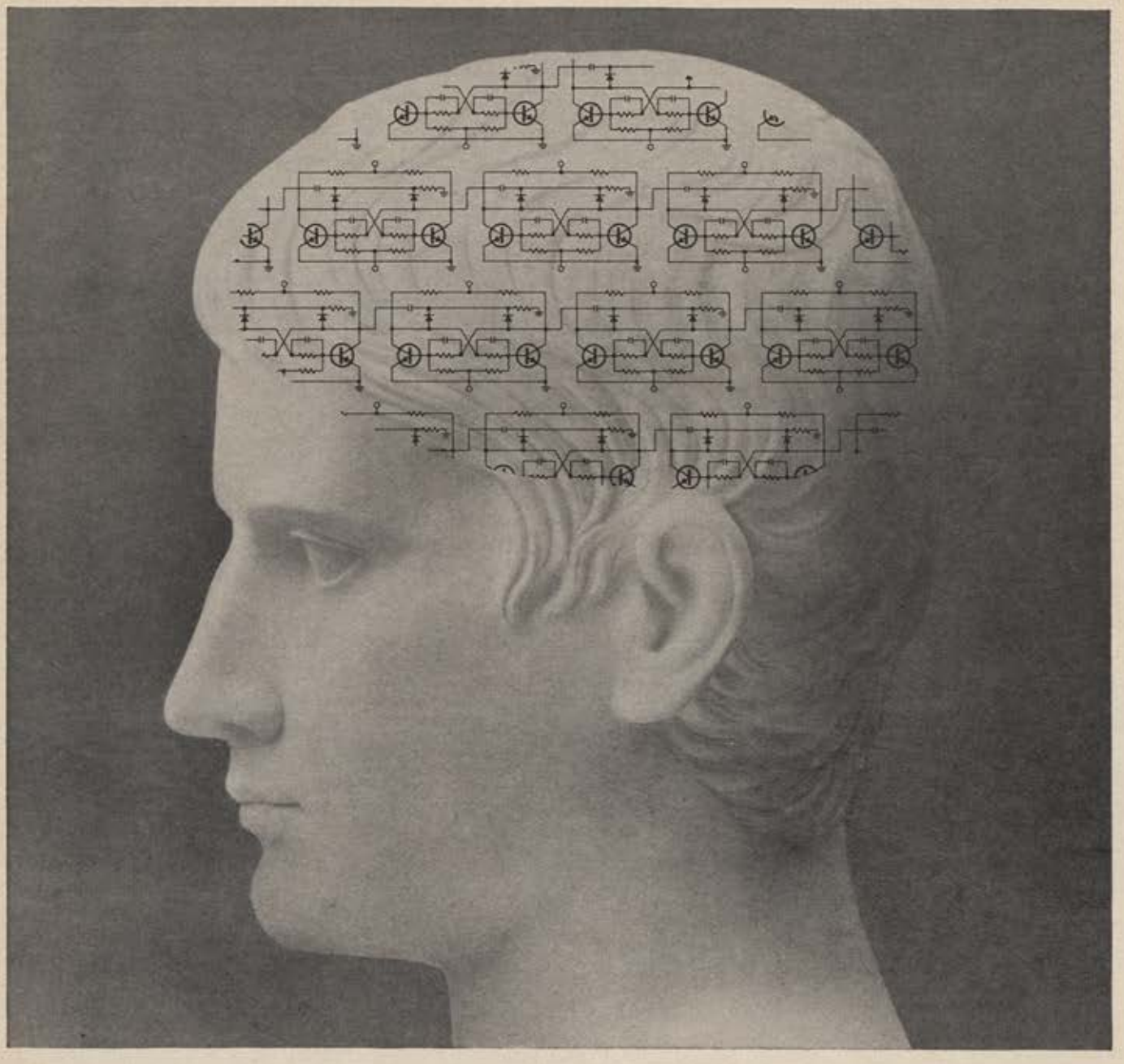
Western airpower has a big edge in quality of planes and pilots but also a big weakness in lack of depth in air bases. There are about 200 modern Communist jet air bases in the Far East, extending deep into China and Siberia, many times the number of such fields available to American air forces, most of which are close to the mainland and thus vulnerable.

In a war fought with conventional "ironbombs," Western air forces therefore would be a great disadvantage. But, at least against Red China, the nuclear firepower of the force deployed to the Far East in the Quemoy emergency amounted to tremendous strength.

This time the available forces were strong enough. No one can say about another time.—END

An F-104 takes on fuel after its airlifted arrival on Formosa. Much of the credit for lessening the Far East crisis went to USAF's airpower demonstration.

The author, John G. Norris, military analyst for the Washington Post and Times Herald, *is just back from seven weeks in the Far East, half of that time on Formosa and Quemoy. A veteran of thirty years of military reporting, Mr. Norris' Washington beat is the Pentagon.*



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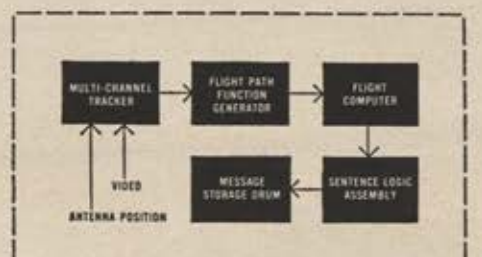

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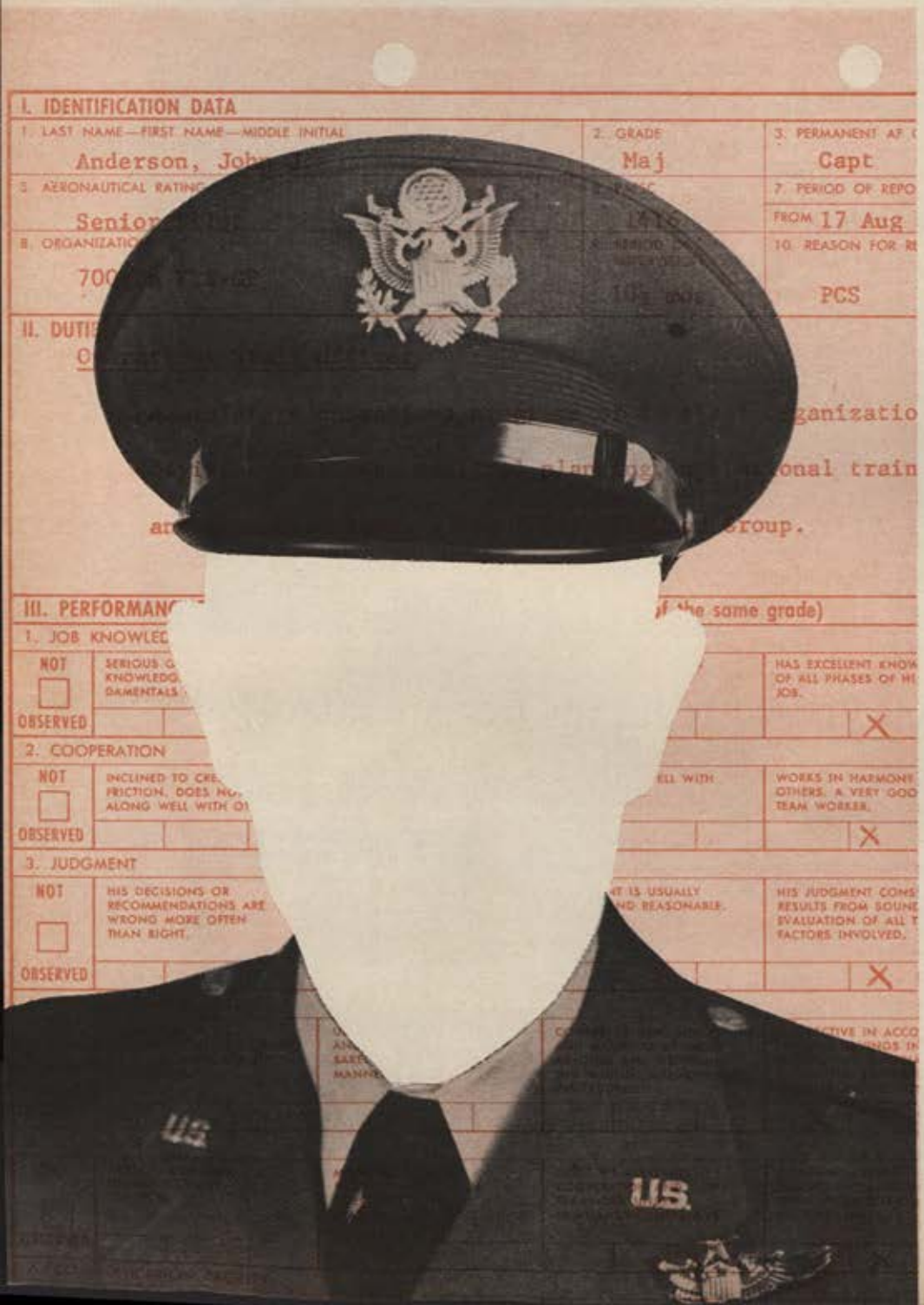
Make Your Effectiveness



AS THE squadron officers toasted the new majors, the promotion party got off to a rousing start. But Captains Ballard and Shaw, off by themselves in one corner of the room, did not share the group's enthusiasm. Despite their hopes and desires, their silver tracks had not changed to gold leaves. Once again they had failed to make the grade. They felt no antagonism toward their associates—but their big question was, "How did it happen?" Why had even some junior officers been promoted ahead of them?

Maybe Ballard and Shaw hadn't deserved promotion, or maybe their effectiveness reports hadn't reflected their true potential. Probably the real truth—which they didn't like to think about—was that their effectiveness reports weren't good enough to beat out junior competitors.

But let's suspend judgment on these two cases and think what happens when this scene is multiplied many times throughout the Air Force.

From such a situation the seeds of dissatisfaction are often sown. Part of the harvest may be the loud cry that the present effectiveness report should be replaced by one that is better, more equitable, fairer—one that would eliminate inequities.

