NOVEMBER 1958 / 50c

AIR FORCE

• The Magazine of AEROSPACE POWER / Published by the Air Force Association

NORTH AMERICAN'S X-15

The Free World's First Aerospace Craft

IN THIS ISSUE:

Full Report on AFA's 1958 Convention in Dallas

INTRODUCING

SPACE DIGEST

THE SPACE AGE IN PERSPECTIVE

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Think small

Mechanical brains for missiles must be as tough and tiny as possible . . . a design problem that calls for experts skilled in both electronic computers and miniaturization.

ARMA's computer group has shrunk a digital computer module until it's the size shown above . . . a feat comparable to squeezing the contents of a steamer trunk into a cigarette package.

Right now, in fact, through new techniques of solid state circuitry, systematic design and compatibility testing, ***ARMA*** is producing a family of airborne digital computers that are operational under the most severe conditions of vibration, temperature, noise, acceleration and deceleration, and nuclear radiation.

For information on our fully transistorized, airborne digital computers, contact ***ARMA***, Garden City, N. Y. A division of American Bosch Arma Corporation.

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Providing a new systems approach that follows through from initial plan to final production, the Bendix Systems Division serves as the *focal point* for the twenty-five strategically located divisions that constitute the Bendix Aviation Corporation. The new building, designed for engineering and managing of major weapons systems, is adjacent to the Graduate Engineering School of the University of Michigan in Ann Arbor.

This structure and its additions will accommodate a staff of 1,000 including engineers and scientists who will explore new concepts in communications, guidance and control, infrared, data processing, aerodynamics and propulsion, radar, acoustics, and countermeasures.

Weapons systems now being developed by this Bendix division include air defense network improvements, global weather reconnaissance, special radar applications for detecting ballistic missiles and low-flying aircraft, underwater surveillance, mission and traffic control, and a supersonic aerial target system for testing operational capabilities of the latest weapons.

Bendix Systems Division

ANN ARBOR, MICHIGAN

Bendix
AVIATION CORPORATION

Key factors in any weapon system

It takes more than a runway or a launching pad to get the new aircraft and missiles into the blue. The requirement for outstanding Air Force personnel is greater now than ever before, and promises to be even more demanding in the years to come. That's why the new Air Force Academy at Colorado Springs has such significance. Here, resourceful young men will be readied for the big jobs of the future. They will acquire that high degree of technical and executive skill which will allow them to handle tomorrow's problems relating to aircraft, missiles or space vehicles with competence and efficiency.

Douglas salutes the foresight of Air Force planners in setting up this fine facility. As an Air Force partner in the nation's security with such projects as THOR, C-133, RB-66 and GENIE, we assume responsibility for our products throughout their operational life. And we realize that their success depends largely on the capability of the personnel who utilize them. We send our best wishes to the men who teach and the men who learn at the new Air Force Academy.

DOUGLAS

The Armed Services' Partner in Defense

Our nation's growing arsenal of missiles, possessing fantastic speeds and awesome capabilities, must be supported by supersonic aircraft of an entirely new order. Such a plane is the Lockheed F-104 *Starfighter*—the culmination of more than a decade of research and development in every phase of jet-powered flight. Plans for new and even faster military and commercial manned aircraft are on the drawing boards at Lockheed—to give vital tactical and logistical support to our far-flung NATO missile bases, our missile-launching mobile units of the United States Armed Forces, and the thousands of industrial firms which produce the armament to maintain America's defenses at optimum strength.

**Military aircraft cannot establish official speed marks until they have been operational 6 months.*

Lockheed's famous "Missile with a man in it," the F-104 STARFIGHTER, entered USAF service in February. Every time it flies an intercept mission for Air Defense Command, the F-104 exceeds the world's official speed record (1207 miles per hour) for jet aircraft.*

LOCKHEED *means leadership*

LOCKHEED CALIFORNIA DIVISION: *Burbank, Maywood and Palmdale, California*

JET FIGHTERS • JET TRAINERS • LUXURY AIRLINERS • PROP-JET TRANSPORTS
AIRBORNE EARLY-WARNING AIRCRAFT • ANTI-SUBMARINE PATROL PLANES

AIR FORCE

THE MAGAZINE OF AEROSPACE POWER

Volume 41, Number 11 • November 1958

1958 NATIONAL CONVENTION ISSUE

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AIR FORCE MAGAZINE AND SPACE DIGEST STAFF

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American industry teams up to build the B-70 and the F-108

AMERICAN INDUSTRY faces a job that is big, demanding, urgent.

The F-108 and the B-70 will be the first of the new generation of manned weapon systems. No military airplane in the world today even approaches their performance.

They represent such a sharp break with the past that almost everything that goes into them — aerodynamic design, structure, propulsion, electronic and hydromechanical systems — will require giant forward strides in engineering.

The need for these radically advanced manned weapons is very great. Yet the scope and complexity of the systems engineering involved presents problems so formidable that it will challenge the most creative minds in America.

There is only one way to handle projects of this size: dividing each project into major systems and assigning each of these systems to a major contractor. In this way, America's outstanding scientists and engineers can begin work *simultaneously* on each of the separate systems (15 for the F-108, 16 for the B-70).

Each major contractor will be responsible to the Weapon System Manager for *everything* about his system, from engineering through construction. In every case he will sublet contracts for engineering and components to other companies, large and small. He will deliver his system to the prime contractor, North American Aviation, who in turn will deliver the complete weapon system to the Air Force.

This is the Weapon System Manager concept. This is the way American industry shelves self-interest and shares secrets to make the nation strong. This is the way that free men can meet the threat of tyranny.

The Los Angeles Division of

North American Aviation, Inc.

An Editorial

We Can Afford What We Need

John F. Loosbrock, Editor

AN ANCIENT anecdote tells of the man who, after months of joblessness, got work as an apple sorter. He took the apples as they came from the pickers and sorted them into three piles—small, medium, and large. Before he had finished a week on the job he went to the foreman and asked for his pay.

"What's the trouble?" he was asked. "Hours too long?"

"No, sir."

"Work too heavy?"

"No, sir."

"What then?"

"It's my nerves, sir. The decisions are killing me."

The story illustrates the national defense dilemma of how much can we spend and what should we spend it on.

In the recently issued report of the Committee for Economic Development, entitled "The Defense We Can Afford" *(see "Airpower in the News," page 15)*, James F. Brownlee cogently outlines the problem. He says:

"We face a seemingly endless list of choices. Should we concentrate upon delivering hydrogen bombs to the homeland of the potential aggressor, thus running the risk of a full-fledged, universal nuclear war? If we follow this course should we use more of our resources for building up civil defense and our capacity to recuperate from disastrous retaliatory blows? Or should we support a military organization geared to react to local and limited aggression by use of conventional forces and nuclear weapons adapted to the attainment of strictly limited objectives?

"How much should we spend on increasing the mobility of ground forces? How much on guided and ballistic missiles and their supporting installations? How much for basic research? How much to the improvement of weapons likely to be out of date two or three years from now? How much on submarines? How much on the conquest of outer space?"

Decisions, decisions. And it is not a question of the right apple in the right barrel. Upon the wisdom of our choices may lie our very survival as a nation.

The CED report goes on to point out that "these choices once made cannot be quickly changed. They will determine our state of readiness for many years into the future."

One thing is sure, however, says the report:

"The less we spend on defense the harder will be our choices, the more we will have to rely on our frail capacity to foresee the future. And the fewer will be the contingencies against which we can defend ourselves."

All of which brings us to what is perhaps the most significant single sentence in the 1958 Statement of Policy of the Air Force Association:

"Our total national defense effort can be expanded without endangering the economy."

This is important for it is difficult to see, at this juncture, how our national defense posture can be significantly improved without substantial increase in the national defense budget. No one questions the fact that available money can be spent more wisely, that we are still frittering away our substance on obsolete weapons and obsolete concepts. The recent reorganization of the Defense Department admittedly falls short of achieving maximum efficiency within the amount of dollars available. Yet the threat continues to grow and the inevitable gap between the respective military capabilities of the US and the USSR is fast becoming a matter of when and how much, not if. It seems apparent, then, that the only short-term answer is more money.

As an AFA elder statesman put it in private conversation, "If your little boy sets the house on fire, your first move is not to lecture the little so-and-so on the dangers of playing with matches. The first priority is to put out the fire."

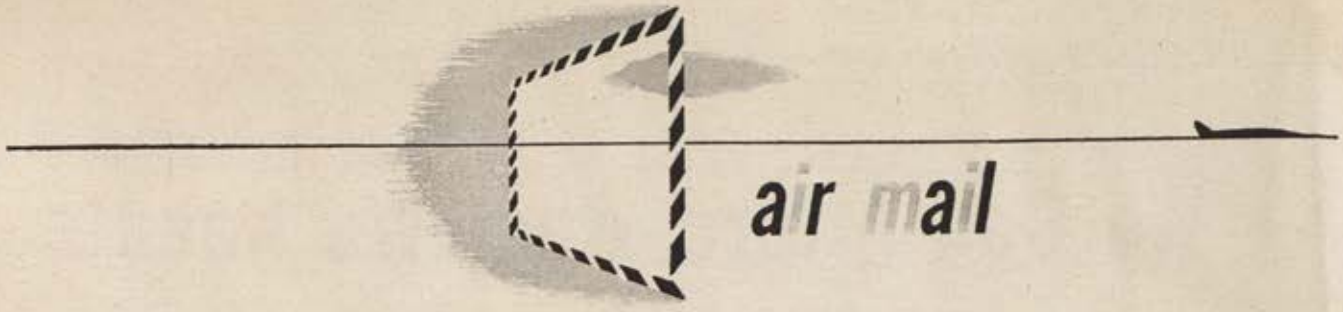
Here one runs smack into the ancient argument that there is some arbitrary limit on what we can afford to spend on defense. That such a limit somewhere exists may well be true. But that we are even close to it at present appears to be a gross exaggeration.

Taking an average of several serious studies of the matter, the Soviet Gross National Product has grown about twice as fast over the past ten years as has the GNP of the United States. Even with their late start, the Soviet Union today is producing over-all about forty percent of what we are.

But—and here's the rub—from twenty-five to fifty percent of the Soviet GNP is devoted to military purposes. To err on the side of conservatism, let's take the lower figure—twenty-five percent. We expend between ten and twelve percent of our GNP on defense. This means that with a GNP that is forty percent of ours, they are matching us in military effort.

Naturally, this depresses the standard of living in the Soviet Union. But they're getting by—and expanding. We devote ninety percent of our Gross National Product to peaceful purposes and say we can't afford to spend any more money on defense without wrecking the economy. The Soviets spend seventy-five percent of a much smaller GNP on peaceful purposes and boast that they'll lick us in the economic war before the ICBMs get into the battle.

This doesn't add up to me. Paying taxes isn't my favorite indoor sport by a long shot. But it seems to me that we're neglecting the greatest weapons in our arsenal: the wealth and productivity of this nation. I'm naive enough to believe that no American will dodge the issue if it's made clear to him, that no one wants that second television set badly enough to risk his freedom for it, and, further, that this nation's economy, managed with the boldness that made it great, can grow faster than the threat and that the people of the United States—to return to the words of the CED report—"can afford whatever has to be spent in the cause of national defense."—END



General Gavin's "World"

Gentlemen: It would be negligent of me to pass over a reading of your editorial entitled "The Little World of General Gavin" [September '58] without expressing my disappointment with your treatment of the subject and its personal aspects. I would not take offense at anyone's objective review of General Gavin's *War and Peace in the Space Age*. However, you have chosen by inference to deride a sincerely dedicated man, one of our nation's finest soldiers and citizens. . . .

The true facts are opposite from those you infer. General Gavin obviously has a high regard for all the military services and their uniformed members. He has repeatedly established the urgency for maintaining high capability in all the military media of land, sea, and airpower. As early as 1947 in his book entitled *Airborne Warfare* he states, on page 174:

"Airpower is now the decisive element in modern war. And by airpower is meant every contribution to waging war that man has created and that can be flown. Men, weapons, ammunition, food, bombs, missiles, and all that it will take to fight a future war must fly."

And earlier, on page 170:

"The nation or group of nations that control the air will control the peace."

Furthermore, I believe there is evidence of progress in Army research and development under General Gavin's direction. . . .

Your claim that General Gavin suggests that we should neglect our ability to wage general war is surely in error. The fact that he establishes early in his book that "a limited war concept is only valid within an impressive overall framework to wage general war" disproves such allegation. . . .

I can only surmise that a more factual research of General Gavin's expressed views, and a more factual knowledge of his personal background, would have revealed to you that he is not deserving of the derision you accord. He has consistently throughout his brilliant military career portrayed an intelligence, courage, and integrity not easy to equal.

Aside from your curious desire to deride this fine officer, you appear to agree reluctantly with much that he has to say. I, too, agree with much that he says, and believe that a more studied look into the matter will reveal that "The Little World of General Gavin" is in truth not so very little, but much, much bigger than you think.

Col. John W. Oberdorf
Maxwell AFB, Ala.

● *We respect your opinions but must continue to disagree with you. Our contention was that he was all for airpower but thought the Army should run it. As for the progress of Army research and development, we feel it is safe to say that it would be farther ahead in terms of the doughboy mission had there not been so much effort expended at Huntsville in pursuit of the Air Force mission.*—THE EDITORS

Convention Praise

Gentlemen: My heartiest congratulations to Peter J. Schenk on his most deserved reelection as President of AFA and on AFA's greatest Convention ever.

I've attended a number of the Conventions in the past and thought they were real professional jobs. But the one in Dallas really outdid them all. The highly capable AFA staff and the boys down Dallas way really are to be commended for their efforts and accomplishments.

I wish also to belatedly congratulate the AIR FORCE staff on their 1958 Almanac issue. I think it's terrific. The magazine always has been number one in my library.

Lt. Col. Joseph H. Friedmann
Editor, *The Air Reservist*
Mitchel AFB, N.Y.

AF Materiel Planning

Gentlemen: I enjoyed the editorial in the October issue on the new SPACE DIGEST. It is a wonderful idea. We should all do as much as we can to spread information with regard to the development of space and the construction of missiles.

There is one other phase of Air Force activity which no one covers and about which less is known in the construction of ICBMs. That is the materiel support of Air Force operation. Since we have had our source of origin in the Army, the Air Force has in general taken a Quartermaster view of this most important aspect of its operation. When Grandpa and Uncle Mike were in the Confederate Army, outside of their uniform and rifle, the CSA was responsible for little more of their equipage. . . .

Today's warfare is entirely different. Failure upon failure occurred during World War II and the Korean War as a result of ignorance of materiel planning. I know that you realize what a coordinating affair a mission properly accomplished with a B-58 will require. ICBMs will require even greater coordination. There is extant among Air Force officers today a greater knowledge of the scientific aspects of missiles than there is of the day-to-day operation of materiel.

Maj. Gen. Clements McMullen
USAF (Ret.)
San Antonio, Tex.

"Ham" Sleuths

Gentlemen: Your paragraph about Soviet amateur radio operators being trained to find hidden transmitters with portable receivers ("What's New With Red Airpower," September issue) is occasion to remind you of the activities of our amateurs in this art.

For several years, radio amateurs in this country, usually under the auspices of local "ham" clubs, have engaged in "hidden transmitter" hunts. Usually these hunts are conducted in connection with a club program, the "hunt" being the feature event.

The ingenious locations of these transmitters, and the persistence of the radio sleuths, is more than interesting. It shows that our radio amateurs are quite adept in a technique which perhaps some AIR FORCE readers may think is unique to the Soviets.

The refreshing aspect of our US group is that our radio amateurs do their radio sleuthing quite voluntarily.

Rest assured that as long as our government continues its enlightened policy of licensing US amateurs, and protecting their frequencies, this nation will be well girded with a corps

(Continued on page 11)

At DRESSER, Men with Imagination Help You Probe New Horizons

Wherever new horizons in technology are being explored – whether in the stratosphere or at the bottom of the sea – the men of Dresser Industries are helping to supply technical services and equipment.

Dresser experience in engineering and manufacturing has set high standards in oil, gas, chemical and electronic industries for many years. Today, in atomic research, in missilery, in electronics, the men with imagination at Dresser are exploring new frontiers in technological development. These men are supported by the combined facilities of the companies that make up Dresser Industries, Inc. The engineered equipment Dresser supplies to government agencies ranges from tiny hermetically sealed transformers for jet aircraft to compressors for giant atomic submarines, from launching towers for missiles to gas pumps for nuclear power installations.

Whatever your needs, look to Dresser. From no other single organization will you receive the same combination of facilities and experience with individual attention to your needs. For although each Dresser company works independently, all are teamed together in a single organization to provide unified research, engineering and manufacturing facilities.

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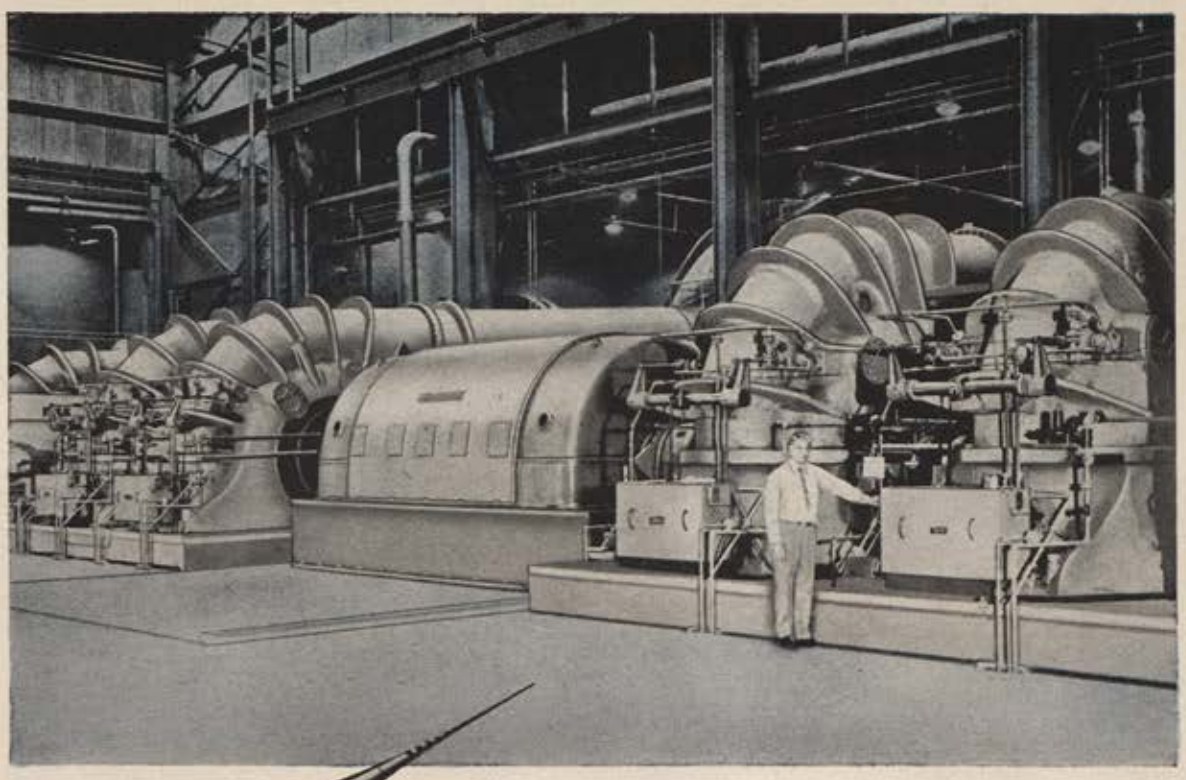

Roots-Connersville creates **stop-and-go whirlwinds for aircraft research**

Man-made air masses that match the violence of nature's hurricanes pour from the Roots-Connersville Blowers at the Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics. Yet the power of these huge wind-making machines can be instantly controlled, from a soft, whispering breeze to a roaring, whirling cyclone. In the reverse, the siphoning air movement can develop almost perfect vacuums to simulate the air conditions of high altitudes. A similar but larger N.A.C.A. "wind-making system" has now been completed at Langley Field, Virginia.

The same engineering and manufacturing abilities that developed these stop-and-go whirlwinds are applied by Roots-Connersville to the everyday movement of gas and air, in small or large quantities, for industry. Now in its second century of service, Roots-Connersville Blower Division, one of the Dresser Industries, designs and builds the world's most extensive and varied line of such equipment.

Teamwork... that serves the world!

In its specialized field, each Dresser company, operating independently, has the experience, facilities and engineering manpower to meet the progressive needs of the industries it serves. Whenever an unusually challenging problem is put before any Dresser operating unit, the vast research, engineering and production facilities of all divisions of Dresser Industries, Inc. can be swiftly mobilized into effective teamwork. Throughout the oil, gas, chemical, electronic and other industries, this coordinated performance is known as the Dresser *Plus* +... a standard of comparison the world over. *Briefacts* gives the complete story of the Dresser *Plus* +. Write for your copy today.

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REPUBLIC NATIONAL BANK BLDG. • DALLAS 21. TEXAS

of citizens who have a lot of communications and electronics know-how.

Will Hilbrink
Worthington, Ohio

NAEC Program

Gentlemen: I noticed in my copy of September AIR FORCE Magazine the very fine advertisement for the National Aviation Education Council. This pleased me greatly because I feel that your magazine is a good medium to bring about a closer understanding of the place of aviation in today's world by teachers and school administrators. It is also good for your membership to know more about what the NAEC is doing.

As a member of the Board of Directors and an officer of the NAEC, I want you to know how much I personally appreciate the continued cooperation and assistance of your fine magazine.

Willis C. Brown
Specialist for Aviation Education
Office of Education, HEW
Washington, D. C.

Gentlemen: I want to take this opportunity to thank you for giving our NAEC program the nice advertisement. I appreciate very much all that you have done in making it possible for more people to know about our program.

Dr. Evan Evans has done an exceptional job in putting this program on a going basis, and it is thrilling to us to see the increase in interest among students and teachers over the country.

K. Richard Johnson, President
NAEC
Washington, D. C.

Still the "Adjutant"

Gentlemen: The editorial, "Alas, the Adjutant," which appeared in the *Arkansas Gazette* and was reprinted in AIR FORCE Magazine, September 1958, bewails the passing of the word "Adjutant" from Air Force terminology.

Air Training Command Supplement-1 to Air Force Regulations 20-16 is quoted for your edification: "No change will be made to redesignate Adjutants as Administrative Officers."

Within the Air Training Command the Adjutant remains as before—performing his traditional duties and functions plus such "administrative services" as are described in Air Force Regulation 20-16.

Lt. Col. Robert A. Schaaf
Adjutant
Randolph AFB, Tex.

One of the "Handful"

Gentlemen: Relative to Col. Alfred L. Wolf's letter on "The Lighter Touch" in September "Air Mail," please enroll me as a member of the "handful of intellectual leaders" who "eagerly await the papers you present."

Capt. A. W. Gilham
Wadena, Minn.

FAA Debate

Gentlemen: Having been a private pilot of thirty years' standing, an Air Force major, and currently again a commercial pilot, the writer feels qualified to answer the editorial signed by Claude Witze in the September issue of AIR FORCE. . . . The article makes reference to the law which creates the Federal Aviation Agency. . . .

Having been in the Air Force we know how an Air Force officer may be tempted to assume the "I-Am-Bigger-Than-You-Are Cult" which is alluded to in Mr. Witze's editorial as applicable to "general aviation." . . . My heart bleeds for the Air Force, for naval aviation, for Coast Guard aviation, for the Civil Air Patrol, for all manner and kind of military aviation in its fight to survive and its desperate effort to be "protected" against dominance by civilian influences. Horrible thought. . . .

(Continued on following page)

This is my first quarrel with the editorial policies of the Air Force Association concerning which I am so proud to be qualified as a member. I pray that I never again will have occasion to take issue with AFA in any of its announced policies. . . .

Warner H. Kimball
Detroit, Mich.

● *We regret that Senior Editor Witze's "Airpower in the News" column has been viewed by Mr. Kimball as an expression of official AFA policy. It is a commentary by an experienced and well-informed Washington reporter. In reading the Senate debate on the FAA legislation, Mr. Witze sensed an effort by general aviation interests to cite the size of their operation and argue that it is most important because it is biggest. As a commentator on the news, he took exception to this. He has editorial license to be critical in this sense and is encouraged to be critical. What he says is his comment and does not in all cases represent AFA policy on subjects on which the Association has not taken an official public stand.*—THE EDITORS

Author's Query

Gentlemen: I am contemplating writing on the military service, with particular emphasis on humor, sports, and war experiences.

I would appreciate hearing from some servicemen who might like to collaborate in the venture by tossing around some ideas on the subjects with the thought of our putting together some stories or even books.

Bernard C. McColey
320 E. 73d Street
New York 21, N.Y.

New Aviation High School

Gentlemen: It is heartening to see your magazine give support to the National Aviation Education Council. As a vice president of this organization I am most interested in its work and in the importance of getting the story of aviation education told to adults as well as to children.

Frank Woehr, Principal
Aviation Trades High School
New York, N. Y.

The Deadliest Men

Gentlemen: I just read the article in AIR FORCE Magazine of October titled "The Deadliest Man in the World." I was very surprised to see how far behind the times it was. Harlingen Air Force Base is no longer the only primary basic training center for navigators. James Connally AFB, at Waco, Tex., is doing the same job. Its first class graduated about a month ago.

The PBN program now has a new system. It is 150 training days (approximately thirty-seven weeks), and we no longer take electronics, so no vacuum-tube diagrams. I am one of those disappointed "washed-out pilots," but I found the article quite interesting.

You mentioned the long day flights but forgot the night ones—1600 to as late as 0230, but the heavens are beautiful on a clear night, if you just have time to look out.

By the way, the E-6B is long gone. We use an MB-4.

2d Lt. E. W. Paulson
James Connally AFB, Tex.

● *Reader Paulson is correct in that James Connally AFB is also a PBN center. But there are actually three computers now in use instead of just the MB-4.*—THE EDITORS

...NEWS IS HAPPENING AT NORTHROP

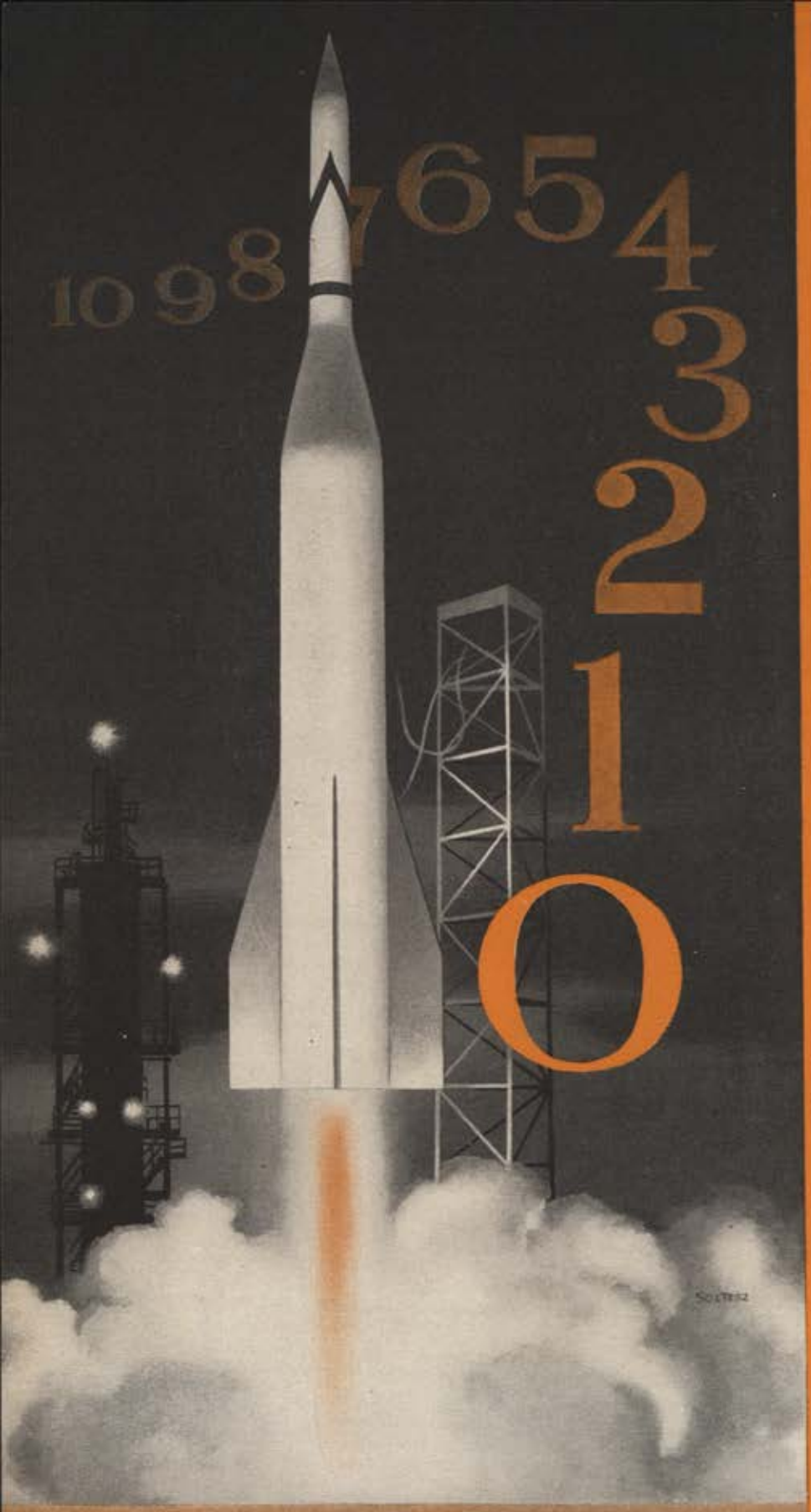
NORTHROP T-38 TO TRAIN THE NEW GENERATION OF SPACE AGE AIRMEN!

Ahead of schedule! Northrop introduces the first lightweight, low-cost trainer with combat performance characteristics, in which U.S. airmen of the space age can safely master the very special art of supersonic flight.

The twin-jet T-38 pioneers a new Northrop family of low-cost, high-performance aircraft. Another member, Northrop's N-156F NATO-SEATO counterair fighter, is now being built at Hawthorne, California. Final mockup of the N-156F is shown in background of above illustration.

Both aircraft are evidence of Northrop Division's skill in creating and producing higher quality products at lower cost. With other current projects, the T-38 and N-156F illustrate a new kind of cost-conscious creativity—are results of Northrop's budget-minded management team, the unique Performance and Cost Evaluation Program called PACE, and of Northrop-developed production techniques.

NORTHROP
HAWTHORNE, CALIFORNIA
A Division of Northrop Aircraft, Inc.



From concept to countdown... Crosley

A missile is no better than its parts! And Crosley, working from "research to hardware," is designing and manufacturing improved component parts for missiles. Several of today's important missile programs rely upon Crosley because it offers:

- An unparalleled background in development and production of complex electronic and electromechanical systems, including guidance systems.
- Proven design capabilities along with extensive, low-cost manufacturing facilities—including stainless-steel contour honeycombing, metal bonding and chemical milling.
- Systems management that insures both speed and efficiency during every phase of a project.
- Experience. Crosley has and is proving itself on many projects, including some involving the *Falcon, Polaris* and *Titan* missiles; the MD-9 fire control system, research and development of the *Volscan* Air Traffic Control System, MPS-16 Height Finder Radar, missile and mortar fuzing, and structural components for missiles and supersonic aircraft.

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AIRPOWER in the news

WASHINGTON, D.C.

■ The Air Force Association's 1958 Statement of Policy, adopted at the Dallas Convention, recommends a higher rate of spending for both research and development and the force in being. It says this can be done without endangering the economy.

Even as the Statement was being considered by the delegates, the military services were handing their budget estimates for fiscal 1960 to the Department of Defense. Best educated guess is that they will total about $42 billion. This would make them conform to what Donald Quarles, Deputy Secretary of Defense, described to the press as "guidelines . . . somewhat higher than last year."

It must be made clear at the outset that neither Mr. Quarles nor his boss, Defense Secretary Neil H. McElroy, is responsible for any budget limitation, no matter how real or how ethereal. The figures are imposed from above.

The very fixing of "guidelines" is the source of some irritation and a lot of perplexity around the Pentagon. Mr. Quarles denies that the Army, Navy, and Air Force are limited in their budget requests simply because the front office put up a financial fence and told them to keep their exercises inside of it. This prompted the following exchange in Room 3E869, traditional site of Pentagon press conferences:

MR. RAYMOND (New York *Times*): If they are free to ask for more, what is the sense of the guidelines?

DEPUTY SECRETARY QUARLES: The sense of the guidelines is to develop the best budget we can within a framework that appears to be at least approximately the right level for us to seek at this time. But I want to make it clear that there is no Administration policy determination that this will be the level which the President seeks from Congress.

MRS. OSWALD (*American Aviation*): That guideline, sir, is a dollar guideline, is it not?

DEPUTY SECRETARY QUARLES: It is a dollar guideline primarily as to the expenditure level in the next fiscal year.

UNIDENTIFIED: Is that a higher or lower figure than last year, the current year?

DEPUTY SECRETARY QUARLES: The guidelines to which these budgets are being drawn will be somewhat higher than last year, but I want to make it very clear that *this is not imposing a ceiling on the budget. It is seeking a budget presentation that we can study.*

• • •

Under these circumstances it has become an idle exercise to seek an estimate of what the Chiefs of Staff really think they need to do the job. There has appeared in the public prints an outside guess that the Air Force, for example, has put a price tag of $26.5 billion on its essential tasks for fiscal 1960. This probably is about $7 billion more than USAF will officially try to get within its "guidelines."

Estimated USAF expenditures for fiscal 1959 are a little over $19 billion. Actual new money provided for this year was $18.6 billion, and it is not anticipated that the figure will climb much past $19.3 billion for the year that starts next July.

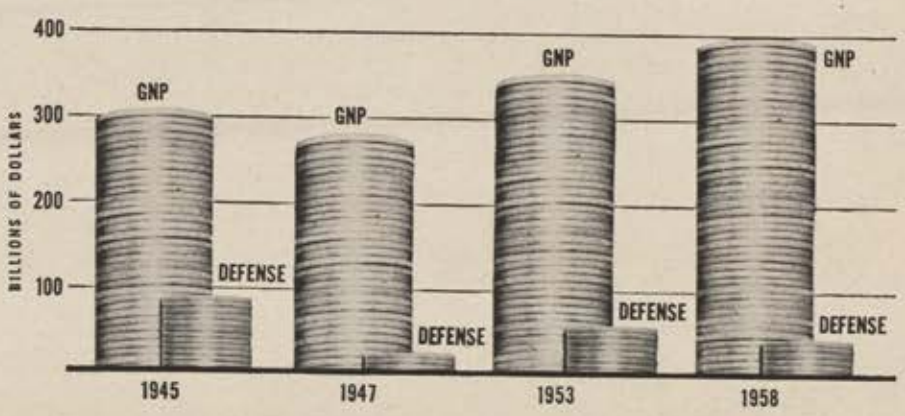
There is no doubt about it, something has to give way if we are to stimulate research and development, continue the force in being with modernization and dispersion, *and* plunge ahead with activation of tomorrow's weapons. Atlas and Titan ICBMs will not add to the deterrent force if they are standing in warehouses. Plans have been announced for the sixth ICBM base site, to be located in Kansas. By the time this base is ready to go it will cost about $290 million, of which $30 million will go into construction alone.

With so much of its contemplated expenditures already frozen in concrete because the commitments have been made—to ICBM bases, nuclear submarines, or mobile Army units to put out brush fires—it is difficult to see how the nation can live—or even survive—within the guidelines contemplated by the Defense Department. If Mr. Quarles is

(Continued on following page)

How Much Can We Afford for National Defense?

It took less than thirty percent of our Gross National Product to pay for our defense effort in 1945, the last year of World War II. There was a low in 1947 (about five percent), and the post-Korean peak was in 1953 (about fourteen percent). Today we are spending about ten percent or eleven percent of the GNP for military purposes. In Russia, the Communists are reported to ignore costs in matters involving education, research, weapons. The result is that they can "afford" more than we are willing to pay for. Chart is adapted from statistics by the CED.



completely honest about his statement that there is no ceiling being imposed, and the reporters he faced displayed no little skepticism about it, it is going to be impossible to provide what is needed.

If we were to reduce the fiscal 1960 budget situation to the status of an argument, there is no evidence that the Administration disagrees with the AFA contention that the deterrent force must be maintained and the research frontier exploited. There is a serious difference of opinion, it seems obvious, when AFA contends we can have both without endangering the economy. Very simply, AFA believes the country can afford the defense it needs. The Administration, as evidenced by the guidelines, believes the country can afford only part of it.

Well, how much can we *afford* to spend on defense?

THE PERIL IN ECONOMY

If we shift too large a proportion of our funds from planes to research and development, we may find ourselves at a critical moment without sufficient retaliatory striking power. Prototypes and missiles on the drawing board cannot fight.

If we economize excessively on research and development, including basic research, we may discover that the Soviet Union has achieved a technological breakthrough in a weapons system which renders our forces in being obsoleté.

If we are parsimonious about active and civilian air defense, and the Big Deterrent fails to deter, we may have caused the death of millions who might have survived.

If we spend so much on air defense or on large conventional surface forces that we cannot provide enough for retaliation, we may have blunted our crucial power of deterrence.

If we economize excessively on mobile ground forces and tactical air forces that are able to do combat in local wars, we may see Communist rule expand by means of military blackmail or local warfare because we hesitate to unleash an unlimited nuclear war of mutual destruction . . .

We cannot afford to gamble for the sake of economy.

—*From* "The Defense We Can Afford" *by James F. Brownlee.*

The question is basic, and it has been dodged too long. There was a time within the memory of many voters when the screams were long and loud because of a proposal that the federal debt ceiling be lifted to more than $48 billion. The idea was an anathema at least to one end of Pennsylvania Avenue nearly twenty years ago. This country, said the Cry of Doom, would be bankrupt if the debt were not curbed. The debt ceiling in 1958 is $288 billion.

"We see no need to be apprehensive about whether or not the American economy can stand the strain of the present budget or even a considerably larger one," said the Committee for Economic Development in a recently published report.

"The risk that defense spending of from ten to fifteen percent of the gross national product, or if necessary even more, will ruin the American way of life is slight indeed.

"It is even less likely that there is some magic number for defense expenditures that, if exceeded, would bring economic disaster; rather, the impairment of growth caused by increasing taxes is a gradually rising one.

"We have not reached the point at which anxiety over the healthy functioning of the economy demands that defense expenditures be slashed regardless of the dictates of military prudence.

"*We can afford what we have to afford.*"

The CED report, written by James F. Brownlee, looks at the constant danger facing the United States with a good deal more frankness than is prevalent in other circles.

"Since there seems to be no foreseeable future without danger to peace, no probability of a return to normalcy," it says, "we must not hobble ourselves with the notion that there is some arbitrary limit on what we can spend for defense or that we can exceed only with disastrous consequences."

Here the issue is joined, because even the Defense Department's "guidelines" can be interpreted as an arbitrary limit. The Research and Policy Committee of CED says it made its study in the hope that the results would help clear away "certain false ideas that have governed these decisions in the past."

It should be added that the Committee for Economic Development is a highly reputable organization of 150 leading US businessmen and educators.

In addition to its demand for a higher rate of spending, the AFA Convention at Dallas called on the Administration and Congress for these things:

- A realistic appraisal of the military requirement in terms of the threat.
- A realistic appraisal of the cost of this established requirement.
- A realistic appraisal of the effect of this established cost on the national economy.
- A realistic analysis of the relationship of the threat to the military requirement, of the requirement to the cost, of the cost to the nation's ability to pay.

Here lies the real challenge to American capitalism, for which we are committed to fight if it is necessary. If an important aspect of this war with Communism is the Battle of the Buck—and both Russians and Americans say this is true—then what in the name of Fort Knox is keeping us out of the trenches? If dollars are bullets, we have the biggest arsenal in the world and should not be afraid to use it.

■ Sometimes it is a lucky thing that not all of us are like Will Rogers. Otherwise, all we would know is what we read in the papers.

From the Washington *Daily News* September 16, 1958

Dr. Homer E. Newell, Jr., head of the atmosphere and astrophysics division of the Naval Research Laboratory, said it appeared the Russians were willing to use ten times as many scientists and spend ten times as much money on certain space problems as this country.

From the Washington *Evening Star* September 17, 1958

"I say without fear of contradiction," General Trudeau [chief of Army R&D] asserted, "that the advanced state of the Soviet technology today is due more to the Soviets' success in espionage and subversion than it is to their scientific apparatus, as good as it is."

■ With something that approaches pride of accomplishment, the Department of Defense disclosed last month that it has declassified a few million documents. The possibility

(Continued on page 19)

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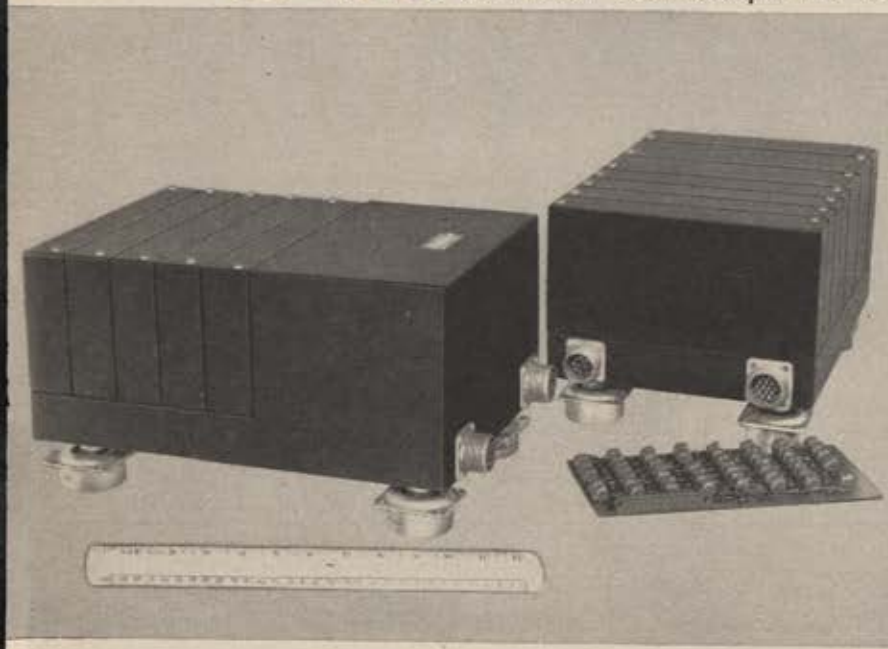

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that they contain anything of interest or importance to technologists and military strategists is pretty remote. All were stamped for secrecy between the Civil War and the beginning of 1946. By topic, the files were sterilized and they do not include any information that was really very sensitive in the first place.

The only reason for mentioning the subject is to warn against any assumption that there is a tendency in Washington to relax the mania for using rubber stamps. The exact opposite is true. As we have pointed out repeatedly, nobody wants to print military secrets or make speeches about them in public. But the fact remains that all documents are submitted to the office of the Assistant Secretary for Public Affairs to face what is called a "review for policy." Pentagon heretics call it the Murray Snyder Thought Control Program. Under this kind of domination it is becoming increasingly difficult, if not impossible, for a man in uniform to express an opinion—or a stray thought—that is remotely original. This is because all original thoughts stray in one degree or another from the accepted policy, at least when that policy is defined or interpreted by some individual chosen almost at random to pass on somebody else's ideas.

It has been pointed out time and time again that overzealous secrecy in handling technological information is a major impediment to scientific progress. It is just as true, though less widely realized, that ideas, like technical facts, must be freely exchanged if concepts and doctrines are to keep pace with the changing world. Inside the military there are scholarly dissertations produced at the in-house war colleges that today are not being circulated where they should be read and considered and contribute to improved techniques. They are not being circulated because the authors have expressed an opinion that does not win the favor of some clerk or possibly an officer of another branch of the armed forces.

In the case of one scholarly journal, published "to stimulate professional thought," about two-thirds of a current issue was forced behind this intellectual iron curtain. The articles that were not killed in their entirety were so emasculated that the editors found it pointless to put them on the press. Both the editor and the managing editor of this military publication hold degrees, have been in their present slots for a number of years, and must be considered qualified to exercise the judgment necessary in their jobs.

In the case of another erudite essay submitted for policy clearance by an Air Force officer, the paper was read by three Defense Department officials. Two passed it with almost no comment. The third rejected the piece. Asked why, he replied that he couldn't find anything specifically wrong—he just disagreed with the viewpoint.

The outrage does not confine its damage to the cross-pollinization of military ideas. As this issue of AIR FORCE goes to press there is a serious public-relations problem in Great Britain, created by the recent arrival of the Thor IRBM, soon to join other weapons at the disposal of our NATO allies. Basic to this problem is the reluctance of the Defense Department to release data on the missile's capabilities. The British press, some of it editorially opposed to IRBM emplacements in England, has been exposed to more derogatory than laudatory opinions about Thor. So far, for example, no assembly-line photos have been released, although a picture of the Army's Jupiter assembly line has been displayed in the concourse of the Pentagon. Many Britons suspect they are getting an inferior US weapon system.

From the standpoint of our national deterrent power, a situation at once more serious and more absurd involves the soon-to-be-fired Titan ICBM. The Air Force recommended release of external photos of this unclassified weapon last April. It is on public view from outside the grounds of the Martin Company plant at Denver. The Denver *Post* has been making a legitimate issue out of the Titan's status (unclassified but unreleased) for more than six months, calling it a "most widely known secret." Thousands of people have seen the weapon and photos have been printed. But the Defense Department is adamant and will not permit release of official pictures. Says the Denver *Post*, editorially, "How Silly Can You Get?—This is How."

There is a strong school that advocates fullest possible release of weapon data on the theory that an unknown deterrent is about as good as no deterrent at all. Without arguing the virtues of this approach, let us point out that the Strategic Air Command is feared more for its demonstrated long-range capability than for its secrets.

■ The National Aeronautics and Space Administration is getting a baptism of fire in Washington. More or less covertly it has locked horns with the Defense Department's Advanced Research Projects Agency and, right out in the open, is being attacked as a cannibalistic enemy of the Army's Ordnance Missile Command. In both cases, NASA is in the unfortunate position of having irritated some pretty important neighbors merely by carrying out the orders it got from Congress and the White House.