Consider the problem objectively. We're human beings. Thus any system of officer evaluation is bound to be susceptible to human error. So once you recognize that just another form won't necessarily solve the problem, the real question becomes, "What can

Report EFFECTIVE

Maj. John N. Borini

be done to reduce the shortcomings of the present system?"

First of all, all officers should appreciate the importance of the effectiveness report. The ER is probably the most important single piece of paper behind the career of every officer. It's no secret that these ERs are the best source of information for selection boards to use in evaluating officers up for promotion. An accurate system of evaluation assures that the best officers will be promoted. But beside promotion, ERs help determine future assignments, advanced training, even possible demotion or elimination from the service. The need for accurate, honest, and comprehensive effectiveness reports is obvious.

Promotion boards may face the problem of trying to sort out and reconcile conflicting comments made by various rating officers. This situation comes up fairly often because all officers don't have the same standards. The human factor again. Some may be "conservative raters." This is good only if *all* officers follow the conservative approach. But if you're a candidate for promotion, you're going to have a tough race if your competition for a slot or a boost is an officer rated by a member of the "progressive party." We need some ground rules.

What *can* be done to make this already important piece of paper even more important? Lots of things. Here are a few suggestions, some of them pretty obvious, perhaps, but all of them helpful.

- **Know the man you're rating.** This is basic, of course, but as a rating officer you must keep a list of the officers you'll be rating. And these men should be told so. Don't wait for the personnel officer to tell you that next month you'll have to rate, say, Major Benson. If you find yourself having to manufacture information about this man just to fill up a report, you're doing an injustice to Major Benson and to the Air Force—and not much good for yourself.

- **Keep records.** Once you know you're going to be preparing ERs, you should dream up some system to provide you the significant information that should go into the report. Don't wait until the ER is due and then try to do it all from memory. Chances are this approach won't produce much of the kind of information you need—and that the man being rated deserves. How you do it isn't important as long as you have enough of the raw material. Some officers keep a Form 77 on each officer they must rate and jot things down as they happen.

What about officers you have to rate who are now located on a different base? You can't delegate the responsibility for preparing the report—you certify to this when you sign it. The best thing to do is to make an honest effort to find out what you can about the man. Talk with other members of the staff, review staff visit reports, and, if necessary, make a personal visit to the other base.

- **Don't dwell on minor imperfections.** Although AFR 36-10 stipulates that you must note weaknesses when preparing ERs, a little caution is in order. Exercise discretion. Show good judgment. Pointing up minor imperfections won't do anything useful—and may do an unwarranted amount of harm. Take the case of Captain Fowler, for example. Captain Fowler understood his job exceptionally well, but just because he couldn't answer one question a few days before he was rated, his supervisor felt duty bound to say that Fowler was "occasionally uninformed." So what does a promotion board do when faced with the choice between Fowler and another captain whom the records indicate to be of generally equal competence, effectiveness, and over-all value? It'd be understandable for the board to bypass Captain Fowler because of this one entry. Remember, an individual can be outstanding without being perfect. In the ER limit your comments on defects to those that appear to materially *reduce* an officer's competence or otherwise limit his usefulness to the Air Force.

- **Talk it over with the officer you rate.** Since, as the reporting official, you are responsible for some of the supervision of the officer you rate, you're obligated to help develop his potential. Certainly an "Unsatisfactory," "Marginal," or "Acceptable" report should never come as a complete surprise to any officer.

If the officer has to travel to a higher

(Continued on following page)

headquarters to find out what you wrote about him, you haven't done everything you should. Not only is he entitled to know how he measures up to the expected standards, but it's also part of your responsibility to keep him informed. Some say this face-to-face sort of discussion stimulates inflated reports. This is the same as saying that Air Force officers don't have the tact or moral courage to tell the truth. This is nonsense. If there are grievances, they won't be removed just by waiting. Sooner or later they must be discussed.

- **Be a good endorsing officer.** Although great responsibility for accurate reporting rests on the officer who prepares an effectiveness report, the endorsing officer shares some of the burden. Such an innocuous statement as: "The rating officer is an officer of my command," adds nothing to the report. To rubber stamp the report with "I agree" is a pretty weak endorsement. In a large number of cases, you are serving in a higher grade than the reporting officer. Consequently, your maturity, experience, and judgment should be reflected in your endorsement.

Although in some cases it may be difficult, every endorsing officer should also make a real effort to find out something about the officer's manner of performance. You are, in fact, required to indicate in your endorsement the extent and nature of your contact with the officer being rated. If your review is properly done, it can be valuable to both the individual and to the Air Force. You can play down any bias due to personality conflict, let the air out of any inflated report, and bolster one that may lack factual information.

- **Have something to say.** Have you ever read a lot of words without finding the message? A promotion board often faces this problem in reviewing effectiveness reports.

To avoid being this kind of author, don't pad your reports with empty words. Don't repeat the job description. Don't repeat the performance factors. Above all, don't use evasive language. Such phrases as, "He appears to have ability," and, "He would do well in any assignment in which qualified," add nothing to the report. Does he have ability or doesn't he? Do well in what assignment? Remember, the report is going to be read by people who don't know the officer being rated. Don't bury them in an avalanche of words. What they want are facts. Generalities and sweeping but indefinite phrases have no place in your report.

- **Make your report consistent.** If reports are to have meaning, they must first have consistency. As rating officer, you must keep in mind the relationship of each section of the ER to the completed report. If, for example, an individual is described in the word-picture section as having outstanding judgment, the reader might become confused if on the front of the report he found, "Judgment is usually sound and reasonable." Once you create an area of doubt, the validity of the entire report is in question.

- **Be objective.** Sometime you're apt to find yourself rating a man you dislike—someone who at the same time isn't too fond of you. This condition is euphemistically called "personality conflict." The temptation is to lower the boom. Don't do it. Make an honest effort to be as objective as you can. The rash individual who hasn't heard about unity of command may end up with a low judgment factor rating. If, after a little chat, he still persists in going over your head, you have little choice but to call the strikes as you see them.

A good example of this is Captain Henry who tried to have one of his effectiveness reports withdrawn. He had low ratings on cooperation and judgment. His supervisor, during the period of this report, was a capable individual who had definite ideas how his office should be operated. When Captain Henry couldn't sell some of his own ideas, resentment caused him to make a few end runs. In consequence, his general performance deteriorated. Although you may sympathize with this man, the truth is that he just didn't use common sense and was lucky that his rating officer was as objective as he was.

- **Justify your rating.** All Air Force officers aren't in the "very fine" or "outstanding" categories, but some definitely belong in this upper strata. If you think that you have such an officer working for you, don't automatically lower his evaluation to "typical" officer if the ER is returned to you for justification. Calm down, stop cussing the personnel officer, and think about the problem from the Air Force's point of view. Maybe you've already written two attachments, but this report isn't being judged by higher headquarters on the basis of weight. What have you said? Remember that comments are written to be read and understood by people who don't have your close knowledge of the officer who is being rated.

In such cases, apply this test: Have you supported all your statements with factual and specific comments that clearly indicate why this particular officer should have this particular rating? If not, you should expect the report to bounce. Now, if you can't supply this kind of information, then you have probably overrated your man. You can expect to be called on to justify your rating.

Although acceptable many years ago, such brief ratings as, "A good, young man who does well," and, "Merely good—nothing promising," are obsolete today. Today we must have ratings that provide the Air Force with an order of relative merit within a group composed of officers who vary by limited and difficult-to-estimate degrees.

All of these admonitions seem to put a real burden on the officers who prepare effectiveness reports. They should, for this is the way the system must work. When you're dealing with the future of a fellow officer, no other approach is acceptable.

Coming back to Captains Ballard and Shaw. The only individuals who can really answer the question about their true worth are the officers who have signed their current reports. Nothing can be done about their failure to be promoted, but from now on each rating and endorsing officer can be sure *he* won't be responsible for stopping these or any other deserving individuals from advancement.

The moral is plain: Effectiveness reports must be consistent, accurate, complete, and comprehensive. Improving the standards of ERs being prepared within the present system can be done, but will take work and the full support and cooperation of every officer who puts his signature on an effectiveness report. Are you going to be proud of your signature?—END

The author, Maj. John N. Borini, is now assigned to the Training Requirements Branch, Program Control Division, Directorate of Military Personnel, Hq. USAF, in the Pentagon. Born in 1921 and graduated from the University of California, Berkeley, he was commissioned in 1943 and served in World War II in Africa and Italy. He was recalled to active duty during the Korean War, serving with an AACS wing in Tokyo. In 1953 he became Director of Military Personnel at Hq. Fourth Air Force, and in 1957 was selected for Command and Staff School, Maxwell, AFB.