It was about six months ago that the Senate Committee on Astronautics and Space Exploration pointed out that ARPA was established as an "emergency measure." Whether it continues as a permanent part of the Defense Department, the committee said, will be decided by the President and the Secretary of Defense. Looking ahead with a sharp eye, the committee predicted an almost inevitable "conflict with the needs and authority" of NASA. At this writing there are indications that ARPA does not believe the emergency is over, and it is mapping its fiscal 1960 budget, right in step with the military departments. That the budget will be needed—it is for the year starting next July 1—is far from certain.

So far as the Army is concerned, it is belatedly aroused by a provision of the law which says the President has four years to add to NASA's capability by shifting into its bailiwick any power, duty, facility, or activity that he chooses to move from another federal department or agency. T. Keith Glennan, NASA administrator, already has taken over the Navy's Vanguard satellite project, along with about 150 personnel. He also has expressed an interest in absorbing the Army's Ballistic Missile Agency and Jet Propulsion Laboratory. The resulting outburst from the latter proposal is orbiting around the Pentagon.

The tragedy of the present situation lies in the fact that NASA, which still does not consist of much more than its parent National Advisory Committee for Aeronautics, now stands in danger of being degraded into a topic for political debate and manipulation. For more than four decades NACA was a technological ivory tower, untouched and untouchable. It boasted unquestioned integrity and capability. It enjoyed the confidence and cooperation of military, industrial, and private laboratory talent all over the US. There are Washington observers who shudder to contemplate the possibility that Congress will raise a cloud of oratorical dust when it reassembles and the changes are reported, as the law requires. If the space program founders in this cloud, there will be rejoicing in Moscow.

—CLAUDE WITZE

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.

Russia has a new long-range bomber, successor to the Bison. The aircraft has been undergoing flight tests and may be shown later this year during one of the annual celebrations in honor of the October Revolution, the Red Army, or some such similar event. The new bomber is a large, supersonic type. Detailed data are not yet available.

° ° °

Production of special steel for use in aircraft is now under way in East Germany. The steel is being turned out at the Stahl und Walzwerk at Riesa. If the steel is used in airframes, it could indicate that the Russians are planning to fly aircraft at Mach 3 or higher and are using steel for its heat resistance.

° ° °

Poland has been in production on two models of the MIG-15, which that country designates as the LIM. LIM-1 uses the RD-45 engine, one of the first Russian reworks of the British Nene turbojet. Now the Russians have improved this basic powerplant. The improved version is designated the VK-1, in honor of engine designer Klymov, who did the work on it.

Poland's LIM-2 version of the MIG-15 also uses the VK-1 engine, rated at 6,000 pounds of thrust. Polish production is centered at Mielec.

° ° °

The Soviet Society for Advancement of the Army, Navy, and Air Force, better known as DOSAFF, which many adolescents join, is aiming at a thirty-million membership. The Society trains pilots, parachutists, navigators, and develops talents for shooting, boating, radio communications, and so on. Almost every factory in Russia has its DOSAFF chapter.

° ° °

First to get the AN-10 Ukraina turboprop transports are the Soviet air forces. The aircraft, which is suited to sod-field operation, is an ideal transport for military use (*see* AIR FORCE, *November 1957*). Only after the initial needs of the air forces are met will the aircraft go into service with Aeroflot, the Russian civil airline. In view of the many IL-18s (turboprop transports) Aeroflot has on order, it is not likely that the AN-10 will appear on Aeroflot's more important routes. Rather, the AN-10 will be used in the back country for which it is designed, and also to carry freight.

° ° °

Less than a year ago the East Germans announced they were going into production on a jet transport, the B-152, designed by Prof. Burnolf Baade, who was forced to work for the Russians for several years after World War II. While in Russia, he designed several jet-powered bombers which were flight tested long before the first Soviet twin-jet Badger appeared.

Baade's twin-jet bomber designs, flown in Russia at Toplistan and Kuibyshev, were the EF-150-V-1 to V-3, based on earlier design work done in Germany. The jet engines were suspended beneath the wings similar to the pod suspension of US jet bombers and transports built by Boeing, Douglas, and Convair. The new B-152 also employs suspended jet engine pods.

Here is the plan for the delivery of the B-152 to East German and other airlines:

Two experimental types already have been delivered. One has been flight tested and the other one is undergoing other tests, including static loads and material testing.

The third experimental type, which will be used to test the engines, is expected to come off the line soon. The fourth type will be ready by May 31, 1959, and will be flight tested without normal inside equipment. The fifth will come off the lines by September 30, 1959, and will undergo additional experimental testing. The sixth will be used to run stability tests, and finally, the first production model is due on December 31, 1959. It will go to the East German Airline. After that, production models are expected to come off the lines about every three months. It will be a 500-mph-plus airplane.

° ° °

Czech-made MIGs continue to find their way around the world. Recently the Indonesian Air Force received eight MIG-15s produced in Czechoslovakia. The method of payment is undisclosed.

° ° °

To better their radar coverage in the Far East, Northern Siberia, and Central Asia, the Russians are considering the construction of an airship (or series of airships) which would police a permanent "beat" over these regions.

° ° °

The National People's Army of East Germany has an air force of some 11,000 officers and men, and above 150 planes. Of these about seventy are MIG-15s. These figures do not include any Soviet forces that may be stationed in East Germany.

° ° °

The suspicion is growing that the Russians really did little or nothing to the TU-104's basic design to produce the newer TU-104A. General appearances indicate only that some twenty seats were added in the main compartment to make space for seventy passengers. This certainly made the airplane more economical by raising its income potential, but it didn't improve performance. Loaded, the TU-104, according to some observers, barely struggles off the runway at Moscow, and severe braking action is required upon landing at Prague.

° ° °

Once-a-week TU-104 jet transport flights have begun between the USSR and Delhi, India. The jets cross into India by way of Tashkent.

° ° °

The upcoming TU-104B, however, will have a stretched-out fuselage and will accommodate 100 passengers. However, to operate it out of Moscow, Aeroflot will either have to get more powerful engines for its twin-engine jet transport, or lay several hundred more feet of concrete on the end of the runway.—END

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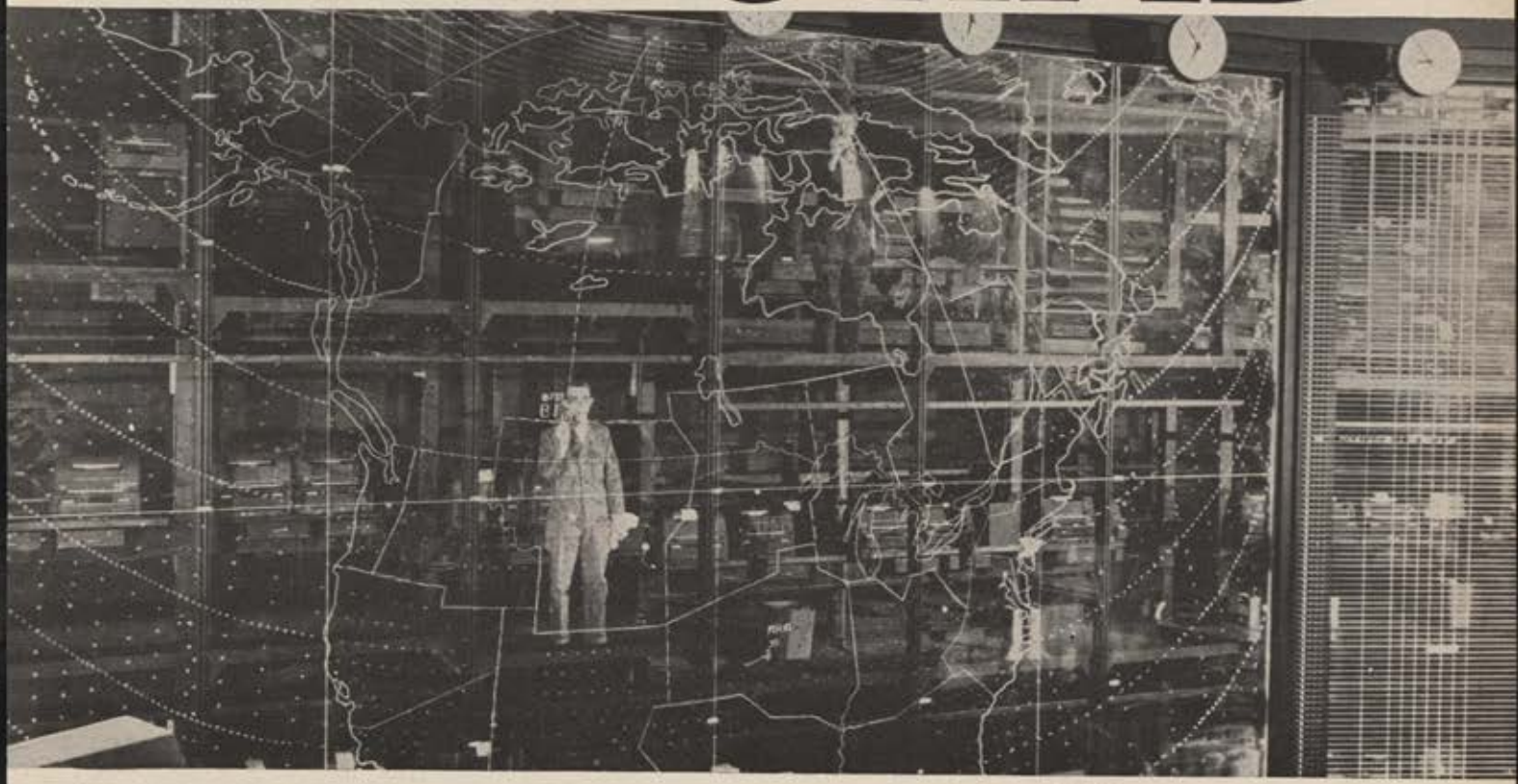

Headquarters—NORAD—Colorado Springs

Like a huge "bumper" wrapped around the North American continent and reaching down along both the Atlantic and Pacific shores, the North American Air Defense Command (NORAD) has been created for operational control of air defense units of the Army, Navy and Air Force of the U.S. and the RCAF Air Defense Command of Canada. Its field includes the vast area between the southern border of the United States and the northernmost limits of Canada and Alaska. Under the functional control of NORAD will be BMEWS (Ballistic Missile Early Warning System) and SAGE (Semi-Automatic Ground Control Environment) for the defense of specified sectors. In addition to its responsibility as prime contractor for BMEWS, the Radio Corporation of America is working on other important electronic assignments for NORAD.

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VIEWS & COMMENTS

Editorial Comment on the "Glorious Failure"

Thousands of words—good, modest words—were written on Pioneer, the October 11 lunar probe that got a third of the way to the moon. There was a visible pride in the public prints, tempered with suggestions that we not sit back on our laurels, but keep hard at the task of space technology. Following are some editorial comments on the launching that heartened America on October 11:

. . . That voyage, it seems fair to say, marks the beginning of another chapter in the history of man's conquest of space, a chapter which promises to equal or exceed in importance that which was begun a year and a week earlier when Sputnik I went into orbit. In the first year of the space age, which ended nine days ago, man's penetration into space was measured essentially in hundreds of miles. Now Pioneer has begun the second year of the space age with a penetration measurable in tens of thousands of miles. This is an enormous achievement. It makes Pioneer's failure to enter an orbit around the moon perhaps the most glorious, even successful, failure in scientific history. . . .

The Pioneer was not only the most complicated rocket vehicle ever launched but it reached many times as far out as any other rocket. The United States Navy's Vanguard I achieved an apogee of some 2,446 miles and the Air Force's Far Side rocket rose at least 2,500 miles and perhaps well over 4,000 miles. Such distances are trivial compared to the 80,000 miles reached by Pioneer. . . .

It has demonstrated beyond doubt that dreams of exploring space are approaching reality at an incredible pace. If the moon has not yet been reached we may be certain from this try that it soon will be—not necessarily next month, or even the next, but when once again all the thousands of intricate preparations involved in such an attempt fall in place at exactly the right instant to make for a perfect launching.—*The New York* Times, *October 13, 1958.*

The first successfully launched American moon "probe" failed by only a few hundred miles an hour, through a slight error in guidance, to achieve the velocity needed to reach the moon. But this most dramatic of all space ventures conducted by the United States to date has been immensely rewarding nonetheless, and the next attempt, which may be made a month from now, may have a greater chance of success as a result of the knowledge gained. . . .—*Washington* Post & Times Herald, *October 13, 1958.*

Whatever may be its final course in relation to the moon, Pioneer, man's first true space traveler, represents a great and unique achievement by our country's military and civilian scientists. For the little vehicle, launched by a four-stage rocket attaining an "escape velocity" of about 25,000 miles an hour, initially pulled away from the earth's gravitational field, and has gone incomparably farther from our world than anything humans have ever before sent heavenward. . . .

Pioneer's performance has been sufficiently spectacular and impressive to lend a touch of near-reality to this vision of the future in space. It is a vision that has ceased to be romantic or fantastic in the comic-strip manner. In terms of its bearing on the advancement of human knowledge, in terms of its military implications, in terms of what it can lead to for the good of the whole world, it is an altogether practical thing full of enormous potentialities. . . . *Washington* Sunday Star, *October 12, 1958.*

It opens the way, also, for fantastic human bodily adventure—some time. There are still, it seems reasonable to say, certain obstacles to be overcome; and current predictions of lunar hotels and of scheduled journeys booked by travel agencies seem somewhat beforehand. But when scientists think it worthwhile to sterilize Pioneer and its contents, lest the rocket chance to hit the moon's surface and contaminate it before the first human explorers get there, scientific possibility is coming close to what until recently was considered science fiction. . . .

We now know that if Pioneer does not get close enough to the moon to investigate it, some other rocket will get there some day. Only a few years ago this would have been thought incredible. The list of incredibilities grows shorter year by year.—*Baltimore* Sun, *October 12, 1958.*

The success of the Pioneer shows what enormous dividends may be the result, but the explosion of the first moon rocket, the Pioneer's predecessor, is there to remind us that one good shot out of three may be as much as reasonably can be expected.

The odds of ten-to-one quoted by moon-shot scientists were not unduly pessimistic. We can't count on the third moon try to succeed, or even do as well as Pioneer. On the other hand, the desirability of continuing the project has been firmly established. We should try for the moon until we succeed and even for Venus, too.

The four-stage Pioneer rocket itself is capable of a Venus flight, without basic alterations; and important experiments and measurements should be made in that vicinity. In short, we favor pressing the space projects for all they are worth. . . .—*Philadelphia* Inquirer, *October 15, 1958.*

Certainly the moon-shot, even though it failed to reach its intended lunar orbit, is an achievement that carries political overtones. It commands respect and admiration, two important requirements for successful leadership in a politically divided world. But those who hope that brilliant scientific performance can counterbalance ineffectual political action are living on the dark side of their moons.

The real significance of the Pioneer lies in the promise that its space journey may signal, however dimly, an eventual end to the conflict of nations on earth. Man, if he is to realize his dream of exploring the heavens, will first have to establish a stable point of departure. International disputes, if they continue without settlement or solution, can only limit and caricature his progress. . . .

The time seems awesomely near when we will reach the moon and travel to the planets beyond. But unless we put our own planet in order, this vision of tomorrow may be blotted out by the follies of today.—*New York* Post, *Tuesday, October 14, 1958.*—END

Beginning in this issue...

SPACE DIGEST

SEE PAGE 67

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More About Strategic Surrender

By Brig. Gen. Thomas R. Phillips, USA (Ret.)

The following communication from Brig. Gen. Thomas R. Phillips, USA (Ret.), is offered in amplification of the editors' note with which we preceded Michael Amrine's review of the book, Strategic Surrender, *in our October issue. In the note we said there was "no such report as General Phillips implied" (in an article in the St. Louis* Post-Dispatch*). In all fairness to General Phillips, we must point out that there indeed is such a study but it is not the Kecskemeti book, as readers of the Phillips article on Capitol Hill and other places had inferred.*—THE EDITORS

THE great storm over surrender that blew for a few days in the middle of August was caused unintentionally by the writer when he reported in an article in the St. Louis *Post-Dispatch* that three nonprofit scientific agencies working for the Defense Department were making "studies as to whether the United States can survive and continue to fight after an all-out nuclear attack."

"One is studying the conditions when surrender would be advisable," the last sentence of the first paragraph stated, "rather than to try to continue a war that is already lost."

The studies referred to were:

- A civil defense study made by ORO (Operations Research Office of Johns Hopkins University), a scientific agency operated for the Army.
- The Rand Corporation study, *Strategic Surrender.* Rand is a scientific agency operated for the Air Force.
- A study by another scientific agency that was not identified because the information concerning its study was obtained in the course of an interview which concerned the general method of operation of the agency, rather than discussion of specific projects.

The failure to identify this agency led many to believe, due probably to the connotation of the title "Strategic Surrender," that it was the Rand study by Paul Kecskemeti that was the study of survival and surrender.

Many assumed that, because the Rand study did not deal with this subject directly, although it did by implication, no such study existed. An Associated Press dispatch of August 14, printed in the *Congressional Record* the same day, quoted a Senator as saying that "Secretary of Defense Neil H. McElroy and Deputy Secretary of Defense Donald A. Quarles had assured the President and Republican Senators that 'there is no thought or plan for surrender and the studies were only theoretical.'"

The Senator continued: "The directive for the study had been made by John B. McCauley, Deputy Assistant Secretary of Defense for Research and Engineering. McCauley made the trip to the Senate," the Senator said, "to explain that part of an over-all study of all possibilities of an all-out war between this country and Russia had included the conditions under which either Soviet Russia or this country might be forced to surrender." This was the unidentified study referred to, not the Rand book.

The ORO study, which was the basis for testimony by Dr. Ellis A. Johnson, ORO Director, before a subcommittee of the Government Operations Committee of the House of Representatives, made an estimate that under varying conditions of attack and defense effectiveness the number of US dead could be from 15,000,000 to 90,000,000.

No valid study that reaches such conclusions can be imagined without thought of national survival and consideration of whether to quit before the magnitude of destruction destroys the loser's bargaining power.

The Rand study was called in the article that raised the furore, "a straw in the wind, showing the direction of some thinking." Dr. Kecskemeti was quoted as follows: "Full-scale nuclear warfare threatens its target with a level of destruction so high that coordinated activities must largely come to a stop. In such a situation, the loser cannot offer 'surrender' in the shape of handing the winner control over cohesive residual capabilities and over a society that is a going concern." By any sort of rational inference such a statement applies just as much to the US as to a possible hostile power.

The director of the agency that was not identified said their studies cast doubt on the ability of the United States to survive and to continue to fight after an attack where 40,000,000 people might be killed.

In lengthy discussions with a highly placed Air Force general, who had called my attention to the studies of survival (or surrender), he made the point that "if the Soviets destroyed most of our counterforce in a surprise attack, say seventy-five percent of SAC, the US from then on would be trading ten American cities to one Soviet city. On the other hand," he said, "so long as we have the means to resist, we have something to bargain with."

The article on surrender was one of a series dealing with the relative military position of the US and the Soviet Union. The idea of relating our situation to survival and surrender was to call attention to the fact that for the first time since the War of 1812 it is possible for an enemy to gain such a great military lead that the US may be faced with the ultimate consequence of its present inadequate military policies—surrender.

A friend in the State Department explained the almost hysterical reaction in the Congress and the Administration to publication of the *Post-Dispatch* article as the expression of a subconscious feeling of guilt. The Administration, which has been determining military expenditures on a budgetary basis, rather than on military requirements, and the Congress, which had generally gone along with the Administration, were suddenly brought face to face with the ultimate consequences of their policies.

Unfortunately, the reaction was to legislate against any study of surrender, rather than to really face up to the military requirements for survival today. "Sufficient unto the day is the evil thereof," is the guiding word, rather than recognition of the peril we face and adequate preparation to meet it.—END

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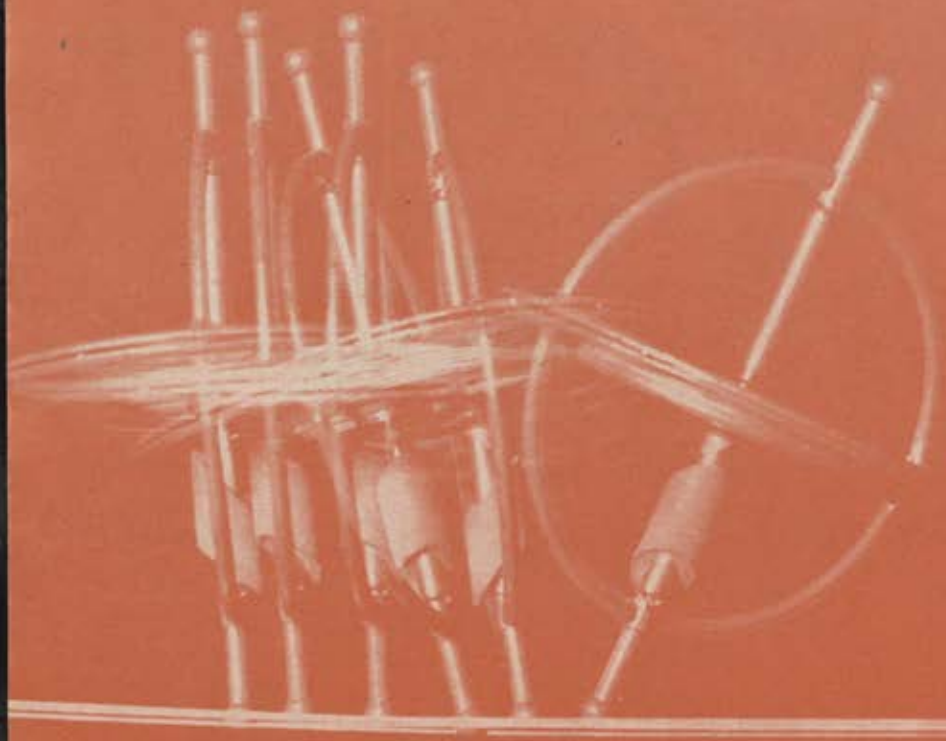

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FLIGHT LINES

Dudley C. Sharp, Assistant Secretary of the Air Force for Materiel, speaking before the **Dallas Rotary Club** on September 24, discussed the **Air Force as compared with other multimillion-dollar businesses.** He said, "The present net assets of the Air Force, estimated at **$70 billion,** exceed the **combined worth of the fifty-five largest industrial corporations in the United States.** These include Standard Oil of New Jersey, General Motors, Dupont, United States Steel, Ford, and Socony Vacuum." He also observed that to visit an AF-supported location every working day **would take thirty years**—*not* including bases on the moon!

Since the Air Force produces none of its own equipment, one of its greatest problems is **procurement,** which involved **$9.4 billion during the last fiscal year.** On the distribution of procurement dollars, Mr. Sharp said ". . . technical developments and changes in strategic concepts frequently cause us to close existing installations or shift our procurement programs . . . but our citizens must always remember that the Air Force's business is *defense, not* economic support."

Gen. Curtis E. LeMay, Vice Chief of Staff, USAF, flew a **KC-135 jet tanker to an unofficial Tokyo-Washington speed record** on September -. The **7,100-mile trip** took twelve hours and twenty-eight minutes, breaking the previous SAC record by more than an hour. Because of the time difference and the crossing of the International Date Line, the KC-135 was over Washington **thirty-two minutes earlier** than its takeoff from Yakota Air Base, near Tokyo.

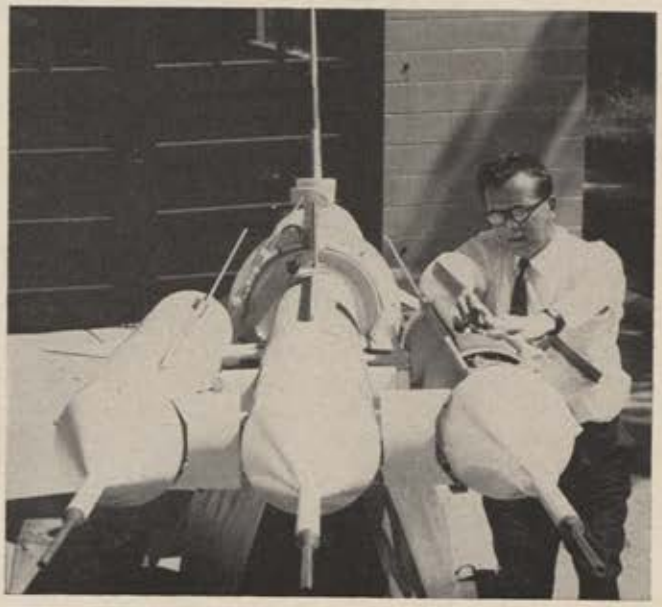
Two B-52 jet bombers hit top speeds of over 600 mph in long-range speed runs on a **closed-circuit triangular course from Rapid City, S.D., to Douglas, Ariz., Newberg, Ore., and back to Rapid City,** a distance of 3,107 miles or 5,000 kilometers. One of the Fifteenth Air Force's Stratofortresses flew the course in **five hours, eleven minutes, and forty-nine seconds** at an average speed of **597.8 mph.** Another B-52 flew the same course twice, in **eleven hours and nine minutes,** with an average speed of **565 mph.** Both planes are attached to the 28th Bombardment Wing, stationed at Ellsworth AFB, Rapid City, S.D. The 10,000-kilometer flight was the **longest nonrefueled jet bomber flight.** National Aeronautics Association observers were on both planes.

The **thirteenth Atlas ICBM** to be fired from Cape Canaveral, Fla., the first scheduled to travel its full range of 6,325 miles, left its launch pad at 4:48 pm, September 18, and **blew up eighty seconds later,** at an altitude of 60,000 feet. **Seven Atlas tests have been successful,** while **six exploded** shortly after liftoff.

The USAF successfully launched **a Boeing IM-99 Bomarc** long-range interceptor missile against a **North American X-10 Navaho** on September 24. The Bomarc was alerted, fired, and guided from the **SAGE center at Kingston, N.Y.,** but was **launched from the Cape Canaveral range,** 1,500 miles away. The X-10 was intercepted over seventy-five miles off the Florida coast at about 48,000 feet. The Bomarc made its attack from a high altitude. **It did not carry a warhead,** but tracking equipment showed that the IM-99 intercepted the X-10 at a **range that would have been a sure kill** if the Bomarc had carried nuclear or conventional explosives.

Operation Long Leap landed three **TAC F-101 Voodoos** at **Carswell AFB, Tex.,** from **Kindley AFB, Bermuda,** as **part of the AFA Convention aerial review.** They flew to Texas nonstop.

Also as part of the review, a **SAC KC-135 Stratotanker** set a new world record for **airlifting a maximum payload of 77,350 pounds to an altitude of 2,000 meters (6,671.7 feet)** on September 24. The record-setting crew, commanded by **Capt William H. Howell,** is assigned to the 99th Air Refueling Squadron of the 4050th Air Refueling Wing at Westover AFB, Mass. This record surpasses that of the Soviet TU-104A jet transport that lifted 44,213 pounds to an altitude of 6,561.666 feet on September 6, 1957.



A supersonic parachute-testing rocket, the Cree, has been developed by ARDC's WADC, Dayton, Ohio. The unit can test three parachutes simultaneously, at altitudes from 30,000-50,000 feet and speeds from 1,520 to 3,040 mph.

Lt. Gen. Donald Putt, who had served as Deputy Chief of Staff, Development, Hq. USAF, until his retirement last June, has been elected president of **United Research Corporation,** a newly formed subsidiary of **United Aircraft Corporation.** He will also be **Assistant Director of Research** for the parent company. United Research will support re-

(Continued on following page)

Lt. Gen. Donald Putt, left, who retired as chief of AF Research and Development last June after thirty years' service, is now president of United Aircraft's new space department. Lt. Gen. Elwood Quesada, USAF (Ret.), has been appointed to head the new Federal Aviation Agency.

search in advanced propellants in cooperation with the Stanford Research Institute as its initial project. As president, General Putt will be advised by a directorate including **Dr. Isidor I. Rabi,** of Columbia University; **Dr. C. Richard Soderberg,** Dean of Engineering, MIT; **Dr. Guyford Stever,** Assistant Dean of Engineering, MIT; **Dr. Bernard Lewis,** Combustions and Explosives Research, Inc., Pittsburgh, Pa.; and **S. Allen Kline,** nuclear physicist and president of Sierra Metals Corp.

Lt. Gen. Elwood R. (Pete) Quesada (*see cut*), who has been President Eisenhower's special assistant for aviation problems and Chairman of the Airways Modernization Board, was given a recess appointment by the President on October 1 as **Administrator of the Federal Aviation Agency.** The FAA was established by Congress last August to make flying more safe and to deal with the problems of the jet age. The new agency will **absorb the Civil Aeronautics Administration** as well as **some of the functions of the Civil Aeronautics Board** and the **Airways Modernization Board.** Under the act that set up the FAA, it cannot begin operation until sixty days after the appointment of the administrator. General Quesada, who retired from the Air Force in 1951, after a military career of twenty-seven years, has been a vice president of **Lockheed Aircraft Corporation** and director of various industrial corporations, mostly in California, before becoming a Presidential assistant.

Dr. George E. Valley, left, USAF Chief Scientist from September 1957 to October 1958, has become Director of Development Planning, Melpar, Inc. Maj. Gen. Dan C. Ogle, right, AF Surgeon General the past four years, retires on November 30 after almost thirty years of active service.

A flight of jet aircraft, in traditional missing-buddy formation, flew over the **USAF Academy cemetery,** north of Colorado Springs, Colo., on September 28, as **Lt. Gen. Hubert Reilly Harmon** was buried with full military honors. His widow and family, the Cadet Wing numbering 1,140, the Cadet Choir, Secretary of the AF **James H. Douglas,** and Chief of Staff **Gen. Thomas D. White** were present. General Harmon, first Superintendent of the Academy, died in San Antonio, Tex., on February 22, 1957. He expressed a wish to be cremated and have his ashes buried at the Academy's site.

STAFF CHANGES . . . Brig. Gen. Ernest H. Beverly, Comdr, Washington AD Sector, ADC, Ft. Lee, Va., has been relieved from additional duty as Comdr, 85th AD (Defense), ADC, and assigned additional duty as Comdr, North American Air Defense (Continental AD), Washington Air Defense Sector. . . . **Brig. Gen. Hewitt T. Wheless,** formerly Chief, War Plans Div., Directorate of Plans, DCS/Plans and Programs, Hq. USAF, has become Director of Plans in the same office. **Brig. Gen. Joseph R. Holzapple,** who was Chief, Operations Control Div., Directorate of Operations, DCS/O, Hq. USAF, was assigned duty as Deputy Director for Operational Forces, Directorate of Operations, replacing **Brig. Gen. Frederick J. Sutterlin,** who became Deputy Director for Operational Resources, DCS/O.

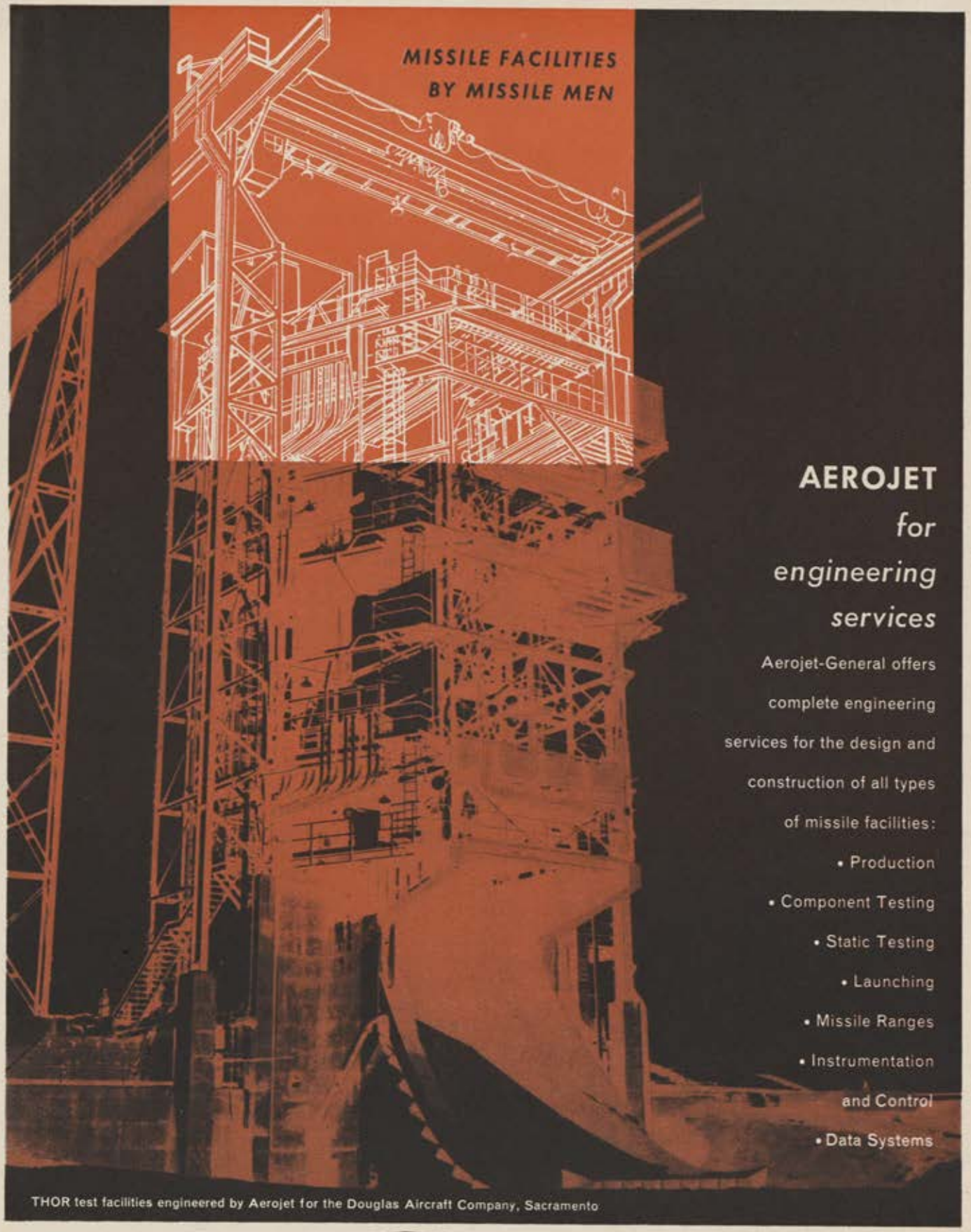
Maj. Gen. Robert O. Cork, who was Assistant AF Comptroller, Hq. USAF, has been assigned duty as Deputy Chief of Staff, Administration and Logistics, Hq. Pacific. . . . The former Deputy for Operations, Hq. Eastern AD Force, ADC, Stewart AFB, N.Y.; **Brig. Gen. Von R. Shores,** has been assigned as Comdr, Boston AD Sector, Stewart AFB. . . . **Maj. Gen. Charles B. Dougher** has been reassigned from Deputy Comdr, Eighth AF, SAC, Westover AFB, Mass., to duty as Chief, Air Technical Intelligence Center, 1125th USAF Field Activities Group, Wright-Patterson AFB, Ohio.

Maj. Gen. Dan C. Ogle, AF Surgeon General for the past four years, will retire on November 30, after almost thirty years of active service. He will be succeeded by **Maj. Gen. Oliver K. Niess,** who is currently serving as Command Surgeon of the Pacific Air Forces in Hawaii. . . . **Maj. Gen. Harold H. Bassett,** formerly Deputy Comdr, US Taiwan Defense Command, has been assigned duty as Comdr, Air Weather Service, MATS, at Scott AFB, Ill.

Maj. Gen. Ben I. Funk has been reassigned from Deputy Director for Ballistic Missiles Office, Director of Procurement and Production, AMC, to Comdr, AMC Ballistic Missiles Center, both at Inglewood, Calif. . . . **Brig. Gen. Beverly H. Warren,** who was Deputy Director of Procurement and Production, AMC, has become Comdr, AMC Aeronautical Systems Center, both at Hq. AMC.

Brig. Gen. Waymond A. Davis, formerly Deputy Director of Weapon Systems, AMC, Wright-Patterson AFB, Ohio, was reassigned as Deputy Director Production, Directorate of Procurement and Production, AMC. . . . **Maj. Gen. Hunter Harris, Jr.,** has been relieved from assignment as DCS/Plans and Operations, Pacific Command, to become Deputy Comdr, Eighth AF, SAC, Westover AFB, Mass. . . . **Maj. Gen. Albert T. Wilson, Jr.,** formerly Senior Member UN Military Armistice Commission (UN Command Component), has been assigned duty as Assistant AF Comptroller, Hq. USAF.

RETIRED: Maj. Gen. Merrill D. Burnside, Brig. Gen. Ethelred L. Sykes, Maj. Gen. William M. Morgan, Maj. Gen. Edward W. Anderson, Brig. Gen. Hollingsworth F. Gregory.—END



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WITH THE EDITORS OF AIR FORCE MAGAZINE

SHOOTING THE BREEZE

We don't have a man Stanley, but we do have a latter-day Aesop who scatters fables appreciated by military types. Here is one he left on our desk:

Once upon a time there was a handsome young lion. He was captured in the African jungle and brought to America, where he was put on display in a zoo. This made the lion very unhappy because he preferred the freedom of his wild native land and the companionship of other jungle beasts. But after a time he became resigned to his fate and made up his mind that if he had to live behind bars he would be the best zoo lion around.

In an adjoining cage there was another lion, an old and lazy one with a negative personality and no signs of ambition or capability of any kind. He lay all day in the sun, aroused no interest from visitors. In sharp contrast, the young lion paced for hours back and forth in his cage. He acted the true King of Beasts, rolling his maned head, snarling, and baring his teeth. The crowds loved him. They paid no attention to the indolent old lion asleep in the next cage.

The young lion appreciated the attention he was getting, but he was annoyed by his failure to win adequate reward. Each afternoon the zoo keeper came through the cages to feed the animals. The lazy old lion, who made no effort to please the spectators, was given a big bowl of red horsemeat. The young lion, now a star attraction, was given a bowl of chopped-up oranges, bananas, and nuts. This made him very unhappy.

"Perhaps," he mused, "I am not trying hard enough. I will improve the act." So he strutted longer and more spectacularly. To the snarls and gnashing of teeth he added frequent roars that shook the bars of his cage. The crowds got bigger. Thousands of citizens came to see his performance and he was pictured on page one in the local newspapers.

But the diet did not change. Still the lazy lion got the red meat, and the young lion stayed on a vegetarian diet. Finally, he could endure it no longer. He stopped the keeper with a challenge.

"I am getting sick and tired of this," he complained. "Each day you give that no-good lazy type next door a big bowl of meat, and you feed me oranges, bananas, and nuts. It is grossly unfair. Why do you think all these people come into the zoo? They come to see me. I'm the star attraction, the lion that's doing all the work and the one that gets results. Why am I not entitled to meat for dinner?"

The keeper did not hesitate with his reply.

"Young man," he said, "you don't know how lucky you are.

"Our Table of Organization in this zoo calls for one lion. You are being carried as a monkey."

MORAL: **You can live high on the hog without working hard; just make sure the T/O provides for hard-working monkeys.**

Newest addition to the National Headquarters staff of AFA is Richmond M. "Max" Keeney, who has joined the Washington, D.C., office as Director of Insurance Programs. A 1952 graduate of Amherst College, Max comes to AFA with a backlog of experience gained from the Connecticut General Life Insurance Co. As Director of AFA's Insurance Programs, he will be responsible for all such activity in which the Association is involved, particularly the Flight Pay Protection Program, which since October 1 has been underwritten by the Mutual Benefit Health and Accident Association, known as Mutual of Omaha.

Max Keeney

Max is an Air Force veteran with four years of active service as a weather officer. A first lieutenant in the Air Force Reserve, he is assigned to the Fourth Weather Squadron at Andrews AFB, Md.

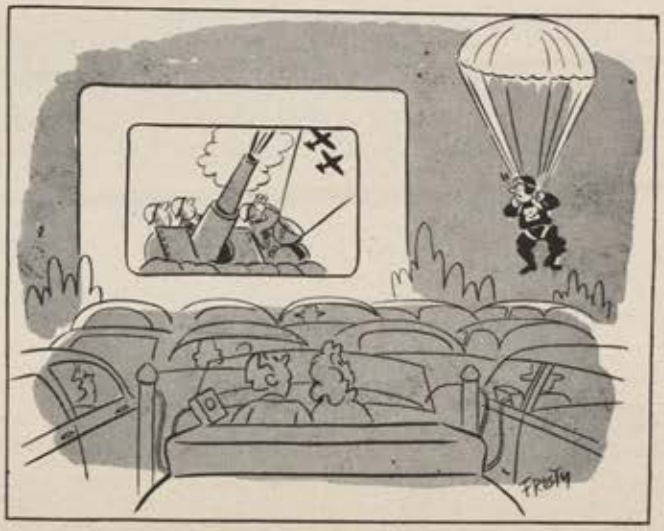
Married and father of a daughter, he is a native of Winchester, Mass., and now lives in Rockville, Md.

☆

It's pleasant to note that, with the great interest in space these days, the old Greek prefix, "aero" is working its elegant way back into the language. When many of us were lads, an airplane was called not that but an "aeroplane."

Then, as the human facility for contraction of words, to save a letter here and there, got to work, "aeroplane" became "airplane." Most people finally got around to saying just "plane."

(Continued on following page)



Now, with the need for a new term descriptive of the great frontier where the wild blue yonder becomes the enigmatic black of space, a new compound word, using the wonderful old prefix, is fast gaining currency—"aerospace."

We like it. It reminds one of yesterday and gives promise of tomorrow.

And it suggests a wonderful string of new words, some of which we've already used on these pages—words like aerospace craft, aerospace power, etc. The problem in editorial offices these days is: Where do you put the hyphen? That is, if you use hyphens.

☆

"Could it happen?" asks Larry Dart, of North Miami, Fla.:

CAPE CANAVERAL, Fla.—Oct. 4, 1964—At 0916 today, a steady finger pressed a small button. This seemingly insignificant action heralded what may well be the end of all future experiments with artificial satellites.

For despite the fact that all rocket stages fired as planned, the attempt to place into orbit Vanguard XLVII was revealed by experts to have been a failure.

The satellite was reported to have glanced off Russia's Sputnik XXXIV, knocked into outer space England's Britannia XXVI, caused India's Sacred Cow XII to burn up by pushing it back into the atmosphere, and finally exploded in an intense flash, totally destroying Japan's Banzais IX and XIII, and the privately launched Lone Star I, which had been blasting forth with the Texas state anthem for the past thirteen months.

The moon was unaffected.

☆

For a really good photo-narrative of the events and flavor of the 1958 Dallas AFA Convention, turn to pages 42-45. A mild, soft-spoken Air Force veteran who now makes his home in San Antonio, Tex., Les Bland, helped the busy AFA newsroom staff, shooting forty rolls of film to record the record-breaking meeting. Les' other photos appear throughout this issue. Les and his camera are old friends, and we'd like to thank him in this space for the good job he did. Fine photo work is his specialty. Many Air Force photo people will remember Les as one of the first Air Force photographers to shoot aircraft-in-flight photos some years back.

☆

An honored name will join the list of Air Force Base designations. Renamed after the late Lt. Gen. Claire Chennault, World War II Flying Tigers chief and World War II Fourteenth Air Force Commander, was Lake Charles, La., AFB. It's to be officially renamed Chennault AFB.

The formal redesignation takes place November 14. Lake Charles' new name joins that of Vandenberg AFB, Calif., formerly Cooke AFB, described graphically in October AIR FORCE in the article by Ed Mack Miller.—END

"Look, Edl F-104!"

FROM AN ORIGINAL PAINTING FOR CECO BY R. T. HANDVILLE

Contributing to superb performance . . . Boeing's 707 Jetliners powered by Pratt & Whitney Aircraft JT-3 turbojets will be equipped (as will many of the JT-4 applications) with *main fuel pumps* engineered and built by Chandler-Evans. CECO, in addition, is producing *cabin temperature control valves* for a number of the 707s which have been ordered by world-famous air lines.

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Regulus I became an *operational* missile as early as 1955. It has proved its reliability with a record of more than *700 flights*. *Regulus II*, carrying on this tradition for reliability, in September accomplished history's first flight of a supersonic missile from a submarine.

Experience gained with *Crusader I* and the *Regulus* missiles is the heritage of *Crusader III* — a heritage backed by 41 years of developing, producing and servicing *reliable* weapon systems.

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AIR FORCE
NOVEMBER 1958

FOR THE RECORD

What happened in Dallas

AS THE years pass it becomes more and more difficult to document fully the annual Conventions of the Air Force Association. We thought the peak in programming, number of registrants, and general interest had been reached in Washington last year during the Golden Anniversary celebration of the Air Force. But the Dallas registration was higher than Washington by a good forty percent, and the agenda was just as full. Those who were there could not possibly have seen and heard everything. For them, we hope this issue of AIR FORCE *will serve to help fit the pieces together. Unfortunately, even a Convention registration list as large as Dallas' can represent no more than a good cross-section of our readers. Equally important, then, is the need to document the proceedings for the stay-at-homes. We don't pretend it's all here, but the significant portions are treated at some length, plus the flavoring of the color.*—THE EDITORS

AFA's 1958

STATEMENT OF POLICY

Unanimously adopted by the delegates to the Air Force Association's Twelfth Annual Convention, September 1958, in Dallas, Tex.

THE free world is fighting a war for its survival on many fronts—technological, military, economic, educational, ideological. At this juncture in history the immediate coneern of the Air Force Association is with two of these fronts.

One front is technological: it includes the war of the laboratory, the classroom, the drawing board, and the test stand. The other front involves military forces in being: the ability to deter conflict, through a day-by-day military capability to be used in support of international policies which must be clearly understood by the aggressors and by ourselves.

Under current programming, the free world is losing ground on both of these fronts.

Soviet strength and striking power continue to grow at a more rapid pace than our own. Our margin of security continues to dwindle. The Soviet lead in the satellite race should make this fact clear.

Our peril would be clearer to the American people if our leaders would make candid acknowledgement of their estimates of current and future Soviet forces to be posed against us—forces which daily grow more dangerous to our survival.

In the face of this danger, we must better organize and integrate our efforts upon both fronts.

We must concentrate on weapon systems best designed to cope with the threat and ruthlessly eliminate the others. Service tradition and rivalries are inefficient and expensive luxuries that do not add to our national defense.