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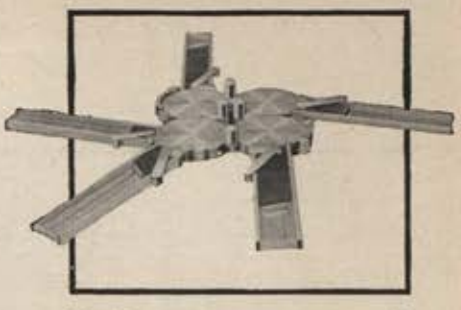

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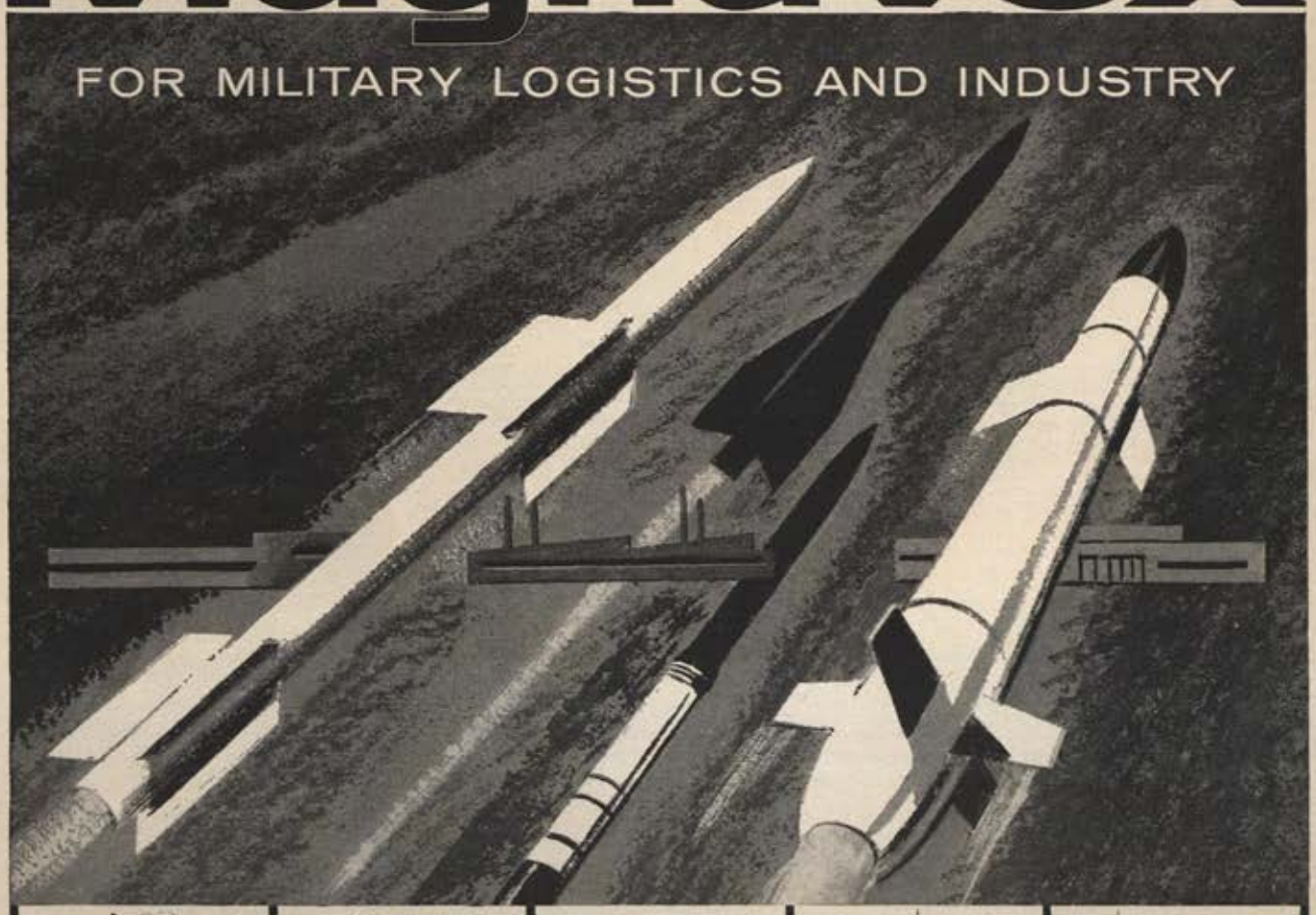

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The READY ROOM

RESERVE AND AIR GUARD NEWS

There is definite evidence of **progress toward a separate budget for the Air Force Reserve.** This year two major items of the Air Reserve budget will be **specifically earmarked** for Reserve personnel and Reserve construction. Also, the Department of Defense has indicated it has **no objection to a separate budget** for the Air Force Reserve in the **operations and maintenance area.** Years of effort to attain a separate Air Reserve budget are at long last beginning to pay off.

• • •

Funds for the **construction of eighteen line items** contained in the approved FY '59 **AFRes Construction Program** have been released to the field. The approved program **totaling $4.5 million** includes construction at the following flying locations: **Alvin Callender NAS, La.; Andrews AFB, Md.; Bakalar AFB, Ind.; Bates Field, Ala.; Bradley Field, Conn.; Davis Field, Okla.; General Mitchell Airport, Wis.; Grenier AFB, N. H.; Richards-Gebaur AFB, Mo.; and Willow Grove NAS, Pa.**

The FY '60 construction program is still subject to **review by the Bureau of the Budget,** but it is expected that an estimated $5 million will be approved. For the first time, the construction program provides for a **barrack-type facility** at several locations where assigned Reservists are traveling excessive distances from home to the training location.

• • •

AFA Headquarters has received word from the Department of the Air Force on **AFA's resolution that the Air Reserve and the Air National Guard be equipped with modern transport aircraft** as rapidly as such aircraft can be made available. (*See "Ready Room," December 1958.*) Proponents of the resolution suggest that such aircraft could include **transports made surplus by commercial airlines.** The Air Force reply said, in part:

"In view of present and anticipated pressure being exerted for the USAF to buy surplus commercial airline, piston-engined aircraft, such as the DC-7, Constellation and DC-6, it should be noted that **the critical military airlift problem is one of suitable long-range aircraft designed primarily as cargo carriers.** Procurement of aircraft which do not have this capability would not assist in overcoming this deficiency.

"At the present time, the primary air transport role of the **Reserve Forces is a troop-carrier role.** A review of the entire Air Reserve Forces program is currently being conducted to determine the validity of presently assigned missions. This study will consider the feasibility of developing additional air transport capabilities within the Reserve Forces."

• • •

AFA President, **Peter J. Schenk,** has announced the names of **Air Guardsmen and Air Force Reservists composing AFA's Air National Guard and Air Force Reserve Councils,** respectively. Under **chairmanship of Col. Bob Campbell** of Los Angeles, Calif., the **Air National Guard Council** membership includes:

Brig. Gen. Donald J. Strait, Vice Chairman, Basking Ridge, N. J.; **Lt. Col. Roy E. Cooper,** Cheyenne, Wyo.; **Brig. Gen. Bernard M. Davey,** Atlanta, Ga.; **Brig. Gen. Philip E. Tukey, Jr.,** Bangor, Me.; **Maj. David F. McCallister,** Swarthmore, Pa.; **Lt. Col. James A. Poston,** Columbus, Ohio; **Col. B. B. McEntire, Jr.,** Eastover, S. C.; **Capt. John T. Guice,** Tucson, Ariz.; **Lt. Col. Robert P. Knight,** White Bear Lake, Minn.; **Maj. Douglass N. Presley,** Grand Prairie, Tex.; **Lt. Col. Curtis J. Irwin,** N. Syracuse, N. Y.; **1st Lt. Dale J. Hendry,** Nampa, Idaho; and **M/Sgt. Harry Kilpatrick,** Syracuse, N. Y. (*ex officio*).

• • •

Col. Roy T. Sessums of New Orleans, representing ARDC, and AFA Regional Vice President for the South Central Region, heads the **Air Reserve Council.** Serving with him are:

Lt. Col. Gordon W. Edwards, Colorado Springs, Colo., representing ADC; **Col. Harold H. Hinds,** Lincoln, Neb., representing SAC; **Lt. Col. Jack Jenesky,** Dayton, Ohio, representing AMC; **Brig. Gen. Jerry Davidson,** Fort Worth, Tex., Hq. Fourteenth Air Force; **Maj. Robert M. French,** Williamsburg, Va., representing TAC; **Ben W. Fridge,** Washington, D. C., Deputy Assistant Secretary, USAF; **Col. James H. McPartlin,** Mt. Clemens, Mich., Tenth Air Force; **Lt. Col. Charles P. Collins,** Bedford, Mass.; **Col. Donald T. Carney,** Denver, Colo., Lowry AFB; **Col. L. Gary Clemente,** New York City, Hq. USAF, Washington, D. C.; **Lt. Col. Frank Ward,** Battle Creek, Mich., Tenth Air Force; **Maj. Joseph L. Hodges,** South Boston, Va., Hq. USAF; **M/Sgt. Ronald McDonald,** San Pedro, Calif., Fourth Air Force, (*ex officio*).

• • •

At its December 6 meeting, **AFA's Board of Directors** unanimously voted to **oppose current Department of Defense directives** that specify that **Air Reservists, Air Guardsmen, and retired personnel must accept a new and supposedly "more satisfactory" identification card.**

The change, opposed by many Reserve and retired officer organizations, was announced several months ago. But **considerable opposition** has caused the Department of Defense to reconsider the plan, and, at this writing, a new proposal, said in essence to be **agreeable to all Reservists and Guardsmen,** was submitted to the three military services. AFA's Board also went on record in **support of the new Department of Defense proposal.** Final action to be taken is still forthcoming.

• • •

Cleveland's Air Reserve ISO Flight is winning its **community-relations battle** in behalf of the Air Force with a **staggering schedule of speeches, lectures, outer space symposia, airpower programs** especially produced for luncheon, civic, and service clubs; **displays and exhibits** before senior and junior high school students; and **participation in avia-**

(Continued on following page)

Air Reservists get close look at C-123 transport's anti-icing and heating systems at Dobbins AFB, Ga. Class instruction is part of the Mobile Training Detachment's program.

Miss Air Reserve (pretty Marty Elmore) was chosen after a lengthy search by the ISO Flight of Cleveland's Air Reserve Center. Here she gets "Keep 'Em Flying" instructions from Maj. Willard L. Dougherty, Flight Commander.

tion panels, councils, meetings, and open houses in the Cleveland area. The flight works in cooperation with the local Air Force Association Squadron, and all of the flight members are active in AFA.

Under the direction of the ISO Flight Commander, Maj. Willard L. Dougherty, the group has presented two Outer Space Symposia in as many years, two "Air Defense of Cleveland in the Jet Age Conferences"—one for Air Reservists and one for the Cleveland Kiwanis Club—and a Kids' Day. It has also sponsored opening nights and premieres of motion pictures dealing with airpower matters.

° ° °

Summer training sites for the Air National Guard's twenty-four combat wings and related flying units were designated at year's end by the National Guard Bureau in instructions sent to all states, territories, and the District of Columbia. Air Guard field training is authorized to begin on June 6 and will end not later than September 5. The specific fifteen-day period within these time limits when each unit will attend summer training will be established by the adjutant general of each state, after consultation with adjutants general of other states scheduled to use the same training site. Wendover AFB, Utah, has been added to the list of training locations.