We desperately need consolidation of our three military departments into one for efficiency, economy, coordination, and the ability to respond instantly, with a maximum effort, in time of national emergency.

We must increase expenditures for research and development of future forces appropriate to the changing threat.

We must increase the force in being to match the current threat.

Our total national defense effort can be expanded without endangering the economy.

The defense effort today represents less than twelve percent of our gross national product. Estimates of the percentage of gross national product devoted to the Soviet Union's military effort range from thirty to fifty percent. Yet the threat posed by the enemy's actual force in being today, and by the more advanced weapon systems he is rapidly developing and producing, places a far greater requirement upon our defense effort now and over the next decade than was the case ten years ago.

We believe the people of the United States should be frankly informed of the grave danger in which they live. Any policy or program, no matter how costly, which leaves a margin of doubt that it is sufficient to meet the growing threat involves an unacceptable risk to our nation's security. We believe the American people are currently being asked to take this risk without their full knowledge and understanding.—END

In one word: Biggest

Dallas—World's Aerospace Capital During

AIR FORCE ASSOCIATION'S 1958 CONVENTION

By William Leavitt
ASSOCIATE EDITOR

A RECORD number of delegates, military-industry-scientific leaders, and press representatives—more than 3,500 in all—transformed Dallas, Tex., into the aerospace capital of the world September 25 through 28 as the Air Force Association gathered for its twelfth annual Convention. Helping make the 1958 meeting a significant success were nearly 150 local AFA committeemen, working under General Chairman Al Harting, of Dallas, and Maj. Gen. Harry Crutcher, Jr., Chief of Staff for Air, Texas National Guard, who was military host. USAF Project Officer was Maj. David O'Hara, Hq. USAF.

From opening session to closing brunch, there was but one adjective to describe the Dallas meeting: BIGGEST.

Yet against a background of near-war in the Far East and continued tension in the Near East, delegates and participants—outwardly enjoying the ten-gallon-hat flavor of Big D—got down to serious considerations of such matters as the role of the US Air Force in the new space age; the need for greater public understanding of America's defense posture; the contributions and new demands on Guard and Reserve Forces; civil defense in nuclear war; air defense; and the increasing need for maximum utilization of the combined talents of industry, science, and the military in times which seem to grow more perilous as technology advances and politics lag.

One moment during the Convention—the public unveiling of USAF's Convair-built Atlas ICBM outside the Dallas Memorial Auditorium—represented the real theme of the 1958 AFA meeting: the call for Americans everywhere to understand that our country is engaged in a "for-keeps" race on all fronts with the Soviet Union, with the final prize the future of the world.

A hushed crowd watched that ceremony in the dusk of Thursday, September 25. Veiled in blue cloth, the giant missile towered seven stories over the people who had paid for and built it, until the moment when the tug of a stout rope by USAF Chief of Staff Gen. Thomas D. White, Convair President J. V. Naish, and AFA President Peter J. Schenk, revealed the ICBM's deadly beauty.

Stressing the ingenuity of the Air Force-industry team, increasingly

(Continued on following page)

USAF's retired Maj. Gen. Norris B. Harbold gets western welcome at Dallas.

Symbolizing USAF aerospace arm, the shrouded Atlas awaits ceremonies attending its unveiling in front of Dallas Memorial Auditorium, site of the tremendous AFA Airpower Panorama, truly an "Aerospace World's Fair."

Some of the thousands of Dallasites who viewed the fabulous Airpower Panorama.

Generals Grussendorf, left, Wilson, right, congratulate Ricks race winner, ANG pilot, Capt. Clarence Christensen.

AFA CONVENTION — CONTINUED

geared to design and production of space-age weapon systems such as the Atlas, was the enormous and colorful "Aerospace World's Fair"—the 1958 Airpower Panorama in the Dallas Memorial Auditorium. The Panorama was viewed by nearly 100,000 people during the Convention. The record crowd ranged from Dallas-area high schoolers to veteran aviation enthusiasts who could remember when flying from New York to Los Angeles was a species of miracle.

The Panorama, featuring exhibits by 125 companies, plus Air Force displays, packed an area of 75,000 square feet in the ultra-modern exhibition hall. Displays ranged from demonstration of plasma propulsion for spaceships to a dramatic preview of the US Air Force's first manned trip around the moon.

Preview of the Panorama, a special event in itself, was held immediately after unveiling of the Atlas Thursday night.

One veteran aviation writer, who has attended every major air exhibit since World War II, described the 1958 Panorama as "without a doubt, the biggest and best aviation exhibit under one roof" that he had ever seen. "And," he added, "everything was *new!*" The reaction was universal.

• • •

Pre-convention kickoff event, starting a busy week on Sunday, September 21, was the traditional AFA-sponsored Ricks Memorial Trophy event, an annual Air National Guard proficiency test. Winner of the dash from Jackson, Fla., to Hensley Field, Dallas, which featured radar-controlled intercepts, and one stop for refueling, was Capt. Clarence Christensen, Jr., of the 173d Fighter-Interceptor Squadron, Nebraska Air National Guard, from Lincoln. Eight of the

Dallas-Fort Worth area citizenry get a closeup look at USAF array of aerospace power at nearby Hensley Field.

Prior to the opening of the first business session, assemblage bowed their heads as invocation was given by outgoing AFA Chaplain, Msgr. William Mullally.

nine ANG pilots who started the classic, finished. Captain Christensen's trophy-winning elapsed time: one hour, forty-eight minutes, twenty seconds. Participants flew North American F-86Ds, powered by General Electric J-47 engines (*see page 183*).

Thursday, September 25, was the first day of the Convention proper. The packed schedule included a heavily attended special USAF airpower review at nearby Fort Worth's Carswell AFB, the first AFA delegates business session, the Reserve Forces Seminar, the Atlas missile unveiling (televised in the greater Dallas area), and the Panorama Preview at the Dallas Auditorium.

After the opening invocation by AFA National Chaplain Msgr. William F. Mullally, delegates heard remarks by Meeting Chairman Howard T. Markey, Great Lakes Regional Vice President; AFA President Schenk; Convention Chairman Harting; Dallas Mayor R. L. Thornton; and Military Host General Crutcher. Next came a review of the strategic significance of Alaska by Lt. Gen. Frank A. Armstrong, Jr., Alaskan Command Commander, who represented the now-biggest state in the Union. On hand was an AFA delegation from the newly chartered squadron in the forty-ninth state. Following General Armstrong's talk, delegates heard the keynote address by Gill Robb Wilson (*see page 60*) and reports by Executive Director James H. Straubel and National Secretary Julian B. Rosenthal.

At the Reserve Forces Seminar, moderated by outgoing AFA Board Chairman John P. Henebry, the crowded meeting heard panels on civil defense, logistics, air defense, spaceflight, and civic responsibilities. The roster of speakers included USAF Vice Chief of Staff Gen. Curtis E. LeMay; David S. Smith, Assistant Secretary of the Air Force for Manpower, Personnel, and Reserve Forces; Rep. Overton Brooks, Democrat of Louisiana; and Lt. Gen. Clarence R. Huebner, USA (Ret.), Director of Civil Defense, State of New York. Condensations of their remarks begin on page 158. The Ricks Memorial Trophy was awarded during the seminar, and moderator Henebry was presented the Air Force's highest civilian honor, the Exceptional Civilian Service Award, by General LeMay, in recognition of Mr. Henebry's numerous contributions to airpower (*see page 50*).

Friday, too, was a big day. Its theme was the space age. The Eighth Annual Symposium, this year sponsored by the Space Education Foundation, was devoted to the Space Age in Perspective.

The day's morning session, held at the Auditorium theater, featured a battery of scientific and military speakers including SAC Commander in Chief Gen. Thomas S. Power, who discussed the strategic aspects of space operations; Dr. Hugh L. Dryden, Deputy Administrator of the new National Aeronautics and Space Administration, who gave a picture of the new space agency's role; and Dr. John Turkevich of Princeton University, who described the challenge of Soviet science.

Moderator of the symposium was Alex Dreier, noted NBC commentator. A few days prior to the Convention, he had devoted a nationwide broadcast to the contributions of the Air Force Association to national security.

Space age significance of the forthcoming flight of USAF's North American X-15 was pointed up by a panel including Brig. Gen. Marcus F. Cooper, Commander of the Air Force Flight Test Center, Edwards AFB, Calif.; USAF Capt. Robert White, who will fly the craft; North American's Scott Crossfield, who will fly the X-15's first test; Walter Williams, NASA, representing that agency's vital contributions to the project. *Condensation of the X-15 panel begins on page 84.*

The afternoon session of the Space Symposium carried the theme from hardware and strategic concepts to astronomy and capabilities for placing man into space. Leading off the session was Dr. Gerard P. Kuiper, noted director of the Yerkes Observatory of the University of Chicago, who suggested some of the answers to the question: Why go into space? Dr. Kuiper took the audience on a graphic trip to the moon via the medium of slides.

His presentation (*condensed, starting on page 103*) was followed by a "Man in Space" Forum, chaired by USAF Brig. Gen. Don Flickinger, Director of Life Sciences, ARDC, and special assistant for bioastronautics to BMD Commander, Maj. Gen. Bernard A. Schriever. Speakers on the panel included Lt. Col. Rufus R. Hessberg, Aeromedical Field Laboratory, Holloman AFB, N. M.; Dr. Paul Webb, Aero Medical Laboratory, WADC, Wright-Patterson AFB, Ohio; Capt. Clyde H. Kratochvil, School of Aviation Medicine, Randolph AFB, Tex.; and Col. John E. Pickering, also of the School of Aviation Medicine. (*This*

(Continued on following page)

AFA's Tiger Award for top recruiting went to 3506th Recruiting Group, Mather AFB, Calif. Col. Earl Jacobsen, commander, accepts award from Gill Robb Wilson.

panel is covered starting on page 110.)

Between the two symposium sessions, delegates gathered for the Space Age Luncheon in the main auditorium. Toastmaster was Gill Robb Wilson and speaker was Chief of Staff, Gen. Thomas D. White, who reported on the Air Force's operational readiness and plans for the future (*see page 51*).

Honored at the luncheon were Lt. Gen. Donald L. Putt, former Air Force Deputy Chief of Staff for Development; Gen. Edwin W. Rawlings, AMC Commander; and the late Col. Leo F. "Pat" Paul, former special assistant to the Chief of Staff. All received AFA Citations of Honor for their contributions to airpower. Mrs. Paul accepted the Citation on behalf of her late husband. Honored too was the USAF's top recruiting unit for the year, the 3506th USAF Recruiting Group, Mather AFB, Calif., which received an Air Force plaque, accepted for the unit by its commander, Col. Earl A. Jacobsen. Specially mentioned as the Air Force's top recruiter of the year was M/Sgt. Edward T. Badder of the same unit.

Recipient of the Air Force's Scroll of Appreciation for contributions to airpower during the fiftieth anniversary celebration last year, was AFA Executive Director James H. Straubel (*see page 50*).

A special feature of the luncheon was pinning of the new Air Force missileman badge, analagous to wings, on Capt. Walter A. Loughridge and M/Sgt. James J. Mustaine, symbolizing the Air Force's new aerospace arm. Maj. Gen. David Wade, Commander of SAC's 1st Missile Division, did the honors.

Announcement was made at the luncheon of plans for the first World Congress of Flight to be held in Las Vegas, Nev., the week of April 12-19, 1959. (*See page 55 for additional details.*)

Friday, a busy Convention day, came to a relaxed close as delegates gathered in the auditorium for an old-fashioned Western Wing Ding, complete with barbecue dinner for a crowd surpassing 3,500 that danced its happy way through the evening. On hand to entertain were Jimmy Stewart, Milton Caniff, Vince Barnett, the Airmen of Note, the Four Saints, the Rangerettes, and a delegation of Kiowa Indians in full regalia who performed tribal dances and capped the evening by formally adopting Jimmy Stewart and newly reelected AFA President Pete Schenk as tribal brothers.

Saturday was equally busy. While delegates huddled at the morning business session, industry representatives attended a classified Air Materiel Command briefing where the speakers included Gen. Edwin W. Rawlings, AMC Commander; Maj. Gen. Frank A. Bogart, Director, Plans and Programs, AMC (*see page 142*); and Maj. Gen. Ben I. Funk, Commander, Ballistic Missiles Center, AMC.

An Industry buffet luncheon followed the morning session. At this luncheon AFA President Schenk and General Rawlings presented AFA plaques to five members of AMC who had distinguished themselves in the field of management (*see page 143*).

The afternoon session featured reports by Lt. Gen. Roscoe Wilson, Deputy Chief of Staff for Development, USAF; Lt. Gen. Samuel E. Anderson, Commander, ARDC; Brig. Gen. J. W. Carpenter, Vice Commander, ARDC (*see page 148*); and Col. Carlo R.

Western fun, complete with hula hoops, livened chuck-wagon Western Wing Ding.

Tosti, Special Assistant to the Commander, ARDC. The panel following the reports included General Anderson; Maj. Gen. L. I. Davis, Deputy Commander for Research and Development, ARDC; Brig. Gen. Lee W. Fulton, Deputy Commander, Resources, ARDC; Brig. Gen. Melvin F. McNickle, Deputy Commander, Weapon Systems, ARDC.

Final formal event of the Convention was the annual Airpower Awards Banquet at the Dallas Auditorium, Saturday evening, September 27. Featured speaker was Secretary of the Air Force, James H. Douglas, who reported on the Air Force's present posture and made some pointed remarks on the service's readiness to handle any situation arising from the smoldering Red China crisis that filled the newspapers that week (*see page 46 for Mr. Douglas' remarks*).

Leading the AFA award list was BMD Commander, Maj. Gen. Bernard A. Schriever, chosen as "Aviation's Man of the Year"—(*for full report on awards see pages 56 and 57*). Specially honored by the Air Force with its Exceptional Civilian Service Award for his numberless contributions to airpower over the years was Past AFA President Gill Robb Wilson (*see page 50*). Toastmaster Milton Caniff introduced the honored guests, including the Air Force's 1958 outstanding airmen (*see pages 58 and 59*). Entertainment was provided by the Airmen of Note, the Lackland AFB Glee Club, and others.

Sunday morning marked farewells. Delegates gathered at the Statler Hilton for the annual Airpower Brunch. Family Awards honoring AFA people who had made outstanding records during the past year were announced (*see page 188*), and the 1958-59 officers and directors, headed by reelected President Schenk and newly elected Board Chairman James M. Trail of Idaho, were introduced.

The curtain was down on another AFA meeting, the first of Year One of the Space Age.—END

Devoted as always to recollections of the Convention coming to a close and previews of the year to come, the Airpower Brunch featured a display of these lovelies, representing Miami Beach '59 meet. At rostrum, Alex O. Morphonios.

1958 CONVENTION SPONSORS

The Air Force Association is most grateful to the following firms and groups for their contribution to the success of its 1958 National Convention and Airpower Panorama through sponsorship of the events and activities listed:

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Western Hats

Pre-Convention event (above and left) was crowded air show at nearby Hensley Field, held the day of Ricks Trophy event.

CONVENTION PHOTO ALBUM

Camera's eye on Dallas Convention as delegates made a busy Texas town even busier

One of the hit events at the Convention was the Golf Tournament which drew fairway lovers during week. Shown receiving low gross trophy from Herb Durham is John De Garmo. At right, Durham gives low net trophy to Maj. Gen. William Fisher.

Historic moment outside Dallas' Memorial Auditorium as Gen. Thomas D. White, USAF Chief of Staff, AFA President Peter J. Schenk, Convair President J. V. Naish combine forces to unveil the huge Convair Atlas intercontinental ballistic missile.

Having a ball at the Westinghouse Roundup party was famed television and movie star, Desi Arnaz.

As Panorama goers passed through exhibition hall, they got a preview of the 1959 Convention at Miami Beach, Fla.

Long time friend of AFA and airpower leader, movie star Jimmy Stewart, enjoys chowdown at the Wing Ding meal. Stewart later took part in the Wing Ding program (right).

During the show, Jimmy and the patron cartoonist of the USAF, Milton Caniff, creator of "Steve Canyon," take part in a skit that earned hearty guffaws from the audience.

Smash hit at Western Wing Ding was series of dances by Kiowa Indian delegation, clad in colorful tribal garb.

Wing Ding cocktail party goers were entertained by Mexican bandsmen who delighted large crowd with music prowess.

AFA Executive Director James Straubel, center, beams as he is presented a silver plate autographed by AFA Past Presidents. With him, George Kenney, Gill Robb Wilson.

Just before the closing Brunch, crowd refreshed themselves at Convair's Space Bar, where attendants, clad in whimsical space helmets, served morning "pick-me-ups." The Brunch followed, with presentation of traditional Family Awards.

THE YEAR SINCE SPUTNIK

Hon. James H. Douglas

SECRETARY OF THE AIR FORCE

THE year of the Sputniks has been an eventful one. It has been one of progress for the Air Force and the Defense Department, and one of distinguished service for the Air Force Association. The Air Force Association deserves well of the Air Force and of the nation. I have in mind its support of the President's defense reorganization plan and the military pay legislation. Also the Association made fine contributions to a better national understanding of space problems and possibilities through its conferences and its magazine, AIR FORCE. Outstanding and of lasting value were the April issue on missiles and space, and the "Air Force Almanac of 1958" issued in August. The magazine is excellent, and as a regular reader I recommend it to you. The "Almanac" is unique as a source of information on the organization, men, weapons, facilities, and history of the Air Force. I congratulate your President and his associates, and particularly the publisher and editors of AIR FORCE for their efforts in making effective the Association's support of programs that will strengthen the Air Force and our national defense.

Also I pay tribute to the understanding and conviction on national security and Air Force problems generally expressed over the years by the Association's policy statements. Your statement adopted on Thursday reflects the thought and patriotism on which Association policies are based. In my remarks I shall give attention to some matters of concern in the policy statement. I ask your careful consideration of my observations on these same matters.

A year ago on this occasion I spoke to you of "weapons and money." Our central problem is still that of developing aircraft and missile systems for the future while continuing to strengthen our force in being. Your editor, Jack Loosbrock, has described this double task as like trying to get into orbit while keeping one foot on the ground. I shall discuss here where we stand in the development of certain important weapon systems, and I shall refer to the readiness of our force in being. My remarks, however, will be wholly unorthodox in omitting mention of the budget except to say that within its present scope we expect to go into orbit, keeping one foot on the ground.

I take strong satisfaction in the Defense Reorganization Act. Broad discussion of our military organization occasioned by the President's proposals has given to the Congress and the country a better understanding of the problems of effective control of military planning and operations, and has brought agreement on the need for further unification of all our defense efforts. Unquestioned authority of the Secretary of Defense over the military departments has been established. The position of the Chairman of the Joint Chiefs has been strengthened, and an appropriate staff for operations and strategic and logistic planning is being provided to the Joint Chiefs to meet their increased responsibilities with respect to the unified commands. Better planning and supervision of research and engineering is sought through the establishment of a new Director in the Office of the Secretary of Defense who will be senior to the Assistant Secretaries of Defense and have broad powers over all research and development programs in the Department. The emphasis placed on missile programs, advanced research, and space projects under the direction and supervision of the Office of the Director of Guided Missiles, ARPA, and the National Aeronautics and Space

Administration create problems of relationships and possible overlap. These must soon be solved. Their solution awaits organization of the new Directorate. As to the National Aeronautics and Space Administration, the appointment of the Director, the Deputy, and members of the Council give full confidence that this Administration will be a worthy successor to the NACA.

The new military pay legislation not only creates a reasonably satisfactory pay scale, but provides a proficiency pay system to help retain in the service scarce technical skills. This legislation is a great step forward in making Air Force careers attractive. We know that pay is only one of many factors in determining whether we can retain the skills required to operate a modern Air Force, but it is at the heart of the problem. Under the new law we are this month upgrading 2,000 master sergeants to the grade of senior master sergeant with more to follow. A plan to inaugurate proficiency pay that will affect some 25,000 airmen in fifty-four different technical skills has been approved. Reenlistment over-all is over fifty percent as against a level of about thirty percent three years ago, and in some highly technical skills it is up from ten percent and less, to thirty percent and more. We have not solved our problems, but these figures mean abler, better-trained airmen and happier families, millions of dollars saved in reduced training requirements, and in better maintenance and operations, and a stronger Air Force.

". . . abler, better-trained airmen and happier families."

"The Titan missile should have its first test firing soon."

The year of the Sputniks began one year ago . . . when the Soviets were successful in putting the first satellite on orbit. In November [1957] they launched the satellite which carried a dog, and in May launched a much larger satellite which is still on orbit. We must concede that during the past year they have fired several ballistic missiles to intercontinental ranges. We concede them operational missiles with ranges of less than a thousand miles. Their achievements with ballistic missiles and satellites have emphasized the high technical quality of their military power, and call for us to consider the probable scope of Soviet missile threat. We expect that the Soviets will have a very small number of intercontinental-range missiles in an operational unit during the next year, and that they can have a substantial number available in 1960. They may have today a considerable inventory of missiles of ranges less than a thousand miles. We also know that the Soviets could be developing ballistic missiles to launch from submarines. Factual evidence in this area is lacking.

In this situation where do we stand in our own missile programs? Our Army has successfully launched three satellites; the Navy-Geophysical Year project has put one on orbit. These have been small and give little indication of the propulsion system of our large ballistic missiles. The Air Force has tried, so far, one moon probe, and this was unsuccessful. The Thor and Jupiter tests, however, have proven all components of these intermediate-range ballistic missiles, and both missiles are being produced for operational units. Thor missiles have already been delivered to England for the first British squadron which is scheduled to be operational in December.

Commencing in July there have been three successful firings of the complete Atlas missile, and two failures. These firings successfully tested the complete propulsion system including the support engine and separation of the main booster engines, precision guidance, and nose-cone separation and reentry. Although we have yet to fire a successful full-range shot, these recent tests give us confidence that the first Atlas squadron will be equipped with operational missiles within the next year, as scheduled. Let me make clear, however, that in striving for a high degree of reliability which will justify reliance for deterrence on our missile forces, we must expect additional failures in testing.

The intercontinental Titan missile should have its first test firing soon. But perhaps most important of recent Air Force actions in the missile field was the selection, in July, of contractors for the propulsion stages, the guidance system, and the nose cone of Minuteman. This is the second generation of Air Force strategic missiles and embodies all the advantages of a solid-propellant propulsion system. Evaluation of proposals for assembly and testing is under way and major component testing is starting in the very near future. In my judgment the importance of the Minuteman development can hardly be overemphasized.

I understand development by the Navy of the Polaris

(Continued on following page)

ballistic missile, and the submarine which will serve as its launcher, is making good progress. Polaris should prove a useful addition to our offensive weapons, and one which will bring new and difficult problems of defense to an enemy, as it has platform mobility that can be exceeded only by the airplane with a ballistic air-to-ground missile. Also the Navy already has the Regulus, an air-breathing missile, which can be launched from a submarine. This missile is similar to the Air Force Matador, now deployed in operational units in Germany, Taiwan, and Korea.

Strong voices have been raised asserting that in the period of 1960 to '64 we may be so far behind the Soviets in long-range missiles that our deterrent power will cease to be effective, and so our national life will be in jeopardy. My answer is that our deterrent power can certainly be kept strong, and should continue to be effective, if we stay on our present course and make timely decisions to bring

". . . we can build such missile force as may be required."