The Air Reserve Forces will join the Tactical Air Command and the US Continental Army Command in a joint field training exercise in the vicinity of Fort Bragg, N. C., during the latter part of May or early June.

The Air Reserve Forces portion of the maneuvers, called "Exercise Pine Cone II," will feature the Air National Guard as the Tactical Air Force and the Air Reserve as the Troop Carrier Force.

The Army portion of the giant maneuver has been named "Dark Cloud," while Tactical Air Command's portion will be known as "TACAIR 59-5."

° ° °

During the past month, USAF announced the reassignment of Hq. Civil Air Patrol, Washington, D. C., to the Continental Air Command for administration and operational control. The transfer became effective the first day of the new year. The transfer has been made to strengthen the Air Force-Civil Air Patrol activities. CONAC was selected to direct CAP activities because of its geographic spread of responsibilities for search and rescue operations and coordinating USAF activities with civil defense in the event of emergencies.

° ° °

Supplementing the deterrent ability, Air Guard units have been busy exercising their readiness.

A number of attempts have been made during the past month to penetrate the ZI air defense system by Air Guard tactical reconnaissance wings. The forays were part of a series of "Eye-opener" test missions being flown by the Guard at request of the Air Defense Command. Used in the flights were RF-84s and RB-57s.

° ° °

Hawaii's 199th Fighter-Interceptor Squadron is programmed for F-102s during FY '60. This Air Guard unit is the only combat interceptor force with the specific mission of air defense of the Hawaiian Islands.

In the ZI, the 118th Tactical Fighter Squadron, Bradley Field, Conn. will receive F-100s by summer.

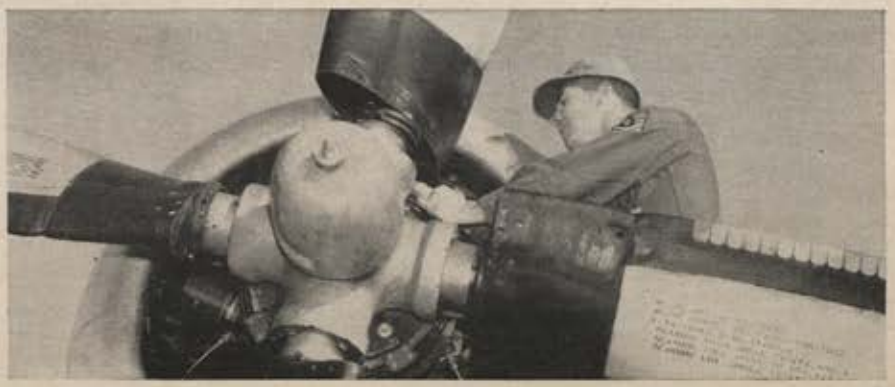
° ° °

After a record of 800 awards made to employers of Reservists in every section of the country, the Department of Defense Reserve Awards program is phasing out.

Nominations for the awards which were received prior to December 31, 1958, will continue to be processed, but later requests will not be considered.

The Air Force, Army, and Navy have concurred in the decision to terminate the program.

—By the Staff



Crewman taking part in recent "Tornado War" operational readiness alert for Oklahoma's 305th Troop Carrier Squadron (Res.) checks aircraft prior to takeoff. The exercise, which ran seventy-five hours, was to test ability to airlift paratroops and materiel.

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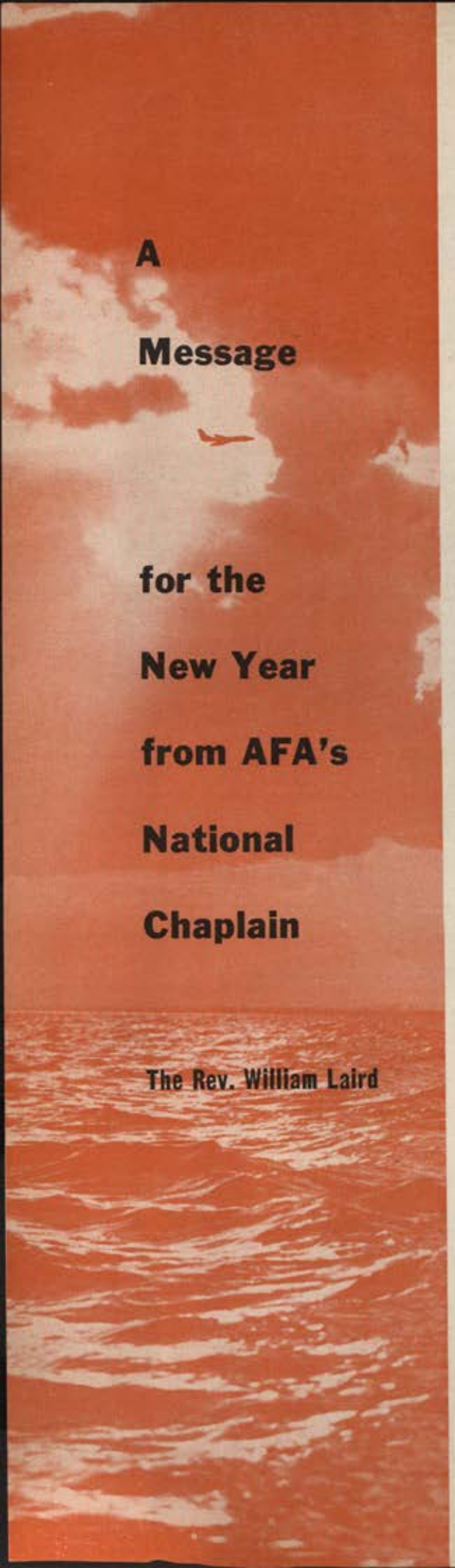
A Message for the New Year from AFA's National Chaplain



The Rev. William Laird

WHEN this issue of AIR FORCE reaches you, Christmas will have passed, and you are probably surveying the wondrous scene of wrinkled Christmas wrappings and a Christmas tree that is beginning to get tired and sag. The children have exhausted all the newness of their toys and you have begun to wonder if you can face another year.

The end of every year is a time when we take stock of what has happened to us in the year past, and somewhat timorously we begin to try to find encouragement to face the future.

Consider this year. As members of an Association, we in AFA can rejoice at the success that belongs to the air arm of our nation in that we have gotten off the ground, for revolving around the world are Sputniks of our own. Our Association has been ennobled and enhanced by the courageous sacrifice of life and limb and through long hours spent in research, planning, testing, and experimentation on the part of men and women who are not afraid to explore the unknown.

The fellowship that is ours in our Wings and Squadrons is deepened and strengthened by the tireless service of the officers and individuals who plan our local-level programs.

When a man thinks of the year past he calls to mind tragedies, disappointments, setbacks, but also these are matched by scenes of encouragement, growth, and development.

If, as an Association, we only place our trust in arms and technological might, our cause for satisfaction is all too temporal. We are where we are today because of the unchanging nature of God. He created us in love, and He seeks fellowship with us and provides us with every encouragement and opportunity not to remain earthbound creatures.

There is spread out before us all the wonders of creation to be explored and to revel in. As we venture out in these new realms we have His companionship. When a man considers the year past and looks to the year ahead, he invariably makes resolutions of self-improvement.

May I suggest that through prayer, meditation, and concentration on the bounty of God we strive to lean on Him more completely, and we have Him in every aspect of our life more joyfully, thankfully, and courageously. Then the resolution to serve the purpose of AFA, our home, and our country will be realized by us.

At the end of next year we will have fewer causes for disappointment and embarrassment and greater causes for thanksgiving.

The New Year holds a great deal of promise for you. For the man of faith it will be filled with the never failing Grace of God. God grant you a blessed New Year filled with opportunity of service to those you love and your fellow men.

This poem is given to you as a suggested prayer for the New Year.

Great God, we sing that mighty Hand
By which, supported still we stand;
The opening year Thy mercy shows;
Let mercy crown it till it grows.

By day, by night, at home, abroad,
Still we are guarded by our God;
By His incessant bounty fed,
By His unerring counsel led.

With grateful hearts the past we own,
The future all to us unknown,
We to Thy guardian care commit,
And, peaceful, live before Thy fit.

In sense exalted or depressed,
Thou art our joy, and Thou our rest;
Thy goodness all our hopes shall raise,
Adored through all our changing days.

When death shall interrupt these songs,
And send in silence mortal tongues
Our Helper, God, in Whom we trust,
In better words our souls shall boast.

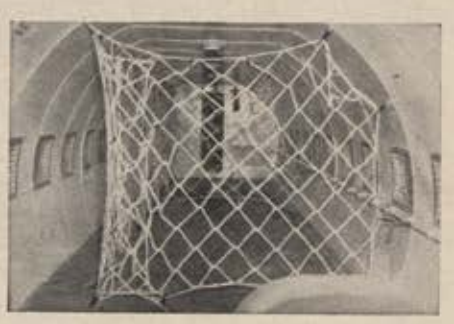
PHILIP DODDRIDGE, 1751

New Aeroquip Ratchet Tie-Down Buckle Assures Easy Tensioning, Quick Release

Flight tests of the new Aeroquip 5000-lb. Ratchet Buckle for tie-down straps show it greatly simplifies cargo tie-down and control. Air freight loading crews find it takes less time to secure cargo and requires only minimum effort to achieve proper strap tensioning. Air loadmasters report in-flight adjustment is safe and easy, no loosening due to turbulence. Barrier nets equipped with the Aeroquip Ratchet Tie-Down Buckle are hooked up in half the time required for conventional methods. Write for full technical information.

Aeroquip Web and Rope Nets Speed Control and Handling of Cargo

Web nets of nylon or cotton and rope nets of nylon or manila for all cargo control requirements and complete with hardware can be supplied by General Logistics Division. Typical load requirements meet range from 200 lbs. to 40,000 lbs. Write for catalog.



General LOGISTICS
A DIVISION OF Aeroquip CORPORATION
2929 Floyd Street, Burbank, California

RADIOPLANE RP-76 SIMULATES NEAR-SONIC ENEMY ...ARMY MISSILEMEN SCORE HIT IN FIRST FIRING!