"In every unit there is increasing emphasis on readiness."

new weapons into production when their development and effectiveness are reasonably certain. I say this although I believe the Soviets are today somewhat ahead of us in the development of ballistic missiles. I say it because I am confident, from the progress of our missile programs, that we can build such missile force as may be required to maintain the deterrent *without any gap* between today's effective bomber force and tomorrow's effective force of missiles and bombers. I say it because we are far ahead of the Soviets in long-range manned bombers and we can stay ahead. I believe Soviet statements that a new long-range bomber has been flown. This development, of course, emphasizes the importance of our own advanced bomber programs and of our long-range interceptor and air defense missile programs.

For the present, sure maintenance of an effective deterrent will depend upon our long-range striking forces, warning against surprise attack, and our ability to penetrate enemy defenses. Accordingly, our first concern in air defense must be for warning and protection of our retaliatory forces. Our best assurance of an effective retaliatory force at all times is our warning system, and that part of SAC which is kept on constant alert. And much has been accomplished in developing an active air defense of interceptors and missiles. Air defense is a joint US-Canadian effort under the North American Air Defense Command.

We have today a radar warning system that extends from Midway in the Pacific, around the northern edge of our continent, and to the Azores in the Atlantic, with active defenses in Alaska and Greenland. We have a second warning line in Canada, and a system of heavy radars and gap-fillers in this country that buttresses our forward systems.

All Air Force and Canadian interceptor squadrons are equipped with jet aircraft, and an increasing number of our squadrons are equipped with atomic air-to-air missiles and with the guided Falcon missiles. Two direction centers of our SAGE control system are in operation. Testing of the Bomarc interceptor missile is well advanced, intercepts at more than 100 miles having been handled by the SAGE system control.

To the air defense system the Army contributes more than 200 Nike batteries, several of which are now equipped with the Nike-Hercules missile. I congratulate the Army on the fine performance of the Hercules in recent tests at Eglin [AFB, Fla.]. It is the most effective surface-to-air missile in operational units today. I am sure, however, that for the best air defense against modern bombers, and particularly those carrying air-to-surface missiles, we must go out to meet them as far as possible. To do so we need interceptors and ground-to-air missiles of longer range than those now in our inventory. This conviction points up the importance of our long-range Bomarc missile program, and the need for the supersonic F-108 interceptor with a radius of 1,000 miles.

Whether we are examining our air defense, long-range bomber forces, tactical air forces, or air transport, in every unit there is increasing emphasis on an alert force and readiness.

The crises in the Middle East and the Far East have tested the readiness of your Air Force to perform its prin-

cipal missions, and have found it ready to play its part in meeting the threat in the Middle East and the support of an ally against Communist aggression in the Far East. When revolution in Iraq and rebel activities in Lebanon brought a call for assistance, Marines were promptly landed by the Sixth Fleet and Army forces were moved into Lebanon by troop carrier squadrons of our Air Force in Europe. Tactical fighter and light bomber aircraft moved into Turkey from Europe and from the United States. We carried out long-distance, nonstop deployment of F-100s to Turkey, and a few F-100s landed at Adana in Turkey twelve hours after takeoff from Myrtle Beach, S. C. Strategic airlift by MATS contributed support to our activities both in Lebanon and Turkey. And in the background was SAC, whose deterrent force was an essential safeguard to our operations in bringing assistance to Lebanon. SAC had more bomber and tanker aircraft on

". . . new assurance of continuing dedicated leadership."

alert than at any time in its history, and the alert status of the Air Defense Command gave assurance to the maximum effectiveness of SAC.

A month ago the Chinese Communists, soon after Khrushchev's visit to Mao in Peiping, commenced their heavy bombardment of Quemoy and Matsu. This adventure of international communism called again for prompt Navy and Air Force support of Taiwan and readiness for action to protect the offshore islands if this became necessary. Again the Air Force moved fighter-bombers and transport aircraft out of the United States; this time to airfields of Taiwan, Okinawa, and the Philippines. F-100s and F-101s were flown, and F-104s were carried as cargo in C-124s. So our most modern fighters are on the spot, ready to meet the threat of the Chinese Communists. And make no mistake, our fighter-bombers and light bombers are as capable of using high-explosive bombs as more powerful weapons.

I was in the Far East in May, and everywhere from Bangkok to Tokyo one is constantly aware of the close military threat of Red China, North Korea, and the Soviet Union, and the appalling weight of the threat. Red China alone has some 4,000 aircraft, including a large modern force of jet fighters, and jet light bombers. A considerable part of this force is for the first time on airfields that make it an immediate threat to Taiwan. Again, our situation and that of our allies would be wholly untenable except that airpower cannot be measured by the number and character of aircraft in a particular single area. Still our interceptor fighter-bomber squadrons in Japan, Korea, Okinawa, Taiwan, and the Philippines, and the air forces of our allies provide a visible and important part of the over-all deterrent force, and are essential to the will of the free nations in the Far East to remain free. Let me leave no doubt that the very substantial jet fighter forces of Nationalist China on Taiwan comprise a fine, experienced, and combat-ready air force. Also the jet air forces of our other allies, although very small, are well trained and represent one of the best investments of the free world in the Far East. And always in the background stands our Strategic Air Command.

Our American future calls for continued effort and risk in the Far East. And the effort we rely on in large measure is that of the military services. I realized as seldom before the extent to which the position and future of our country is in the hands of our officers overseas. They may well determine the world's view of our abilities and intentions, and they are a principal ingredient of our military strength and that of our allies. And this is only one part that they play in contributing to the security of our national life.

With this in mind it is appropriate to notice that the Air Force Academy cadets have moved into their new home north of Colorado Springs. Barely five years have passed since President Eisenhower signed the act authorizing the Air Force Academy. The creative task was a staggering one, calling for selection of the site; accomplishment of a design that would be functional and inspirational, so conceived as to assure acceptance not only for today but for the future; construction of the academic buildings and housing; and all-important establishment of a sound curriculum, and assembly of competent teachers. Every step was of intense concern to [Air Force] Secretary [Harold] Talbott and General [Hubert R.] Harmon, and it must be a matter of regret to all of us that they are not here to see the results of their efforts. General Harmon's full energies were devoted to planning an Academy for several years prior to its approval by the Congress and the President, and continuously from that time until his death in early 1957. Tomorrow a fitting tribute will be paid to General Harmon when his remains are given a permanent resting place in the cemetery of the Academy.

I am confident our Academy will be of constantly increasing interest, pride, and inspiration to all Americans, and I include its architecture in this appraisal. I urge you all to see it for yourselves at the earliest opportunity. And whether or not there continues to be sharp criticism as well as enthusiastic approval of the site and the Academy's architecture, we may be sure that the Academy gives new assurance of continuing dedicated leadership for our Air Force in the service of the nation.—END

Secretary Douglas, a graduate of Princeton University and Harvard's Law School, had a distinguished career in law in Chicago before coming to Washington, first in 1932 as Assistant Secretary of the Treasury, and again in 1953 as Under Secretary of the Air Force, the post he held prior to being named Air Force Secretary. In World War II he was Air Transport Command Deputy Chief of Staff.

USAF Cites AFA Leaders

For their contributions to airpower during the 1957 celebration of the Air Force's Fiftieth Anniversary, Gill Robb Wilson, former AFA Board Chairman, John P. Henebry, outgoing AFA Board Chairman, and James H. Straubel, AFA Executive Director, were honored by the Air Force at the Dallas Convention. Messrs. Wilson and Henebry received the USAF Exceptional Civilian Service Award, highest given to civilians, and Mr. Straubel received a USAF Scroll of Appreciation. Awards were made at the Airpower Awards Banquet, Reserve Forces Seminar, and the Space Age Luncheon.

Gill Robb Wilson, left, received award from Secretary Douglas at Awards Banquet. John P. Henebry's award was presented by General LeMay at the Reserve Seminar. James H. Straubel was cited by Secretary Douglas at Space Age Luncheon.

TO GILL ROBB WILSON:

"In a lifetime dedicated to the advancement of aviation, Gill Robb Wilson has won a place in the history of American airpower. . . . He has become an 'elder statesman' of American airpower. . . . His enlightened zeal, broad perspective and unique philosophical approach have inspired millions of Americans with the message of our dependence on airpower for survival. His personal dedication and integrity have endeared him to all airmen. His effective leadership as former President and later Chairman of the Board of the Air Force Association was felt throughout the nation. The resultant impact on aviation and airpower constitutes one of the outstanding individual contributions to the nation's security. This scroll is presented by the United States AF."

TO JOHN P. HENEBRY:

"As an outstanding combat leader and dedicated Reservist, John P. Henebry has made an invaluable contribution to the advancement of airpower. His exceptional skill in administration and his commanding knowledge of aviation were used extensively upon the occasion of the Golden Anniversary of the United States Air Force. In his civilian capacity, he traveled throughout the nation espousing the cause of airpower. During the past five years, his advice and counsel have been sought on many occasions. His voluntary service has been of material assistance in resolving many complex policy issues with which the Air Force has been faced. The USAF presents this award in recognition of his contribution to the cause of airpower and to our national security."

TO JAMES H. STRAUBEL:

"As Executive Director of the Air Force Association and as Publisher of AIR FORCE Magazine . . . James H. Straubel has strengthened and widened public acceptance and understanding of the United States Air Force. He possesses not only the attributes of a true leader: energy, objectivity, and zeal, but also superb skill with the written and spoken word, and a rare quality of dedicated, unselfish devotion to his cause. These have been used to proclaim . . . the message of invincible power as a necessity for national survival. He has been particularly effective in guiding the Air Force Association in its sponsorship of the Golden Anniversary of the United States Air Force. . . . This scroll is presented . . . in warm appreciation for his exceptional services."

AEROSPACE POWER . . .

today and tomorrow

Gen. Thomas D. White
CHIEF OF STAFF, UNITED STATES AIR FORCE

THERE is no need for me to go into detail concerning the most dangerous military threat facing this country. It is Soviet airpower. The advent of ballistic missiles with nuclear warheads has not changed this threat—it has merely brought the threat closer to home. Soviet political cunning and deception on the international scene are designed to confuse and distract us. Nothing could serve their purposes more than to have us lose sight of the primary threat and embark on military programs designed to provide a little bit of everything and not enough of what we need.

The tasks facing our country and its military forces are vast, but not unsurmountable. Briefly, the Air Force is charged with the employment of military airpower in the national interest. During these years of ever-growing threat, the Air Force has been concentrating on its business. As a result, I can say that the Air Force can do its job today, in all its variations—and there are many variations. We have to maintain a strong, dynamic force in being. We must continually keep the force modern and in line with the latest technical advances. And we must devote time, effort, and resources toward research of weapon systems for the distant future. To do all these things with the proper amount of emphasis is the real problem. The Air Force, of all the services, must be ready today and every day on into the future.

Russian successes with the Sputniks and their great progress in the ballistic missile field added a new sense of urgency to the job that the Air Force was already doing. Russians successes did not, in themselves, comprise an entirely new threat, but they did require us to reevaluate our force structure, our plans, *and* our programs.

Out of this evaluation, several things became apparent at the outset. First, the missile threat did not invalidate our bomber strike force. For a long time to come, this force with its great range, its capacity to carry nuclear weapons of various sizes and yields, and its improved electronic countermeasures, could still perform the job it was designed to do. Furthermore, because of the human intelligence factor aboard, the bomber strike force has the added advantages of a recall capability and greater flexibility in target selection and tactics. The proximity of the missile threat did, however, put a premium on expediting security measures for this strike force.

A primary security measure is warning. Study of our warning and control system for use against the air-breathing threat showed us that it was in reasonably good shape and that we were well on our way to its modernization through development of the SAGE, semi-automatic ground environment, system. Quite obviously, however, we had a new and urgent requirement to develop a ballistic missile early-warning system. A breakthrough in radar techniques made in the summer of 1957, prior to

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Sputnik, showed us that the job could be done—but would take time and money. Furthermore, even with such a system installed, the best warning we would get of a hypersonic ballistic missile attack would be on the order of about fifteen minutes.

We had already initiated an alert and dispersal program for our strategic strike force, and funds were appropriated by Congress for this purpose in fiscal year 1957. Additional funds were appropriated in fiscal year 1958, and we planned additional requests in succeeding years to complete the program. Eventually, we want sufficient facilities for our strategic strike force so that not more than one B-52 squadron—fifteen aircraft with its associated tankers —nor more than one B-47 wing—forty-five aircraft with its tankers—will be on any one base. In addition, we have programmed construction of alert facilities such as housing for crews, parking stubs, and additional taxiways so that our aircraft can get off the ground faster. Here again, the proximity of the ballistic missile threat added urgency to the programs.

In addition to expediting a ballistic missile early-warning system and an improved alert and dispersal posture, another obvious measure was to press forward on our own missile programs—both for the offensive and for the defensive. Other less obvious, but nevertheless important, areas were the necessity for better command and control systems and an even more urgent need to fill the long-standing requirement to find the necessary ways and means to retain needed skills and experience in the military service.

During this last year, positive action was taken on several fronts which did a great deal toward expediting the measures I have outlined. For example, early this year the President submitted to the Congress a supplemental appropriation request to the fiscal year 1958 budget. The Air Force portion was for $910 million and was designed primarily to do three things: First, expedite our SAC alert and dispersal program; second, accelerate our IRBM and ICBM programs; and third, hasten the construction of ballistic missile detection facilities and the SAGE system. As a result of prompt congressional action, all of these programs have been expedited, and we have

A camera's eye view of the crowded Memorial Auditorium at Dallas during the Space Age Luncheon at which General White spoke. Announcements of the Space Education Foundation, SPACE DIGEST, and World Congress of Flight were made.

Missilry, the Air Force's newest crucial skill, came in for special honors at AFA's Space Age Luncheon, as two specialists in the field received the new missile emblem at a special ceremony designed to represent all such Air Force specialists. Receiving Air Force missile badges were, left, Capt. Walter A. Loughridge and, right, M/Sgt. James J. Mustaine, both of SAC's First Missile Division, based at newly-designated Vandenberg AFB, Calif. Their commander, Maj. Gen. David Wade, pinned the insignia on the two missilemen after they were introduced to and received an ovation from the assemblage. The handsome new emblems are visible on each left breast pocket.

gained from six to twelve months on the construction of certain facilities.

The new military pay scale is already proving of value —in better retention rates in all categories of Air Force personnel. However, it does not answer the whole problem. For example, the Air Force is still faced with a very serious housing shortage. It is my earnest hope that relief in this area will be forthcoming in future appropriations for this purpose. I feel sure that the increased cost of the new military pay bill and other funds expended to make an Air Force career more attractive will be amortized many times over in the years to come through increased efficiency, lower training requirements, and less aircraft and equipment attrition.

Another important item of legislation which profoundly affects the efficiency and effectiveness of the military services was passage of the Defense Department Reorganization Act. As you know, the Air Force is enthusiastic about the reorganization—and for good reason. The Air Force has long recognized the necessity for centralized control of far-flung resources to assure maximum mission performance. As a result of the reorganization, I am confident that the capabilities of our over-all military force structure will be greatly improved. For example, the combatant unified and specified commanders, under the new act, have clear lines of command established, which flow directly from the top. Force structures will be recommended by the Joint Chiefs, approved by the Secretary of Defense, and those forces once assigned to the commands cannot be withdrawn by the services without approval of the Secretary of Defense. Another material feature of the reorganization is the new organization of the Joint Staff. It will be a fully integrated staff larger in size than before—400 officers instead of 210 officers —and each military department will have approximately equal representation. The Joint Staff will function under the supervision of a Director who is responsible to the Chairman and the Joint Chiefs for its operation. Participation in joint planning by those Air Force officers assigned to the Joint Staff will have a much greater impact on future Air Force activities than has been true in the past. This is particularly true with regard to the impact on those forces which will be assigned to the combatant unified and specified commands. You may be sure we are assigning some of our very best officers to the Joint Staff.

In general, I feel the Air Force, during this last year, has made great strides in attaining a higher state of readiness and a better and more effective reaction capability. Our ZI and overseas commands have substantial portions of their forces on constant alert. Our air and ground crews are highly skilled and well trained. We have not yet reached the optimum in this respect, but our combat and support units represent a formidable force. Let's take a look at our offensive striking forces. The Strategic Air Command, today, possesses substantial numbers of B-47 and B-52 jet bombers. The few remaining B-36s will be phased out of the operational inventory next year. Operational testing of the B-58, the world's first supersonic bomber, is under way. Our tanker force and our air-to-air refueling capability are being continually improved as KC-135 jet tankers roll off the production line. More effective electronic countermeasures are being introduced into our forces, and various decoy devices are far along in the development stage. The great majority of our tactical fighters are of the supersonic Century series, and all are capable of carrying nuclear weapons. TAC's air-to-air refueling capability adds to its ability to deploy quickly and effectively. The Mace, an improved Matador air-breathing surface-to-surface missile, will be in the hands of our tactical forces next year. Our tactical airlift capability is also being modernized as we continue to convert from C-119s to C-130s. We demonstrated a new facet of mobility and airlift versatility recently by flying F-104s in C-124 transports to Formosa.

Now let's take a look at our defensive forces. The main portion of our distant early-warning (DEW) line was completed a year ago. The Aleutian and eastern extensions to this line are under construction. This network in combination with our North American radar systems, airborne early-warning and control aircraft, and picket ships provide an excellent warning and control system for defense against jet aircraft. Over-all, I would estimate that the system is already ninety percent complete, and it continues to be modernized and improved. In this respect, I would like to point out that two of the SAGE units are already in operation. Completion of the SAGE system will give us a much better capability for controlling the air battle. Whereas before, air defense was generally decentralized, SAGE will centralize many air defense functions. Its design follows the basic principle that defense effectiveness is measured by the combination of air weapons and ground control and *not* by each alone. The SAGE system will permit us to meet the combined manned jet aircraft and air-breathing missile threat as one concise problem rather than as a series of varied problems. The end result is that SAGE will make the

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fundamental concept of a coordinated air battle and a defense in depth a practical reality.

There has been discussion in some quarters to the effect that SAGE is already obsolescent because of the hypersonic ballistic missile threat. I do not concur. It is true that SAGE will not be able to track, record, and control attacks against hypersonic ballistic missiles. As yet there is no active defense available for use against such weapons. But we do have effective defense weapons against the manned jet bomber and air-breathing missile threat which, without a doubt, is the biggest threat that faces us today and for the next few years. Even on into the future, SAGE will prove valuable because the forces of the future will undoubtedly be mixed forces—that is, composed of various types of weapons—subsonic, supersonic, and hypersonic. SAGE can track and control attacks against both the subsonic and supersonic weapons.

More and more of the Century series fighter-interceptors are being accepted into the inventory. Our interceptor force is armed with air-to-air missiles, including rockets armed with nuclear warheads. In addition, all of our interceptors and the long-range Bomarc surface-to-air missile are responsive to the SAGE system.

As far as coordinated defense effort is concerned, our close working relationship with our friendly neighbors to the north takes us a long way toward the Air Force's goal of a defense in depth. In this respect, I cannot mention Canadian cooperation without specifically calling attention to the excellent teamwork that exists between the RCAF and the USAF and between the Canadian and American aviation industries. This combined dedication of effort is to our mutual advantage.

So far I have been giving you the facts on our forces of today—what we have available—what they can do. Now let's talk for a moment about missiles. I am inclined to think that some people are unduly cynical concerning the achievements the United States has made. Let's take a look at the Air Force strategic missile program. In the intermediate range we have the Air Force Thor and the Army-developed Jupiter. Both of these missiles have had very successful test firings. When you consider that there are literally thousands of parts in a missile, each of which must be in faultless working order to achieve a perfect firing, we have an excellent batting average. We must do better, but our failures should be recognized as steps on the road to greater success.

Our recent failure to fire the Atlas its fully designed range was a great disappointment. However, in our long-range intercontinental ballistic missile program, we have achieved over-all excellent test performance. The last two Atlas firings employing full guidance control, demonstrated accuracy well within the design specifications. In other tests closely associated with the Atlas program, the Air Force Thor-Able project successfully fired an ICBM nose cone into a predicted target area 5,200 miles distant. This, incidentally, is a greater range than has been fired by any other country as far as we know.

The Titan, which is more sophisticated than the Atlas, is also coming along well in the development program.

The Minuteman, a land-based, solid-propellant intercontinental ballistic missile, is also under development. It will be smaller in size and lighter in weight than the Atlas and Titan ICBMs. It will be easier to disperse and it will have a faster reaction time because of the nature of the solid propellant. With such characteristics, you can see why we are extremely enthusiastic about this system.

In the field of air defense, as you know, the Air Force has been developing a long-range, surface-to-air missile called the Bomarc. This missile can carry an atomic warhead, and has a range in the early model of about 200 miles. The later model will have a range of about 400 miles. We have successfully fired this missile on numerous occasions. Recently, its capabilities in conjunction with the SAGE system were rather dramatically demonstrated when SAGE computers in New York produced the data and directed a successful attack by a Bomarc fired from Cape Canaveral, Fla., against a drone flying far out to sea. This test also demonstrated how an adjoining SAGE unit would function should the SAGE unit in the area under attack become inoperative.

There is another category of extremely significant missiles. I am talking about the air-to-surface field—those missiles that will be launched by manned aircraft. One of the developments we are working on and which is a logical successor to the pioneering Rascal, is the more advanced Hound Dog to be carried by the B-52s. We feel that there is a tremendous potential in such weapons. For example, they will provide the aircraft with greater flexibility in tactics and permit warheads to be launched from hundreds of miles outside heavily defended target areas. Employment of such weapons aboard long-range bombers also would permit a constant airborne patrol over the seas or friendly territory with a capability to deliver an attack deep within an enemy country on a moment's notice. Furthermore, this attack could be launched from totally unpredictable positions.

I want to say a word or two about the future.

Our forces of the future will require both manned and unmanned systems to perform our mission. Our objective is to build a force with a close working relationship between the manned and unmanned systems—thus exploiting the best features of both systems to increase the rate of application of firepower.

What the Air Force has already accomplished in its ballistic missile effort, the X-15, and the Dyna-Soar project, form a good base for the military space projects of the future. I want to point out that Air Force efforts, experience, and capabilities in research on space operations are being oriented entirely toward development of military capabilities which will assure that we can extend our air superiority into space. We recognize that the Air Force mission in space is solely a military mission —one which requires us to develop and produce militarily useful vehicles. However, Air Force experience and capabilities will always stand ready to assist in other fields.

Today, the basic philosophy of the United States Air Force is that we must have offensive airpower second to none. Missiles and Sputniks have not changed our philosophy. If anything, they have confirmed it. In addition, we must have adequate air defense. We believe that possession of such airpower capabilities, in conjunction with the forces of the Army, Navy, and Marines, will be an effective deterrent. Deterrence failing, these forces will provide the maximum security possible in the nuclear age.—END

Chief of Staff of the US Air Force, General White graduated from West Point in 1920 and entered the Air Corps in 1927. A veteran of attache assignments in the Far East and South America, he was assistant Chief of Staff, AAF Intelligence, and Deputy Commander, Thirteenth Air Force in the Pacific in World War II, later assuming command of the Seventh Air Force. Prior to his appointment as Chief of Staff, he served as US Air Force Vice Chief.

AFA ANNOUNCES...