Place: Red Canyon Range, New Mexico. Time: minutes after an RP-76 high-altitude air-launching by Radioplane personnel. Event: Army missilemen sight RP-76 simulating an enemy weapon system approaching at Mach 0.9. They fire—for the first time against an RP-76—score a direct hit.

Responsible: the men of Battery C, 1st Missile Battalion (Nike-Ajax), 56th Artillery, U.S. Army Defense Command; the men of Radioplane's contractor-operated flight service program, backed by the more than 2,500 Radioplane drone specialists who designed and produced the RP-76.

This Army-Radioplane achievement typifies the result of Radioplane teamwork with all of the U.S. Armed Forces. Other current examples in development: the supersonic USAF-XQ-4A weapon evaluation target drone and the U.S. Navy's XKD4R-1 rocket target, two more members of Radioplane's complete drone family.

RADIOPLANE

VAN NUYS, CALIFORNIA, AND EL PASO, TEXAS

A Division of Northrop Aircraft, Inc.

AFA NEWS

SQUADRON OF THE MONTH

Olmsted Squadron, Pa., Cited for

its salute to the Air Force on the occasion of the dedication of the new flight facility at Olmsted AFB, and calling attention to the community support rendered by the Air Force in Harrisburg.

The space age arrived at **Olmsted AFB,** Middletown, Pa., on October 25 as **40,000 Pennsylvanians** attended the dedication of the new 10,000-foot jet runway capable of accommodating the latest Air Force aircraft.

Locally the **Air Force Association** was active in the event; the **Olmsted Squadron** sponsored the **Airpower Brunch** and was listed as a cosponsor of the **Space Age Banquet,** attended by more than 300 persons. **Jack B. Gross,** AFA National Treasurer and recipient of the 1958 President's Trophy as "AFA's Man of the Year," was general chairman of the banquet, and **Bill Lunsford,** a past Squadron Commander, served in the same capacity at the Brunch.

A feature of the day-long program was the appearance of the **Thunderbirds,** world-famed USAF precision jet demonstration team. **Gill Robb Wilson,** former AFA President and Board Chairman, was the guest speaker at the banquet (*see cut*). **Maj. Gen. Paul E. Ruestow,** Director of Personnel and Supply for the Air Materiel Command, was the top Air Force man present.

Participation of the Squadron was directed by **Gene Simm,** Commander, who announced that several hundred people had to be turned away from the banquet because no room in town was big enough to hold everyone who wanted to attend this popular event.

Harlan Johnston, Commander of the **Des Moines, Iowa, Squadron,** sent word of a really outstanding program dealing with the **Air Force Academy.**

In September Johnston requested a roster of all Iowa cadets at the Academy. From this list he secured the name, address, and occupation of the father of each cadet and contacted them with a personal letter outlining AFA's interest in the Academy. He followed this letter with an invitation to the fathers to join as Associate members. After receiving an enthusiastic response to both notes, he then set up a briefing trip to the Academy for all the dads, and actually received more requests than could be satisfied. Iowa's governor, **Herschel B. Loveless,** was one of the first to accept, and the trip took place November 20-23.

This is one of the best programs that could be undertaken by an AFA unit, and our hearty congratulations go to the Des Moines outfit. Johnston's leadership in this venture comes naturally, since his son, **Harlan,** is a first year-cadet at the new Air Force Academy.

Several AFA Squadrons sponsor Auxiliary units. In California the activities of the girls often equal the programs of the Squadrons. **San Fernando's Auxiliary** is a good example.

On November 14, before a fine gathering of local women and some men, the unit sponsored **Air Education Night,** dedicated to briefing the community on programs under way to explore the future of aerospace

(Continued on following page)

General Ruestow; Maj. Gen. George Acheson, Middletown AMA Commander; and Paul Baum, Harrisburg Chamber of Commerce President, gather around Gill Robb Wilson after address.

Jacksonville's Mayflower Hotel was the scene of the big Squadron organizational meeting last month. Shown here are three of the new unit's officers. Left to right: V. H. Marshall, Vice Commander; Hugh Clark, Commander; and Marion Chadwick, Secretary and organizing spark plug.

Shown with annual Queens Squadron awards won in October: Pan American Vice President Harold E. Gray; Richard P. Battle, Region I, Civil Aeronautics Administration; Vernon Taylor, Seaboard & Western Airlines. Squadron makes awards for industry, civil aviation, and air safety.

Chicago WAF Squadron members, left, are shown with an airman from O'Hare AFB and Wing Girl Scouts who received complete briefing and tour of Air Defense Group facility. WAFs are Virginia Hartzaugh, Louise Setlik, and Lucille Zischke. Miss Zischke is the Squadron Commander.

Brookley AFB Air Police are shown with uninvited Mobile Squadron luncheon guest *(see text)*. AFA Manual on alligators states that muscles used to open jaws are much weaker than those used to close them, but these airmen don't appear to have too much faith in it, as ropes attest.

education. Among the speakers were: **Dorothy Taylor,** an engineer with **Marquardt Aircraft Co.**; **Marian Wagstaff,** Director of Aviation Education in **Los Angeles County**; and **John McLaughlin,** aeronautics instructor at **John Burroughs High School.** A feature of the evening was the presentation made by the **Future Engineers of America,** a group of high school students taking science courses and building displays related to their interests.

Joan Meyer, president of the unit, was in charge and deserves special recognition for this fine program.

Nittany Squadron, of State College, Pa., has reported a unique and interesting local program that may be of interest to other units. The Squadron is purchasing a membership in **AFA's Airpower Book Club**; each selection will be read by a member and then reviewed at a formal Squadron meeting to which members of the press will be invited. After the book is reviewed and discussed, it will then be presented to the public library.

This appears to be an excellent method of obtaining maximum mileage from the top airpower material of the year. We congratulate the Squadron on its initiative.

The highlight of the **Boston Squadron's Fifth Anniversary Banquet,** held October 30, was the presentation by **Commander Mildred Buck** of a special citation to the **Boston Public Schools,** in recognition of their distinguished contributions to airpower education. Superintendent of Public Schools, **Dr. Dennis Haley,** accepted the award.

Miss Buck, in presenting the award, commented on the fact that the emphasis on science and other technical courses began in Boston long before Sputnik and the general hue and cry that arose immediately thereafter. Quoting from the introduction to the aviation section of the school textbooks, she read, "It is hoped that, through the development of worldwide awareness for all people, the students will play an important part in a worldwide peace for the future."

The **Mobile, Ala., Squadron,** which boasts one of the largest regular turnouts of any AFA group for its monthly luncheon, had a generally conventional attendance at its September luncheon, but one of the "diners" was a bit out of place. According to our informant—who swears that he did not stay too long at the reception before lunch—there was a seven-foot alligator at the head table. To back him up, we have the word of **Rep. Frank Boykin,** the principal speaker at the luncheon.

It seems that one night the persistent saurian was found roaming the streets of Brookley AFB by Air Police, who promptly pushed him back through the hole in the fence by which he had gained entry. The next day he was back again; since there's a state law protecting alligators, he was held for the state Conservation Department to make a ruling. In the meantime the Squadron saw an opportunity for some publicity and drafted him for an appearance (*see cut*).

On the serious side, Congressman Boykin, in his address, paid tribute to the community value of Brookley, remarking that "Mobile would be a cow pasture without Brookley now." In addition to Representative Boykin, the top Air Force guest was **Maj. Gen. Dan Callahan,** Mobile Air Materiel Area Commander. Host was **Ed Packowski,** Squadron Commander.

CROSS COUNTRY . . . Several AFA Squadrons are sponsoring a unique membership program. The Squadrons offer to pay for the renewal of any individual member who brings in five new members during the year. . . . At the **Dallas Convention** no delegates were on hand from the **Pacific Ocean Region,** so no election was held for that Vice Presidency. **President Pete Schenk** filled the vacancy in December by appointing **Roy J. Leffingwell,** Honolulu, to another term as AFA's top representative in the area. . . . **Sky Harbor Squadron,** Phoenix, Ariz., has announced plans for a big program in February designed to promote interest in and explain the mission of **Military Air Transport Service,** with particular emphasis on the MATS role as a missile carrier. . . . Happy New Year!

—Gus Duda

MISSILE IMPACT PREDICTION

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TRICE, the world's most advanced computer, saves many minutes over time currently required for ballistic missile impact prediction. TRICE modules (Integrators, Multipliers, etc.) can be assembled as a special purpose computer for dynamic systems or as a digital differential analyzer. Its incredible speed of 100,000 iterations per second *in parallel* is unaffected by the size of the problem. The first model is in operation at the U.S. Army Ordnance Missile Command, Huntsville, Ala.

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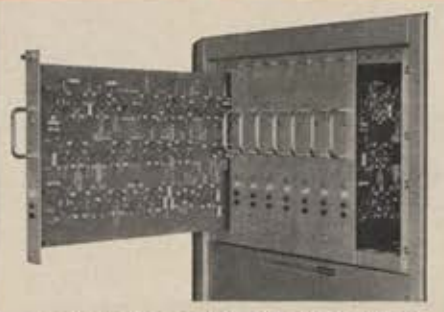

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Operation Skywatch. In 1954 AF Secy. Thomas Finletter asked the GOC to conduct 24-hour surveillance of our skies.

Operation Lookout, staged over the eastern coastal areas of fourteen states, tested GOC's part in our air defense.

Lt. Francis Shanley and David Wilson, dispatcher, at the Air Raid Warning Center, Bridgeport, Conn., during Lookout.

The Ground Observer Corps

A JOB WELL DONE

"The ramparts we watch . . ." A lone Ground Corps Observer does his part for national defense on Vashon Island, Wash.

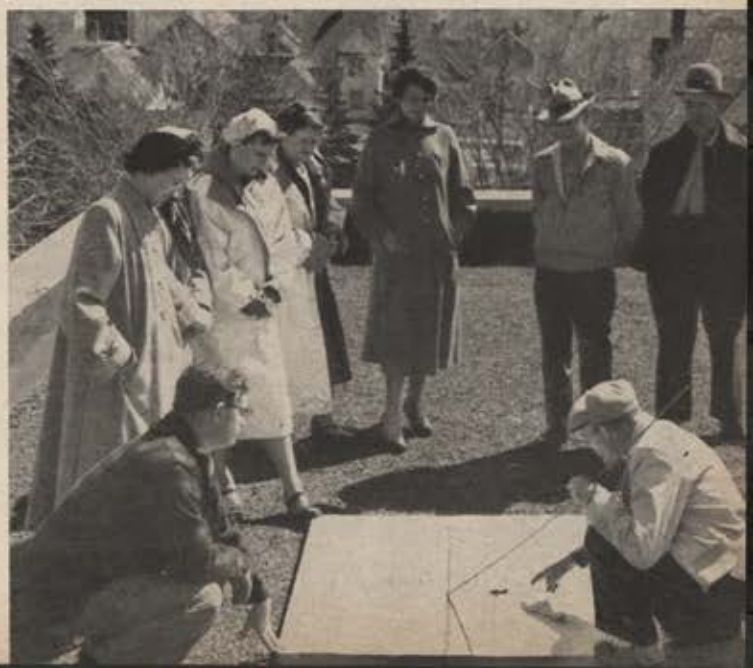
ORGANIZED in February 1950 as an important backup for our radar detection of hostile aircraft, the Ground Observer Corps has completed its mission. In its nearly nine years of existence, as many as 600,000 civilian volunteers have served in some 19,400 observation posts and more than fifty filter centers—unpaid and unsung.

To John Nance Garner, of Uvalde, Tex., to Maj. Gen. William F. Dean in Turlock, Calif., to forty Trappist monks in Dubuque, Iowa, and to 165 inmates of the California State Prison at Folsom; to volunteers in a lonely post on top of Pike's Peak in Colorado where the observers had to look *down* to see passing aircraft, and to each of the thousands of individuals who gave their time to watch our "open back door" during these years, both the Air Force and nation are deeply grateful.

Now that the danger of attack from low-flying aircraft has lessened and there is no longer need to "plug the low-altitude gap," the loyal volunteers of the Ground Observer Corps have earned the right to rest. But it is more than a good guess that from their ranks will come new contributions to the nation's continuing defense needs. —END

Explorer Scout John Beatty and Sea Scout Fred Mueller on duty at the Atlantic Highlands, N. J., post in November 1952.

The roof of the City Hall in Ely, Minn., is the scene of instruction by the post supervisor to his GOC volunteers.



How to crash and walk away

Warren F. Tolar

THE DC-4 moaned as its nose dropped below the horizon. Number four engine had sputtered out some forty minutes before. Now number three was smoking. The pilot could see red tongues of flame licking back from the cowling. Number two's oil pressure was rapidly falling toward the red danger mark on its gauge. A shudder and a sigh ran the length of the tired fuselage, warning of the approaching stall. The pilot fought to keep the plane straight and level and at flying speed. As his hand reached forward to press the fire-extinguisher button for number three, his thoughts turned to the thirty passengers in the cabin behind him.

The DC-4's starboard wing looked as if something had taken a couple of large bites from the outer panel. Now two props were feathered, and both pilot and copilot worked more frantically at the wheel and rudders. In an effort to maintain some sort of control, they let the nose drop even lower. The pilot glanced at his altimeter. Two thousand feet! Below, stretching out to the horizon, lay a thick growth of jungle, broken only by a dry river bed snaking through the solid carpet. Toward this dry bed the two men fought to guide their dying plane. They had to get out of the air, and they had to do it soon. . . .

° ° °

Since that windy day—December 17, 1903—at Kitty Hawk, N. C., when Orville and Wilbur Wright first flew, ever-increasing numbers of men have been imitating the birds. From Henri Farman's biplane to the Spads and Fokkers, from the Lawson Air Liners to Lindbergh to the faithful DC-3, from the P-26 to the P-51 to Sabrejets, and from Ford Tri-Motors to Boeing 707s—since that day in 1903, they've taken off and will keep on taking off, only to land again . . . in from one to one million pieces.

Of the many different types of aircraft accidents (such as collision—both midair and on the ground—fire in the air, engine failure, airframe failure, overshooting and undershooting on landings, wheels up or down at the wrong time, undetermined, and other) the "other" leads the field. Into this category fall pilot error and/or human error.

Someone said, "Accidents are caused. They don't just happen!" This gem needs no clarification. Here, we're not so much concerned with what *causes* accidents. Here, we're more concerned with that critical period between *cause* and the accident itself. Accidents have been caused before and will be caused again. Our desire is to see some reduction in that column of the ledger headed "fatal."

After 5,000 hours of flying, and five accidents (but no fatalities); after witnessing more than 100 crashes—everything from a Taylorcraft that was dropped in way too hard to a Sabre "high-speed stalling" on final approach, to an AT-6 that chopped the tail off a B-24 while both were on final, to an Aeronca Champion that iced up on final approach and undershot the dirt strip by seven feet, ending up in a drainage ditch—I believe I have learned one of the secrets of flying. All of the above accidents had causes. Some had fatalities; others did not. The pilots who survived might also have learned this secret.

Once, tooling a P-36 in on final, I ran out of airspace and was using up some beautiful, smooth concrete runway, rounding out and waiting for the wheels to kiss the deck. One instant, I had both wings intact. The next, my stubby little '36 was completing her final minus the right wing. Airspeed was about seventy mph. In the split second before the wheels touched, the left wing started up. I couldn't hold her down. As I cut the switch and flipped off the gas, the left rudder broke the rolling motion enough so the '36 settled in on tail section and side. The secret? Use those controls until your plane stops rolling or you're a dead duck! If the '36 had rolled before hitting the ground, I'd have gotten a lot more than a piece of airframe tubing through one leg.

Never quit flying! If you have to hit something solid, try for a glancing blow! That's where your controls come in.

I was once in another tricky approach, this time in a Vultee Vengeance dive bomber. The trap-tank, the one down between the pilot's feet, had split open, spewing high-octane gasoline back in my face. The aerial was trailing back across the fuselage, giving me an occasional shock through the throttle. I was in such a hurry to get down that I neglected an important step. The wheels! The landing was smooth. But, it could have been fatal. Once again, after I realized that a crash was certain, the lesson of my first air tangle was burned afresh on my mind. Fight her until she stops or you're dead!

When the good Lord decrees that you end up in trees, if you come in on top, try for a stall and use any remaining control to help the aircraft mush down at the lowest speed you can manage. In a head-on tangle with timber, try to shed both wings at the same time. Losing one can result in complete loss of directional control—you're apt to become an unguided missile.

(Continued on following page)

All of the crew of this B-26 walked away from a potentially fatal belly landing in Korea. They flew her in all the way.

My third "prang" impressed me more than any other with the wisdom of "flying her till she stops." Taking off in a twin-engined Mosquito, I had just seen 125 mph on the airspeed indicator. The wheels were up, and in order to gain more speed I was keeping the young filly low. At that instant I noticed that my starboard engine coolant temperature was climbing off the gauge. Then the engine blew. Hanging in its frame, what was left of the engine began flopping back and forth, spoiling the airflow and creating lots of drag. Again, outside of the airfield, there was nothing below but jungle.

At near stalling speed, I made two circuits of the airfield before I could get lined up with the runway. I clipped the tops off three trees. Once lined up with the strip, I shoved her toward a belly landing, showering parts of the aircraft along a 900-foot skid. Belly landings were a piece of cake with me by then. But, as I've said, fight her until she stops rolling.

The cause of an accident doesn't mean much to a pilot at the time it happens. It's true that if you reduce cause you'll reduce accidents. All well and good. But do away with *all* causes, and there'll *still* be accidents.

Flying instruction, as given by today's flying schools, both military and airline, does much to cover that phase of flying where death lurks just around the corner. Emergency procedure and precautionary measures are pounded into the heads of pilots and crews from the moment they start their initial dual instruction until the day they quit flying, retire, or lie dead in a heap of wreckage.

Pilots are taught that it is much better to overshoot on a forced landing and fly into the fence or house or trees at the far end of the field at a relatively low speed than to undershoot and fly into the same objects at a high speed.

They are also taught that if for any reason they should get halfway down the runway on takeoff, then develop trouble, it's better to pull up the wheels and belly-flop then and there, or to chop throttle and ground-loop rather than desperately trying to get airborne.

Again, if on takeoff, a pilot faces engine failure, he's wiser to continue straight ahead, or perhaps a little to the right or left, and crash there. Never, never try to turn back and land at the airfield you have just climbed out of. This procedure varies some with twin-engined aircraft, but even then any turn is carried out only after sufficient airspeed has been clocked. Here, more than ever, fly her until she stops rolling!

Once in the air, the pilot is taught that he must constantly keep one eye open for usable landing space below, in case of engine failure or other trouble.

There is one thought every pilot should bear in mind. He's there to FLY the aircraft. In a tight spot he may panic. The best men do. He may forget a few things—may push the wrong button, his legs and arms may shake like a tree in a hurricane. But he should remember this: He has a stick in his hand and rudders under his feet. His chances are better if he keeps using them.

There are times when the basic controls aren't much help. Lose a wing or the tail section, at 10,000 feet, and they're not much good. In such cases, a parachute may be your best bet, if your passengers are also wearing them. If not, you all ride her down.

There's the case of a P-47 which rolled at 30,000 feet, throttle wide open, and headed straight for the deck. The controls must have served only to keep the unfortunate pilot's mind busy until the instant the Jug's nose hit the ground. Or the case of an AT-6 snipping the tail off a B-24 while both were on a final approach and only a few feet up. The bomber stood on its ruined tail section, went up a hundred or so feet, then nosed into the ground. The AT-6 landed safely.

In England in 1942, I was leading a flight of three Hawker Hurricane fighters, when my number two man fell out and spun down out of sight. When he tried to regain his original position, he collided with number three. At 20,000 feet, number two came out the loser by half his starboard wing. He fluttered earthward. At 200 mph, the pilot regained partial control. Still at 200 mph, he hit the deck in a diving turn, flying and fighting for his life. His "Hurry-bus" shattered two buildings and three English hedgerows and finally came to rest half in and half out of a chicken house. The pilot walked away from the wreck.