World Congress of Flight

THE First World Congress of Flight, to be held in Las Vegas, Nev., April 12-19, 1959, was announced in Dallas as the newest program of the Air Force Association. In revealing plans for the World Congress, AFA President Peter J. Schenk pointed out that the Air Force Association will have the cooperation of other interested groups, including at this writing the Air Transport Association, the Flight Safety Foundation, the Space Education Foundation, the National Aeronautics Association, and the United States Air Force.

To be understood in its proper context, the World Congress of Flight should be viewed as another and different kind of weapon for the struggle against Communism.

It is no secret that the Communist bloc has declared economic war on the free world. Khrushchev has told us so, in these words:

"We declare war upon you in the peaceful field of trade. . . . We will win over the United States. The threat to the United States is not the ICBM but in the field of peaceful production. We are relentless in this and it will prove the superiority of our system."

In this economic war the Soviet Union is already doing what this nation has not yet learned to do—utilize its commercial aviation as an instrument of national policy.

For months Khrushchev has made his diplomatic journeys in a Soviet-designed and built jet airliner. President Eisenhower will not take delivery of his personal Boeing 707 until some time this spring. In the book, *The Ruble War,* Columbia Broadcasting System's Daniel Schorr writes:

"On Khrushchev's desk I saw models of new transport planes—a jet and a turboprop. They were symbols of a determined drive for a new kind of airpower in the uncommitted world. Soviet Aeroflot [the Soviet Union's government-subsidized commercial airline] routes are reaching out not only to London and Amsterdam, but to Cairo and New Delhi. They seek to make Moscow the transport hub for Asia and Africa in this air age, unfurling the Soviet flag in the skies as a symbol of Soviet prestige. It is no accident that Khrushchev has given airplanes as personal gifts to Nehru and to Nasser."

At this point in history, American airpower prestige in the commercial jet field could use a shot in the arm. With the greatest aviation industry in the world, with the longest tradition of aviation, there is no reason for the United States to play second fiddle to anyone in any facet of aviation. The World Congress of Flight should provide a unique showplace for American knowhow in aviation and astronautics, and thus become an important instrument in the Economic War.

The Las Vegas meeting—an invitational affair—will include the fourth Annual Jet Age Conference of AFA and will combine this big annual meeting on jet age problems with other major conferences on Missile Management and the Space Age. These conferences will be held in the new Las Vegas auditorium, together with a huge exhibition of aerospace equipment. The World Congress of Flight will christen the new $10 million Las Vegas Convention Center.

In addition to these conferences, the World Congress will feature at the Las Vegas airport—McCarran Field—an exposition of the new commercial jet aircraft and related equipment. Other exhibits will provide a showcase for utility, business, and personal aircraft and helicopters.

The World Congress will be international in scope and at least three major international groups are now planning to hold meetings in Las Vegas in conjunction with the Congress. For example, these meetings will include an international Flight Safety Conference of the Flight Safety Foundation, and the annual meeting of the Air Age Education Council of the *Fédération Aéronautique Internationale.* The latter session is normally held in Paris, but is being switched to Las Vegas for this occasion. Twenty-five to thirty countries are normally represented in these groups.

Combat military aircraft, missiles, and related equipment will be on view at nearby Nellis Air Force Base, and demonstrations of military equipment will be held at the Nellis range where the Air Force annually stages its worldwide gunnery meet. McCarran Field, with its new 10,000-foot runway, will be used for air and ground demonstrations of commercial aircraft and equipment.

Many leaders of aviation have felt that such a meeting is long overdue in this country. The annual British show at Farnborough has always been an outstanding event of the international aviation calendar, and other European countries have held top-flight aviation shows. But the United States, cradle of aviation, has lagged behind. With American commercial jets now coming into the flying picture it seems high time that a platform be provided to display American aerospace power with full impact.

Several points should be borne in mind regarding the World Congress of Flight. First of all, it will feature commercial aviation, with emphasis on jets. Second, by utilizing the Las Vegas site, with its new auditorium and exhibit hall, new airport runway facilities, Nellis AFB, and thousands of available hotel rooms, it should be possible to combine regular meetings of many individual organizations into one place and at the same time make available in joint conferences the sum of the best thinking on current problems. At the moment, a plentitude of individual small conferences going on at various times and in various places place a serious drain on industry and government personnel who spend an inordinate amount of time attending, as well as traveling to and from, these gatherings. In fact, companies and organizations are encouraged to hold board meetings, etc., in Las Vegas between April 12-19.

From whatever vantage point it is viewed, the World Congress of Flight is an ambitious undertaking that can only be successful with the full cooperation of many individuals and organizations. First reactions to the AFA announcement have been pledges of enthusiastic support. The World Congress of Flight deserves just that.—END

AFA AIRPOWER

A beaming General Schriever receives congratulations from President Schenk on being named Aviation's Man of Year.

Left, C. W. LaPierre accepts Vandenberg Trophy on behalf of Ralph Cordiner. Right, NACA's Julian Allen is honored.

Donald Rodawold accepts Schilling Trophy for the late Capt. Iven Kincheloe (inset) from Air Force Secretary Douglas.

Brig. Gen. Clifford Rees, APCS Commander, accepts Arts and Letters Trophy for his unit. Trophy was awarded for APCS photo coverage of USAF missile activities.

THE MAN who supervises the vast military-scientific-industry team planning America's space weapons arsenal—Maj. Gen. Bernard A. Schriever, Commander, USAF Ballistic Missile Division of ARDC—was named "Aviation's Man of the Year" at AFA's Airpower Awards Banquet, September 28, traditional climax to the national Convention.

Honored for his contributions to American airpower, General Schriever received AFA's H. H. Arnold Trophy, named for the late World War II Air Corps chief.

A native of Germany, but Texas raised, General Schriever won his commission in 1933 at Kelly Field, Tex., after receiving his degree from Texas A & M. Following a military tour and a stint as a commercial pilot, he reentered active service in 1938, flying as a test pilot. In 1942, he received his master's degree in aeronautical engineering and later that year went to the Pacific where he participated in sixty-three combat missions.

After World War II, he became Chief of the Scientific Liaison Section at Army Air Force Headquarters, later attended the National War College. He was named assistant to the commander, ARDC, in 1954, and the same year was designated commander of the Western Development Division, now the Ballistic Missile Division.

Honored with General Schriever:

- **Ralph J. Cordiner,** Chairman of the Board of the General Electric Company, who received AFA's 1958 Hoyt S. Vandenberg Memorial Trophy, in recognition of his contributions to air age education as a principal architect of the recently enacted "Cordiner Plan" military pay increases. The trophy is named for the late second Chief of Staff of the Air Force.

Mr. Cordiner, who joined General Electric in 1923, has served in a succession of executive posts with the company. During World War II, he went to Washington as Director General of War Production Scheduling for the War Production Board and later served as vice chairman of WPB. He succeeded Charles E. Wilson as GE president in 1950.

A long-time exponent of increased compensation for professional skills, he was Chairman of the Defense Advisory Committee on Professional and Technical Compensation in the Armed Forces in 1956-57. Under his leadership, the Committee submitted a comprehensive program of military pay increases designed to attract and retain critically needed space age technical manpower in the services. Much of the Cordiner Committee's program was enacted in mid-1958. His award was accepted by C. W. LaPierre.

- **H. Julian Allen,** National Aeronautics and Space Administration scientist credited with developing the idea of blunt nose cones for missile reentry, who received the Association's Science Trophy for 1958.

Mr. Allen, Chief of the High Speed Research Division at Ames Aeronautical Laboratory, Moffet Field, Calif., is a veteran of more than twenty years of aeronautics research. He has held his present post since 1945 and is a recipient of the NACA Distinguished Service Medal

AWARDS

Highest Honors Announced at Banquet, Luncheon

for his nose-cone research, which was done under heavy security wraps. Previous recipients of the AFA award include the late Dr. John von Neumann, Dr. Edward Teller, Dr. George Valley, and Dr. Theodore von Kármán.

● The late **Capt. Iven C. Kincheloe, Jr.,** Air Force jet ace who had been scheduled to fly the North American X-15 to the edge of space, who posthumously received the 1958 AFA David C. Schilling Memorial Trophy in recognition of his contribution to flight.

Captain Kincheloe, holder of the world's manned flight altitude record (126,200 feet, attained in the Bell X-2), was killed July 26 in the crash of an F-104 Starfighter jet.

His award was accepted by a longtime friend, Donald Rodawold of Los Angeles, Calif., a retired, disabled Air Force officer designated by Captain Kincheloe's widow.

A native of Detroit, Captain Kincheloe was an experimental flight test officer at Edwards AFB, Calif., at the time of his death. A graduate of Purdue University, where he had earned degrees in mechanical and aeronautical engineering, he began pilot training in 1949 at Randolph AFB, Tex. He completed 101 combat missions in the North American F-86 fighter and thirty missions in the Lockheed F-80 during the Korean War, and earned the title of double jet ace with credit for ten enemy craft destroyed, one probable, and eleven damaged.

Last year, he was honored for his achievements with the Bell X-2 by award of the Air Force's Mackay Trophy.

● The Air Force's **Air Photographic and Charting Service,** which received the 1958 AFA Arts and Letters Trophy. The Award, given by the Association in recognition of APCS's excellent photo coverage of the Air Force's ballistic missiles program in particular, and global Air Force activities in general, was accepted for APCS by the unit's commander, Brig. Gen. Clifford Rees.

Awarded AFA Citations of Honor at the Friday, September 26, "Space Age Luncheon" were:

● **Gen. Edwin W. Rawlings,** Commander, Air Materiel Command, honored for his "outstanding contributions to national security while serving as the US Air Force Commander, AMC, achieving new standards of management efficiency in the vital field of global air logistics."

● **Lt. Gen. Donald L. Putt,** USAF (Ret.), former Air Force Deputy Chief of Staff for Development, who was cited for "his outstanding contributions to national security as a military scientist . . . whose vision and competence in research and development planning for the US Air Force have made him an outstanding leader in the Technological War."

● **Col. Leo F. "Pat" Paul,** late Special Assistant to the Air Force Chief of Staff, honored posthumously for his outstanding accomplishments in key Air Staff assignments. The citation praised his "wise counsel and intellectual integrity" as taking him beyond the call of duty in his contributions to "enlightened leadership for his country and the free world."

Colonel Paul was killed in the crash of a C-47 on October 2, 1957. His widow, Mrs. Mary Lou Paul, accepted his award.—END

Gen. Edwin W. Rawlings, Air Materiel Command chief, receives AFA Citation of Honor for his contributions to airpower. Citation was awarded at the Space Age Luncheon.

Lt. Gen. Donald L. Putt, USAF (Ret.) former DCS/Development, was honored with presentation of Citation of Honor at luncheon, given for his contributions in research field.

Mrs. Leo F. Paul accepts Citation of Honor, presented by AFA to her late husband, Col. Leo F. "Pat" Paul (inset), former Special Assistant to Chief of Staff, in recognition of his wise counsel and service above the call of duty. Colonel Paul was killed in an air crash on October 2, 1957.

Taking bows at the Banquet, ARDC's M/Sgt. Tyson, at left. At right, AMC's M/Sgt. Symmes. Standing in front of Sergeant Symmes is Mrs. Symmes.

Also honored by selection as the Air Force's Outstanding Airmen for '58 was this proud trio. Rising to receive plaudits of the large crowd at the Banquet are M/Sgt. Gaiser of Headquarters Command, M/Sgt. Shane, representing the Air Training Command, M/Sgt. Barrett, Security Service. With them, their wives.

USAF AND AFA HONOR OUTSTANDING AIRMEN

Proud Sergeants Receive Plaudits as Air Force's Finest for '58

FIFTEEN proud airmen, representing the Air Force's major commands, the Air Force Reserve, and Air National Guard, were honored by selection as 1958's Outstanding Airmen, a coveted tribute by the Air Force as the fifteen presented at the Airpower Awards Banquet which capped AFA's Dallas Convention.

Ranging from a project engineer in the Air Research and Development Command to an air police first sergeant, the outstanding airmen received the plaudits of the crowd at the annual AFA Awards Banquet as they rose to be introduced by banquet master of ceremonies, cartoonist Milton Caniff.

Among the honored guests at the AFA Convention, the airmen fulfilled their now-traditional role of representing *all* of USAF at the nation's biggest airpower meeting.

This year's outstanding USAF airmen:

- **Barrett, Fred, M/Sgt.,** Air Force Special Communications Center, San Antonio, Tex., representing the Air Force Security Service.
- **Collins, Edward L., M/Sgt.,** Orlando AFB, Fla., representing the Military Air Transport Service.
- **Easterly, Douglas P., M/Sgt.,** Elmendorf AFB, Alaska, representing the Alaskan Air Command.
- **Gaiser, James K., M/Sgt.,** Bolling AFB, Washington, D.C., representing the Headquarters Command.
- **Glenister, James A., M/Sgt.,** Ardmore AFB, Okla., representing the Tactical Air Command.
- **Karst, Samuel G., M/Sgt.,** Randolph AFB, Tex., representing the Air University.
- **Kilpatrick, Harry, M/Sgt.,** Hancock Field, N.Y., representing the Air National Guard.
- **Rasmussen, Louis J., M/Sgt.,** 2643d Air Reserve Center, San Francisco, Calif., representing the Air Force Reserve.
- **Rodgers, Lee H., M/Sgt.,** Paine AFB, Wash., representing the Air Defense Command.
- **Shane, Charles E., M/Sgt.,** Mather AFB, Calif., representing the Air Training Command.
- **Staley, Roscoe R., M/Sgt.,** Lowry AFB, Colo., representing the US Air Force Academy.
- **Symmes, Ledley B., M/Sgt.,** Robins AFB, Ga., representing the Air Materiel Command.
- **Tyson, Edmund T., M/Sgt.,** Wright-Patterson AFB, Ohio, representing the Air Research and Development Command.
- **Wittle, James D., T/Sgt.,** 2606th Air Reserve Center, Pittsburgh, Pa., representing the Continental Air Command.
- **Womeldorph, Howard R., M/Sgt.,** Offutt AFB, Neb., representing the Strategic Air Command.—END

Left to right, M/Sgt. Karst, Air University; M/Sgt. Easterly, Alaskan Air Command; M/Sgt. Collins, MATS; M/Sgt. Staley, Air Force Academy. Their wives beam with them.

Left to right, M/Sgt. Glenister, Tactical Air Command; M/Sgt. Womeldorph, Strategic Air Command; T/Sgt. James D. Wittle, Continental Air Command; foreground, their wives.

Left to right, M/Sgt. Rodgers, Air Defense Command; M/Sgt. Rasmussen, Air Force Reserve; M/Sgt. Kilpatrick, Air National Guard; and their wives.

Excerpts from AFA's Keynote Address . . .

A NEW KIND OF COURAGE

Gill Robb Wilson

WE BANDED ourselves together in common devotion thirteen years ago, and our objective was to project our experience, not just because we loved airpower, but because we loved this country and felt airpower was the crux of its chance to lead the world to better things.

I hate to think what America would have been without you members of the Air Force Association. I want you to sincerely remember that despite all of your discouragements and the struggles you have had in organization, and the disheartening things that have happened, there never was a medal, from the Congressional Medal of Honor down to the Air Medal pinned on the breast of any boy in a cockpit or on a flightline, as much deserved as the approval that these communities give you when you go into them for our Convention. You have truly done a wonderful thing in less than a decade and a half. You should be proud.

History will say that yours has been a priceless contribution, unrivaled in the field of science, education, technology, political science, sociology, or any other phase of our national life.

But all this is not enough. We must renew our efforts, because by and large the political complex that is the government of the United States stands in abysmal ignorance of the significance of what has happened in the fields of technology and science. How strange it is that this condition should exist.

If we move into the space age with this same attitude, we are going to get run over by Russia, or anybody else who comes along and outthinks us.

Now, I have a word that isn't going to please the scientists either, for I do not believe that they have fulfilled their duties in giving meaningful explanation of the implications of these things to society and to the economics of life.

I do not have any purpose to castigate, but I want to make you aware of the fact that in the decision-making sections of the government, there is represented no experience in aeronautics or astronautics.

I can see no survival unless through the agency of the Air Force Association or its Space Education Foundation, which has been created to run out ahead, we can bring knowledge and conviction to those who are experts in political economy, law literature, and the men and women who administer government, dedicated people who walk in a vacuum so far as survival is concerned, men and women for whom I have the highest respect as concerns their intents, and no respect whatever as concerns their capability to lead, or diagnose the problems upon which the fate of the millions depends.

So if I have one thing to leave with you, it is that you grow not weary. It is awfully easy to say, "Let the younger fellows do it." It is awfully easy for a younger fellow to say, "Well, what can I do?" It is awfully easy to find some logic or reason to say, "I have done my bit, I am going to stand aside a little." You will perish, and that won't be so bad, but your children will perish and your country will perish, and the cause of the God who is our Father, and the ideologies for which our forefathers lived and died, all this will perish, and the world will return to a moral and spiritual jungle, unless you now rally yourselves, take the common experience which is your background, search out the knowledge of missiles, rockets, and all of these problems and become voices of authority in your various communities about the significance of these things.

You are brave men. This is going to take a new kind of courage. Sometimes the penalties of intellectual courage are greater than the penalties that may be exacted for outstanding physical courage, but this you have to rally to. If the Air Force Association, in my considered judgment, does not lead, does not light its candle and walk out there, then there is darkness ahead, no light down the middle of the road. But if you do this thing which you can do, I believe you can so convey and interpret the significance of these times to our leaders and people that they will be inspired, informed, and when they are, the problems of an enemy from without disappears like the mists in the morning sun.

Don't sell yourselves short, gentlemen. You have demonstrated your ability to see and to understand. Now, because the challenge is greater than ever before, let your spirits rise, let your determination crystallize, let us move on to fulfill the destiny that we dreamed about when, in the bonds of comradeship, and because we would rather be with one another than anything else, we formed ourselves into an association, and started out to be a tower of strength to the American people and to the flag we love.—END

FROM THE DESERT TO THE ARCTIC..

First helicopter ever developed to meet specific Army requirements for front-line duty, the Bell HU-1A is now taking a series of rigid Army "final exams" before going into action in the field. One of them is the Army Aviation Board's service testing, which will evaluate the combination of equipment and military personnel in their normal operational environment.

Designated the Iroquois by the Army, this all-new, turbine-powered helicopter will be tested by the Board under simulated battle conditions to allow the factors of weather and terrain full play. At a special site near Yuma, Arizona, the Iroquois will go through its "baptism of fire" in the desert heat. One of the most important checks here, and later at Ft. Rucker, will be made on the HU-1A's tactical capability for troop transport, medical evacuation and emergency resupply. In the climatic hangar at Eglin Air Force Base, the Iroquois will go into the deep freeze of −65°F. Then it will be off to Alaska for actual Arctic testing.

Conclusion of the complete Army shakedown will make the Iroquois one of the most thoroughly tested helicopters in the world . . superbly capable of front-line duty . . ready to keep Army Aviation "Above the Best." Bell is proud of its role as partner in military aviation progress . . of its ability to supply the finest equipment for the military.

U.S. ARMY AVIATION BOARD TESTS THE IROQUOIS' METTLE

BELL Helicopter CORPORATION

FORT WORTH, TEXAS • SUBSIDIARY OF BELL AIRCRAFT CORPORATION

CESSNA L-27A

USAF's new transport with high-power twin-engine safety

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.

Cessna designed and built the L-27A for hard work. Power loading, acceleration, and climb characteristics are excellent. Single-engine performance is particularly outstanding—for this modern Cessna twin packs more power per pound than any other light twin transport. Operating and maintenance costs are low. Result: the Cessna L-27A makes substantial savings for the U. S. Air Force.

Cessna Aircraft Co., Wichita, Kansas.

Cessna

Inquire today about the rewarding future your Air Force offers you

Night Fighters Meet in Big D

In midst of memories, they look at the future

YESTERDAY, night fighters. . . .

Today, all-weather interceptors, operating within the atmosphere.

Tomorrow, aerospace defenders from the ground to the outer reaches of the farthest galaxy. . . .

This is the pattern of progress. This is the pathway of defense at a time when courage and skill had to substitute for the electronic gear of today.

In the European and South Pacific theaters, during World War II, a handful of brave men knocked a lot of enemy bombers out of the sky at night—and paved the way for round-the-clock operations.

The dedication and devotion of these few pioneers not only put this nation in their debt; it also opened a new realm of night air operations—and thereby became a significant part of our nation's forward-looking tradition, the United States Air Force. . . .

However, at this time in history when world tension and technological progress have combined to create the greatest challenge we have ever faced, we cannot take out too much time for recollection. We have a job to do—one that will occupy all our waking hours and absorb all the creative thinking we can muster. We must view the past as a strong foundation on which to build tomorrow's air and aerospace power. . . .

Technology is advancing at a far more rapid pace now than during the past fifteen years. This means that we have to move forward with even more urgency.

As we plan our new aerospace weapon systems for the future, the Department of Defense will pursue and extract from space research projects the breakthroughs that are promising for military use. In keeping with our mission, and in light of the new reorganization action, the Air Force is determined to provide the Joint Chiefs of Staff with a fully modern air and aerospace force appropriate to deter aggression in each time period ahead.

Regardless of the form the future piloted and unpiloted aerospace vehicles may take, their purpose will be to *extend* our present defense capabilities into the years ahead. It was with this thought in mind that I implied earlier how night fighters of the future will be space defenders.

We must remember this: No matter what our future plans may be, no matter how much effort we spend now in getting ready for the future, our goals are valueless unless the follow-on generations pick up where we leave off and carry on.

Guest speaker at Night Fighters meet, Lt. Gen. Clarence S. Irvine, USAF DCS/Materiel.

The Soviet threat to world peace and to our own national security has not diminished one iota. They are outstripping us in the field of propaganda. Their *rate* of technological progress may be still greater than our own. They seem to be pushing forward with a greater sense of urgency than we are. And they mean to beat us at our own game of superior industrial output in the field of air and aerospace hardware.

The industrial network of the United States must redouble its efforts to produce combat equipment of greater reliability and capability. They must accentuate automation to increase output per man hour, and ride roughshod over the technological barriers that block the pathway to effective aerospace operations.

The Air Force, in turn, has the difficult and complex task of programming and developing the aerospace structure necessary to ensure maximum air defense; it must also interrelate and integrate air defense with highly effective and efficient air retaliatory forces to such a degree that the whole air defense/offense machinery can be meshed into positive controlled action by one integrated command from our Chief Executive.—END

° ° °

From the address by Lt. Gen. Clarence S. Irvine, DCS/Materiel to the Night Fighters meeting at Dallas.

Hughes Trophy goes to 31st Fighter-Interceptor Squadron

Featured at the Night Fighter Luncheon was presentation to the outstanding air defense squadron of the Air Force of the Hughes Trophy, awarded each year to the air defense squadron selected by Hq. USAF on the basis of operational readiness, successful missions, and flying safety. Winner of the 1958 trophy was the 31st Fighter-Interceptor Squadron of Elmendorf AFB, Alaska. The trophy, a handsome silver punch bowl, was presented to the squadron by Lt. Gen. Joseph H. Atkinson, Commander, Air Defense Command. The Hughes Aircraft Co., sponsors the Award.

Night Fighters are an organization of 2,000 World War II night pilots and present-day all-weather interceptor crewmen.