In air combat, "Fly-her-till-she-stops" can be proved on an even larger scale. At one of England's World War II "crash strips," I've seen B-17s and B-24s, Lancasters and Halifax bombers land and their crews walk away, when the planes were in such a state of wreckage that the pilots vowed they were holding the air up, rather than vice versa. Two and three engines gone, tails shredded, wings shattered, fuselages looking like a greenhouse after fifty youngsters have spent the day throwing rocks at it! And every pilot who lived flew his plane until she stopped rolling.

My fourth accident? An overloaded Warwick transport. After warm up, all instruments checked out in the green. I ran through a takeoff check, set the trim, and ran up against the brakes. At full throttle I released brake, and the Warwick duck-walked forward. I knew it'd be close. Overloaded? I should have had *two* aircraft! Three-quarters of the way down a 6,000-foot strip she still wasn't off. She wasn't *going* to come off! I chopped throttles and pulled up the wheels. The trip ended up with my fighting her to a stop, fifty feet into the trees at the end of the runway, minus both wings but still right side up and the old gal headed where I wanted her to go. Remember! The same old advice. . . .

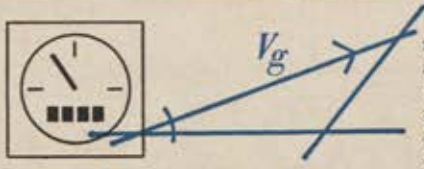
Jets? They're not much different from the old "suds-mixers" we used to fly when it comes to hitting the ground in an awkward position. I've flown jets but have never dented one. They fly faster, but our "secret" still applies.

° ° °

Oh yes. That DC-4? I was the pilot. A Spitfire had dropped from the clouds and made off with a chunk of my starboard wing. Fragments must have hit the vital parts of numbers three and four engines, because they folded up on me. We managed to ease the old baby into that dried-out river bed, and there she died. But the aircraft was the only thing that died. When we realized we were going down, we found a clear stretch of river bed, over a thousand feet long. The DC-4 flew just where we wanted her to. We fought her—and flew her—until she stopped.

Fly-boy, make up your mind here and now. Either FLY her until she stops rolling or drop dead.—END

A veteran pilot, author Tolar will be remembered by AIR FORCE *readers for his harrowing account of a near-miraculous safe landing of a crippled plane, which was published on these pages in October 1957. His flying days go back to 1941 when he joined the RCAF, serving in England, Burma, and India. He entered the civil aviation field after the war and also has worked on such projects as the DEW Line. Married, and father of four, he lives in Ontario.*



Ground Speed & Drift Angle
Any Time, Anywhere, Any Weather

Jet streams were cross-sectioned for the first time using the capabilities of GPL auto-navigators. Now these same ground speed and drift angle measuring equipments make riding aerial "express-ways" S.O.P. for military fliers.

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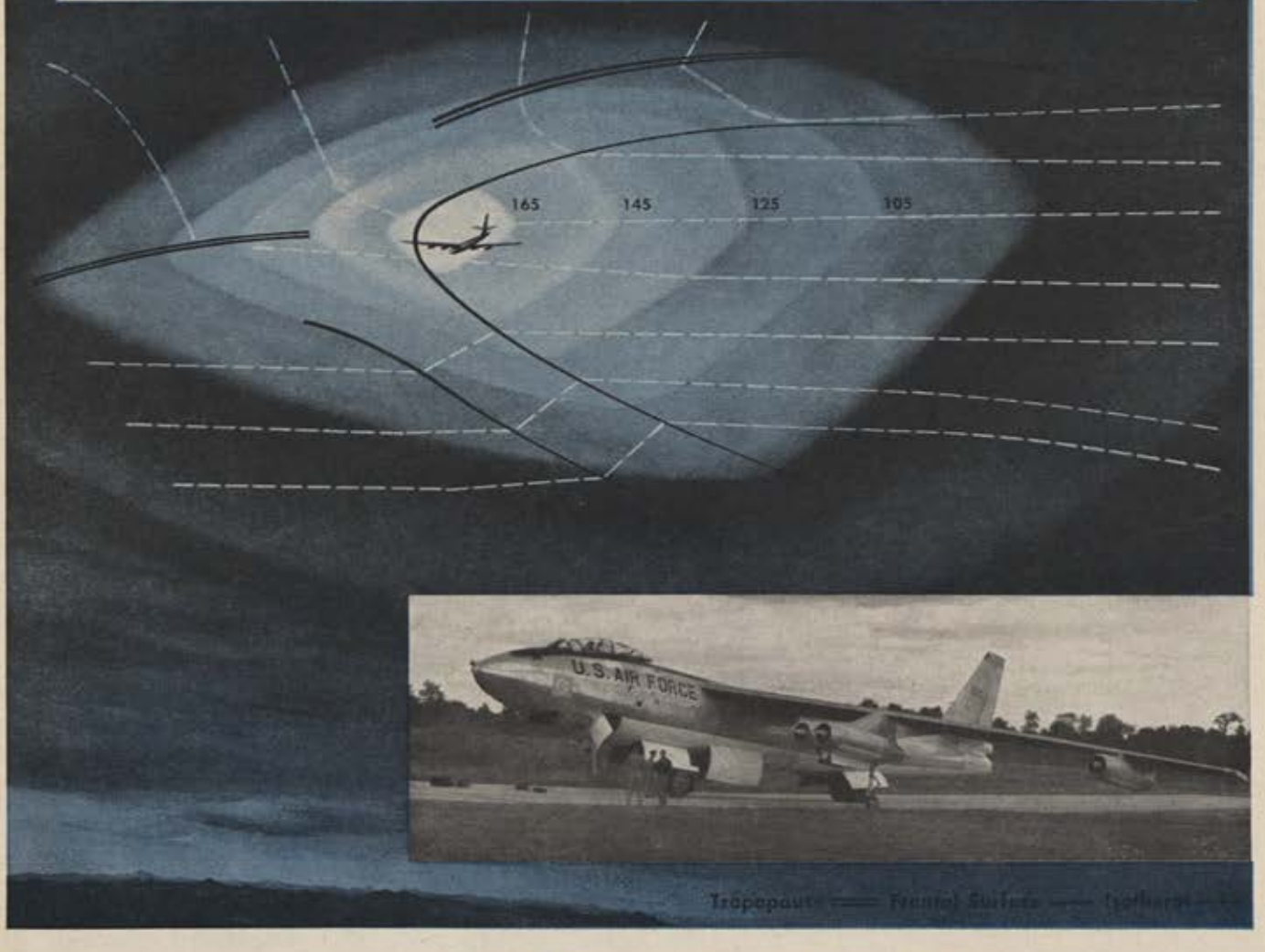

Cross-section of a headline

On January 25, 1957, in the early hours of a California morning, a USAF B-47 climbed skyward into the jet stream. With the aid of one of GPL's self-contained, airborne navigation systems, AN/APN-66, the crew put the plane into a 165 mph-plus jet stream core and held it there all the way across the country. 3 hours, 47 minutes later, the same "47" touched down within sight of the Atlantic Ocean.

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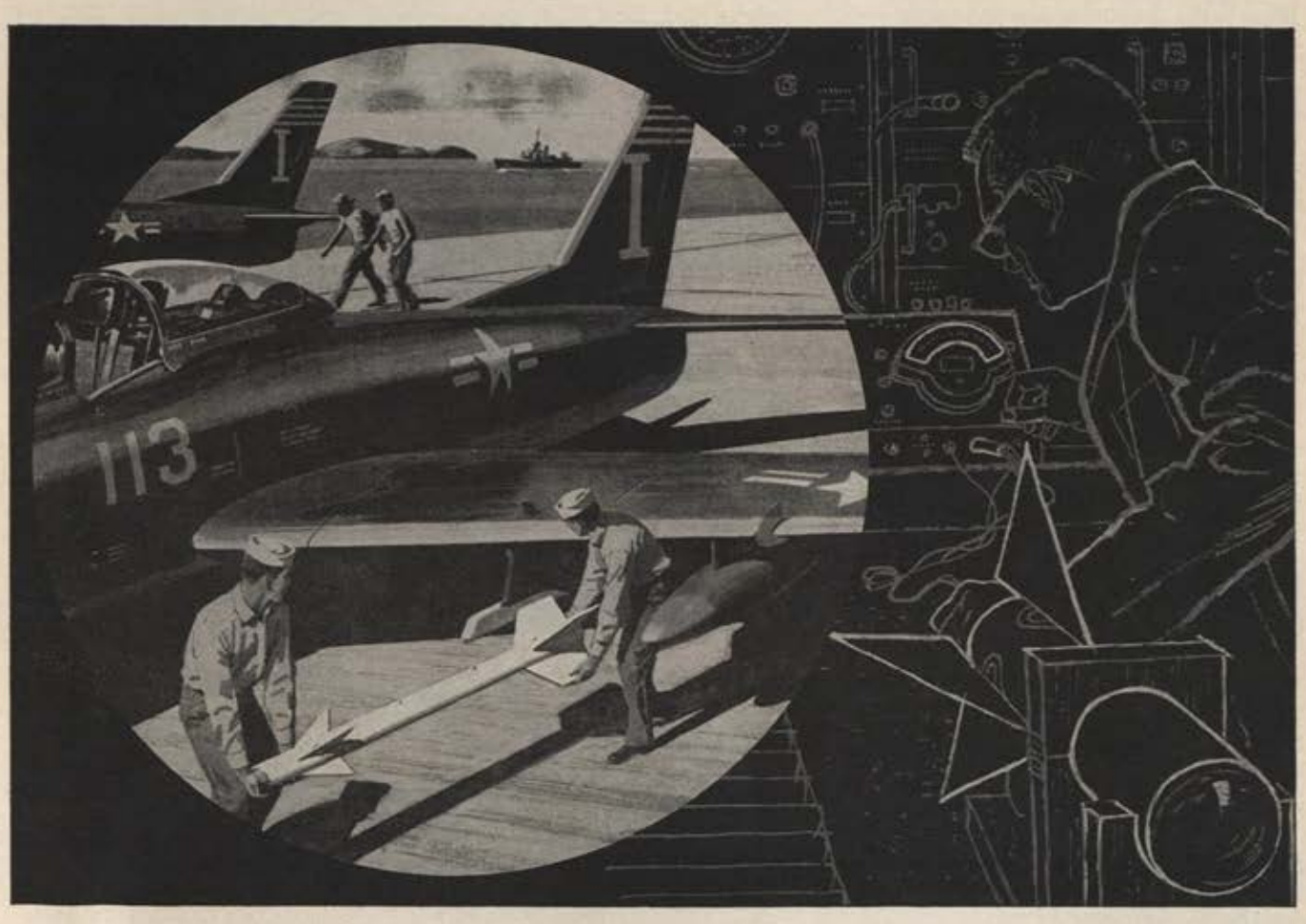

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airman's bookshelf

Veteran aviation writer David C. Cooke has produced a broad-brush air history that should serve as a good basic primer. *The Story of Aviation* (Archer House, $4.95) encompasses flight from the legendary days to supersonic fighters and commercial jet transports.

Four chapters cover the long prelude to Kitty Hawk, describing the experiments of Leonardo da Vinci, subsequent attempts of men to imitate birds, and the nineteenth century era of ballooning, gliding, and unsuccessful powered flight. From Kitty Hawk on, the book is essentially the story of American development of military and civilian flight in terms of the craft, the men, and the accomplishments. Chapters cover World War I, the postwar doldrums, the Lindbergh era, and the "daring decade" of the thirties. World War II is painted as the worldwide proving ground of American airpower. Subjects included are the history of the USAF, naval aviation, jet propulsion, and the US commercial airline development. Appropriately, the volume closes on an R&D note—the accomplishments and contributions of NACA.

The book has some faults. It lacks the depth of interpretation which many professional airmen would expect. But as a light, descriptive, and readable chronicle of man's conquest of the air, *The Story of Aviation* should serve the lay audience. More than 100 photos and drawings illustrate the text and a good index makes fact finding easy.

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On the pictorial side, aviation history is brought up to date in a new revised edition of John W. R. Taylor's *A Picture History of Flight* (Pitman, $7.50). First published in 1955, this collection of hundreds of photos is an airman's dream. Author Taylor packs his facts into captions, introductions to sections, and connective passages. The emphasis is on European accomplishments, although American aviation is adequately represented. New materials added to the revised work include recent US developments in powered flight as well as in rockets and missiles.

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A new air anthology is *U. S. Airways*, edited by Poyntz Tyler (H. W. Wilson, $2). Tyler presents the history of civil aviation with a selection of articles previously published in the national periodicals. His selections covering the beginnings of flight, the years of growth, and civil aviation today are well chosen. It is odd, however, that aviation periodicals, *per se*, are not represented, especially since much of the historical record, in fact and fiction, has been carried by these aviation magazines. Tyler's book is part of a library series of anthologies on diversified subjects and is aimed at the senior high school student and younger adult.

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Nevil Shute is an old hand at writing about the air. During the war and after he frequently wrote about aviation—his first love. A Nevil Shute look-to-the-future, *On The Beach*, created a sensation in 1957, forecasting the end of the world by atomic fallout.

Shute's latest air novel, *The Rainbow and the Rose* (Morrow, $3.95), combines his beloved Australia with his penchant for aviation. It recounts much of powered flight's history in terms of the life of Australian airman of fortune, Johnny Pascoe, who learned to fly in 1916. Shute's story ranges from exciting accounts of World War II dogfights to coverage of commercial DC-6 transpacific runs. High point is the rescue of Pascoe by his friend Johnnie Clark on an unmapped section of Australian coastline. The novel displays Shute's narrative skill. His description of flight in the wire-crate days is highly readable. In fact, this one has been pegged by some critics as Shute's best.

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Pergamon Press, publishers for the Advisory Group for Aeronautical Research and Development (NATO), has issued two new volumes.

Aviation Medicine – Selected Reviews, edited by Clayton S. White, W. Randolph Lovelace, II, and Frederick G. Hirsch (AGARDograph #25, $12), is a group of twelve technical reports by senior aeromedical scientists. These reports are selected critical reviews of major areas of aeromedical science as represented in more than 700 original papers on specific aeromedical subjects. This condensation of technical writings is helpful to aeromed scientists and students.

Air Intake Problems in Supersonic Propulsion, edited by J. Fabri (AGARDograph #27, $5), four papers presented at the eleventh AGARD Combustion and Propulsion Panel Meeting, Paris, December 1956, by French and American aeronautical scientists.

• • •

One possible solution to the traffic congestion of highways and city streets might well be the combination auto-airplane – the "roadaplane." A strong plug is found in Daniel R. Zuck's *An Airplane in Every Garage* (Vantage Press, $4.50).

• • •

Performance capabilities and operations of the various types of navigational radio equipment are described with minimum technical detail in *Radio Aids to Air Navigation*, by J. H. H. Grover (Philosophical Library, $6). Chapters deal with general principles, MF, VHF and pulse systems, hyperbolic aids, approach and landing, and a look at the radio navigational equipment future for the airman. Appendices include table of radio aids, conversion factors, formulae, charts, regulations. A ready reference and guide for flyers.

Related Reading

The combined American intelligence operation is composed of several dozen "gathering" agencies, including those of the military services; at the top of the complex is the Central Intelligence Agency (CIA). *Central Intelligence and National Security*, by Harry H. Ransom (Harvard Univ. Press, $4.75), is a scholarly examination of CIA's contribution.

Ransom describes and assesses this sprawling organization and its diverse operations; he discusses interservice agency relationships, and how they work with the CIA. Greatest attention is given to CIA's influence on formulation of US policy.

CIA is primarily a coordinating agency, although its direct activities include information gathering and political operations abroad. The bulk of information CIA receives is public, unclassified material collected and correlated by vast numbers of military and civilian personnel throughout the world. This information is then synthesized into a daily national "estimate" for the President and a weekly one for the National Security Council. These estimates evaluate, interpret, and predict, and they form the basis of much US foreign policy. The system has weaknesses, as demonstrated in the failure to predict the Chinese

(Continued on following page)

entry into the Korean War and the unfortunate reaction to Mr. Nixon's visit to South America. Ransom studies these lapses.

The book is a worthwhile addition to the professional literature of military science. It should be a "must" for airmen. It is also excellent fare for the layman who wants to learn how our country depends on quick and accurate intelligence for survival in the nuclear age. It gives an interesting picture of the role of a rapidly growing intelligence agency within a free democratic society.

• • •

For ten years John King Fairbank's *The United States and China* (Harvard Univ. Press, $5.50) has been the standard volume on the subject. A new, revised, enlarged edition, examines China today in light of its past and shows how its social, political, and economic ways of life and thought stem from its past. Chapters cover US-China relations of recent years, pointing out where and how we have failed to keep pace with revolutionary times. Fairbank urges that we accept what he calls reality and begin to face the political facts of life in Asia. It is wishful thinking, he claims, to believe that Communism in China will destroy itself.

• • •

Frequently controversial World War II military figure, Gen. Albert C. Wedemeyer, USA (Ret.), joins the growing list of memoirists. He evaluates the strategy of the war years and our postwar policies in the Orient in his book *Wedemeyer Reports* (Henry Holt, $5); he vents his wrath at the "Europe First" policy and attacks the Asian policy of the postwar years. The famous "Wedemeyer Report" on China and the Acheson-Truman White Paper come under examination too. Previously unpublished official correspondence, records of conversations and secret meetings, are used to support Wedemeyer's views on the unsuccessful effort to save Chiang Kai-shek.

• • •

Air Force survival training veterans will be interested in the personal experiences of two German political refugees in Southwest Africa in World War II. *The Sheltering Desert,* by Herno Martin, translated from the German by Edward Fitzgerald (Thomas Nelson, $5), relates how these men, fleeing from capture, found haven in the deadly, forsaken Wamil Desert and lived off the land for more than two years as aborigines without benefit of even the rudimentary personal equipment normally required for basic survival.

• • •

One of the most intriguing chapters in World War II is the intelligence operations which took place throughout the Pacific under the aegis of General MacArthur's headquarters in Australia. These "Coast Watchers" alone accounted for the destruction of hundreds of thousands of tons of Japanese shipping and scores of Japanese planes. The history of the colorful and daring American and Allied espionage, sabotage, and guerrilla and partisan warfare in the Pacific is told in *Allied Intelligence Bureau* by Col. Allison Ind (McKay, $4.50). Hundreds of episodes from underground and commando activities in the Philippines spark the narrative.

Colonel Ind writes from first-hand experience. He was associated with the Pacific Theater intelligence activities during the war.

—MAJ. JAMES F. SUNDERMAN, USAF

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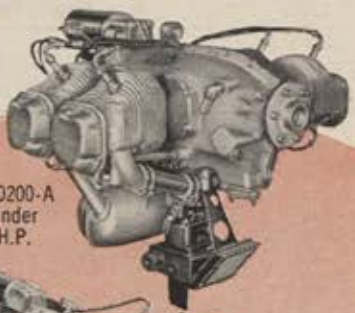

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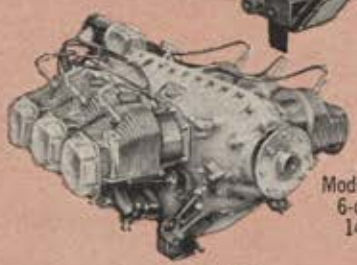

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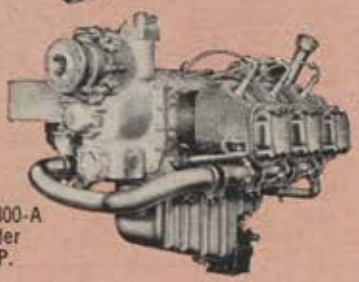

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