Space Education Foundation Sparks Educators' Aerospace Conference

MEETING CHARTS EDUCATION GOALS IN THE SPACE AGE

THE term "fringe benefits" is, perhaps, overworked these days. But one cannot resist the impulse to so describe one of the most important meetings of the Dallas Convention. The crowd was small—but influential. There was no formal program—but much of significance was accomplished. There were no headlines—but the implications and influence were as far reaching as those of any single event in the crowded Convention agenda.

The "fringe benefit" meeting at Dallas was the National Conference of State Education Leaders. It consisted of a group of seventy-five distinguished educators, representing a dozen states as far removed as California and New York, Minnesota and New Mexico. The educators gathered in the improbably named Cactus Room of Dallas' Adolphus Hotel. The common ground—education for the Space Age. The catalyst—the Space Education Foundation.

The group met under the chairmanship of an active and imaginative pioneer in aviation education—Dr. Frank E. Sorenson, of the University of Nebraska.

Dr. Sorenson set the stage in his opening remarks:

"This is a unique and important meeting. I believe it is the first time that a group of educators, officially representing their state Departments of Education, has ever been assembled so that they may be identified with aviation leaders. Sometimes we educators are asked, 'Why are you concerned about aviation?' We need only, as educators, ask two questions in return:

" 'What would we do today without our airpower?'

" 'Are you aware that aviation today is our number-one industry?' "

On the basis of the obvious answers to these questions, Dr. Sorenson pointed out, an educator *has* to be interested in aviation or he is not fulfilling his obligation to his community and his pupils.

Gill Robb Wilson addressed the meeting. It was a remark made in the course of Wilson's inaugural address at the San Francisco Convention in 1955 that eventually led to the educators' meeting in Dallas. At that time, Wilson suggested that state education leaders be invited to future AFA Conventions and Conferences.

Last February a sizable group showed up for AFA's Jet Age Conference in Washington, the largest contingent being from Oklahoma City. They attended the Conference as guests of Maj. Gen. Thomas F. Gerrity, Commander, Oklahoma City Air Materiel Area. With the Jet Age material as ammunition, the group returned to Oklahoma City and put on an outstanding Space Age Conference with the backing of the Frontiers of Science Foundation. Six thousand high school students throughout Oklahoma attended, and television enlarged the conference audience to include hundreds of thousands of viewers. (*See July '58* AIR FORCE *"Oklahoma City Space Age Conference."*)

To pass along the benefit of their experience, a team from Oklahoma City briefed the educators in Dallas. Besides General Gerrity, the team included E. K. Gaylord, Chairman of the Board, Frontiers of Science Foundation; Stanley C. Draper, Managing Director of the Oklahoma City Chamber of Commerce; Dr. Melvin W. Barnes, Superintendent of the Oklahoma City Public Schools; Lawrence D. Leffler, Commander, Oklahoma City Squadron, AFA; and Dr. James G. Harlow, Dean of the College of Education, University of Oklahoma.

A long question period, indicating a keen interest in similar programs for other communities, followed the panel presentation.

Other speakers included Dr. Jess Hudson, Assistant Superintendent of Schools, Tulsa, Okla., who discussed "Careers in Aerospace Science," and George van Leeuwen, AFA leader in Utah, who explained the ambitious annual educational conference in Salt Lake City, sponsored by the Utah Wing.

Response from the educators present in Dallas was enthusiastic. All look upon the Dallas meeting as the beginning of a fruitful collaboration with the Air Force Association and the United States Air Force in the field of aerospace education. In addition to their own meeting, the educators attended the Airpower Panorama, the Space Age Symposium, and other Convention events, and their reactions have been unanimously favorable.

Some typical comments:

"... The AFA Convention was one of the best I ever attended. I learned much that had both personal and educational value. I returned with a feeling that we must renew our efforts for additional and informative units of work relative to the Air Age and Space in our school curriculum."

"The most important part of the Convention was the step taken to organize the Space Age Education Program. This opens up an avenue through which we can develop a partnership with the educational world in the development of airpower in this country."

"We found the meeting exceedingly stimulating, and I wish to record my appreciation for having had an opportunity to attend."

"The meetings were most meaningful and I am sure that they had a great deal of influence on the persons representing education."

"I gained more worthwhile information at the Dallas Convention of the Air Force Association than I had previously gained at any one educational convention."

"The exhibits were beyond imagination. The programs were excellent."

"Upon our return (from Dallas) we introduced into the approved list of high school subjects in our state an additional course entitled 'Earth and Space Science.' "

"An entire new era has been opened to us, and we are most grateful to AFA for having had the opportunity to participate."

Plans are to make an expanded educators' meeting a permanent feature of future AFA Conventions and Conferences and to establish permanent working groups to pursue aerospace education on state and community levels as well. On the agenda is an educators' meeting as an integral part of the World Congress of Flight in Las Vegas, April 12-19, 1959 (*see page* 55).—END

AROUND THE WORLD WITH SIKORSKY HELICOPTERS

TWIN-TURBINE HSS-2—Scheduled for first flight in 1959, the HSS-2 anti-submarine helicopter (Sikorsky S-61) is being developed for the U. S. Navy. It features twin turbine engines, all-weather flight capabilities, and a flying boat hull enabling it to operate from land, water, mud or snow. Shown above in mockup, the new Sikorsky HSS-2 will offer substantial advances in payload, endurance, and cruising speed.

ELECTRONIC TETHER—The Army demonstrates a device developed by Sikorsky for ground control of a flying helicopter using a 50-foot cable. The "tether" aids in hooking up loads to a sling, as shown above, and is also useful for maneuvering near the ground when the pilot's visibility is reduced by darkness, dust or snow.

100th S-56 HELICOPTER—Sikorsky Aircraft has completed the 100th S-56, the free world's largest production helicopter. The aircraft was a Marine Corps HR2S-1. The S-56 is also built as a U. S. Army troop and cargo carrier designated the H-37A. An S-56 holds the world speed record for helicopters —162.7 mph, set in 1956.

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INTRODUCING

November • 1958

SPACE DIGEST

THE SPACE AGE IN PERSPECTIVE

Projects meeting the ever increasing needs of Advanced Power Systems for Air and Space operations are currently under way at Marquardt. Here, in an environment that stimulates creative hypotheses, Marquardt engineers and scientists are engaged in the following diversified areas:

ADVANCED PROPULSION CYCLES

- Ramjets for cruise propulsion for hyper-velocity missiles and piloted aircraft and as accelerating devices for Space Vehicles
- Electrical Propulsion—Plasma Jets, Ion Propulsion and Magnetohydrodynamics
- Nuclear Ramjet

EXOTIC FUELS

- Evaluation—Energy, Compatibility and Logistics

CONTROLS & ACCESSORIES

- Hot Gas Servo Systems
- Accessory power for Space application
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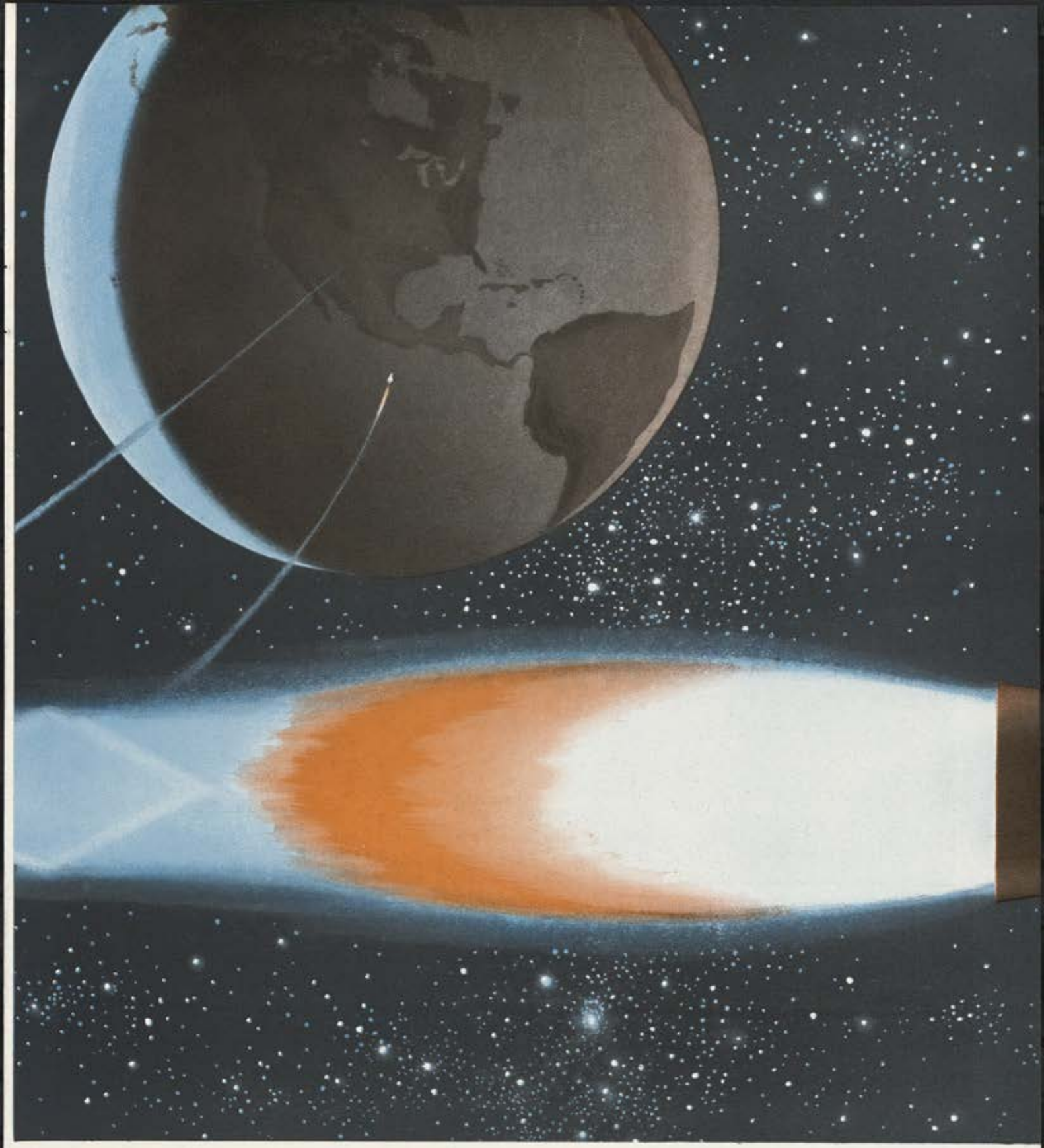
In addition, current application projects include supersonic ramjet power for Bomarc, Super Bomarc, X-7 (test vehicle), Q-5, and Kingfisher.



TO ENGINEERS AND SCIENTISTS:

Engineers capable of contributing to advances in the state-of-the-art and scientists who desire to do proof-of-the-principle research in the fields of propulsion systems, automatic controls, advanced test facilities and high temperature materials may find, here at Marquardt, the climate best suited to your interests and talents.
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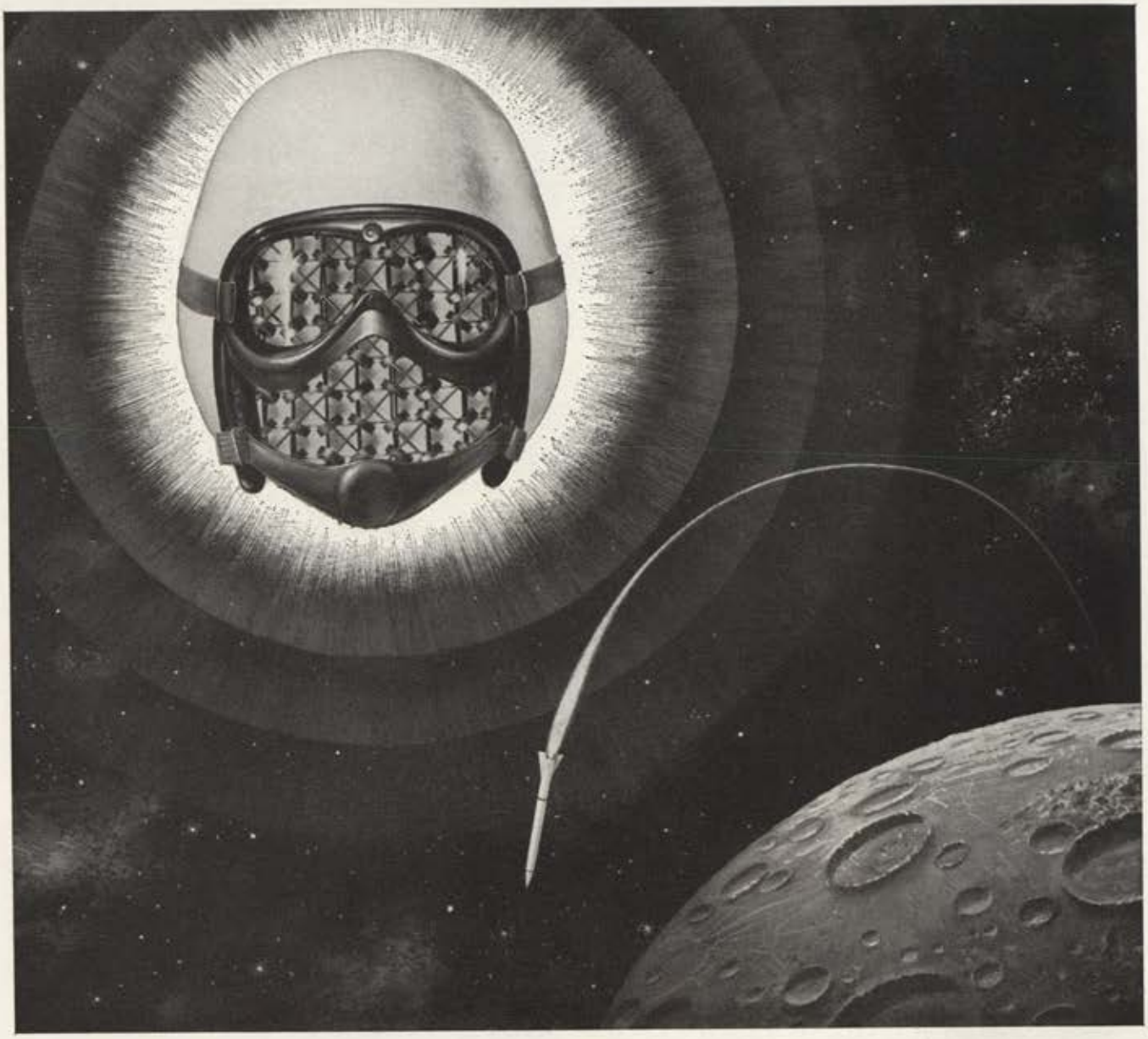

Spaceman-1958

Today, the electronic brain is the spaceman controlling the rockets and satellites probing outer space. It is a vital part of many electronic systems being developed by Sylvania to help man explore the universe.

Scientists and engineers at Sylvania Electronic Systems are developing advanced electronic systems that will contribute to man's conquest of outer space. Over 1,000 strong, their combined training and experience represents literally thousands of years of research and development work in electronics. This concentrated source of research and engineering knowledge, combined with Sylvania's outstanding laboratory and production facilities, is behind many of today's most dramatic scientific advances.

Programs currently under development by Sylvania Electronic Systems include advanced communications, microwave receivers, complex transistorized computers and such "impossible" projects as antimissile missiles. Such programs indicate the kind of experience and proven capability, from initial concept through automated mass production, that is available to you for any project, whether large or small. Call on Sylvania Electronic Systems engineers. They will welcome the opportunity to explore with you your specific project or problem.

SYLVANIA ELECTRONIC SYSTEMS

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ELECTRONICS FOR INDUSTRY AND NATIONAL DEFENSE

VOLUME 1, NUMBER 1 • NOVEMBER 1958

SPACE DIGEST

• CONTENTS

From the Editors...

A DISTINGUISHED companion of ours in the periodical publishing field has had a reputation over the years for publishing articles, planned and written weeks ahead, that tied in with the day's headlines. The editors modestly refer to this as "Post Luck." We don't know how long our luck will hold, but we consider it a good omen for the future that, almost as we go to press with this first issue of SPACE DIGEST, two mighty milestones of space exploration have been passed.

One, of course, is the flight of Pioneer, the Air Force's moon-probe vehicle which came to a fiery end over the Pacific Ocean after having penetrated farther into outer space than any other man-made object to date. Pioneer failed to reach its planned orbit around the moon but as James Russell Lowell once put it, "not failure, but low aim, is crime." *(See following page.)*

The second milestone is the rollout of the X-15, destined to be the first craft, on this side of the Iron Curtain, at least, to penetrate space with a pilot at the controls. *(See page 88.)*

But significant as are these two events, they mark but the beginning of man's great venture into the cosmic void. In SPACE DIGEST, it is our intent to record the history of the exploration of space even as it unfolds, keeping in sober perspective the overriding implications of space technology relative to the security of this nation and the peace and prosperity of the entire world.

"The *Most Glorious Failure*

AS THE Columbus Day weekend, 1958, came to a close, a new axiom—unique to the space age—had come into the language: "Nothing succeeds like failure." For in the pre-dawn mists at the Air Force's Cape Canaveral Missile Test Center in Florida, at 4:42 a.m. on Saturday, October 11, 466 years —short of a day—after the discovery of the New World, the US Air Force, backed by the cream of America's space technologists, launched a vehicle aimed at the vicinity of the moon. By the end of its journey, Pioneer had reached out nearly 80,000 miles into space—the farthest distance ever atttained by an object from earth.

Pioneer's prime objective, to pass around the moon and transmit crude pictures of the far side not yet seen by man, was not attained. Pioneer did not make it all the way to our nearest neighbor in space but, after reaching its fantastic height, came hurtling back to earth to die a fiery death on reentering the earth's atmosphere.

Designed to blast free of the dominance of earth's gravitational grip and "fall" toward the moon's gravitational field, Pioneer's mission was cut short by a slight error in the gyroscopic autopilot of the first stage of the vehicle (an Air Force Thor IRBM), which caused a change in Pioneer's trajectory. This drift was enough to make the probe's path approximately 3.5 degrees steeper than it should have been. The gyroscopic autopilot was used alone, rather than being coupled with the inertial-guidance system of the Thor IRBM weapon system, in order to save weight. This angle change made it harder to fight terrestrial gravity and prevented Pioneer from reaching the velocity required to escape earth's grip. Had Pioneer reached the required speed and

Moments before historic launch, final adjustments are made on Pioneer as probe awaits its spaceward trip.

in History"

BY WILLIAM LEAVITT
Associate Editor

received the final course adjustment planned, it might even have coursed around the moon in a giant elliptical orbit. This would have eventually brought it back to the earth's gravitational field, making it a super-satellite coursing around *earth and moon.*

The initial flight plan was this: After Pioneer's first three stages had taken it (in about two-and-a-half days) to a point some 30,000 miles from the moon, on a course perpendicular to the moon's orbit, Pioneer's fourth stage was to have been fired by remote control from Hawaii to brake its speed, adjust its direction, and take it into orbit around the moon. By mid-morning of the launching day, trackers could see that the angle had been too steep; for a while it was believed Pioneer would reach a maximum altitude of 80,000 miles and then be drawn into a long elliptical orbit around earth. This did not happen. Later it was hoped that the final course adjustment could be made to reorient the trajectory, but temperature effects had weakened the batteries that were to have fired the final stage, and it became apparent that Pioneer would return to destruction in earth's atmosphere. Pioneer died reentering the atmosphere at about midnight, Sunday, October 12.

Pioneer's brief life was most significant. Its near success proved the feasibility of lunar probes (and eventually probes to the vicinity of Mars and Venus). Pioneer sent back information, giving greater credence to theories that the intense radiation belt discovered by the Explorers and Sputniks has boundaries, is related to the magnetic field of the earth, and that the radiation reaches its peak at about 5,000 miles, then begins to thin out. If this is borne out by later, more sophisticated instrumentation, hopes for manned spaceflight should be considerably bolstered. Dr. S. Fred Singer *(see October '58* AIR FORCE, *"Cosmic Radiation—How Much of a Barrier?")* suggests: "What we need is an even greater knowledge of the intensity and nature of the radiation and, with that, greater knowledge of shielding methods."

Pioneer, as it made its historic flight, was a breath of fresh air to the non-Communist world. As a scientific achievement, it far outshone the launching of Sputniks, Explorers, and Vanguard.

The list of credits was long. At the press conference held at the National Academy of Sciences in Washington on Sunday, October 12, T. Keith Glennan, Administrator of the newly established National Aeronautics and Space Administration, which had just taken responsibility for the services' lunar probe operations, lauded the Department of Defense, the Air Force, ARDC's Ballistic Missile Division, the Cape Canaveral Air Force Missile Test Center, and the Navy, which had developed both the adapted Vanguard system used for Pioneer's second stage and the television apparatus. Also praised was the international team of scientists, notably the British, at the University of Manchester, which helped track Pioneer.

The list could never be complete. It featured a dedicated team at California's Space Technology Labs (headed by General Manager Louis Dunn) which worked for months to plan the project with USAF's Ballistic Missile Division and BMD's Commander, Maj. Gen. Bernard A. Schriever. Thousands of people built the combination that comprised Pioneer: the first-stage Douglas-built, North American Rocketdyne-powered Thor; the modified second-stage Vanguard, powered by Aerojet-General engines; the third-stage Alleghany Ballistics Lab rocket; and the fourth-stage, small Thiokol solid-fuel rocket (designed for the course adjustment), with the vital instrument packet contained in this final stage.—END

Instrument payload was sterilized to avoid lunar contamination, in case probe landed on the moon.

Alex Dreier, radio-TV commentator, who served as Symposium Moderator in Dallas.

THE SPACE AGE IN PERSPECTIVE

Annual symposium of the Air Force Association

AS President Schenk remarked when he opened the annual AFA Symposium in Dallas Memorial Auditorium, the title —"Space Age in Perspective"—was carefully chosen, as was the agenda. Perspective was the key word, for it means that the Air Force Association is not inclined to get into purely intellectual orbit, to discuss space for space's sake.

Rather, said Mr. Schenk, "we approach space exploration from the ground up, with full respect for the so-called obsolete weapons on which we must depend for our security for years to come."

Moderator for the Symposium was Alex Dreier, radio and television commentator for the National Broadcasting Company.

Dreier opened the day-long session by asking the audience to give "serious thought" to the following quotation:

"Man has traveled a difficult path of edification on this planet. He has constantly endeavored to explore the unknown, to learn that which he did not know. Disregarding the overwhelming danger, he has set off on long journeys at sea, navigated the poles, risen higher than the clouds, descended into the depths of the sea. He has found the path to the most sacred spring of nature, penetrated the nucleus of life's cell to the atom. He endeavors to resolve the secrets of the universe, to know himself. But man has not once broken the confines of his planet, and the time has arrived for man to take his first step beyond the threshold of his home. This is understandable. Man has matured. 'The planet is the cradle of the intellect. But it is impossible to live eternally in the cradle.' "

Dreier then identified the quote:

"Those are the opening words by the narrator of a motion picture entitled 'Road to the Stars.' It tells the intriguing story of a nation's development of the science of rocketry until, in a climax featuring a huge spaceship, the nation becomes the first to plant its flag on the moon.

"The nation is the Soviet Union. Narrator, film, spaceship, flag, and moon—all are Russian."

He selected this excerpt, Dreier said, "to begin this Symposium, this discussion of the Space Age in Perspective, with consideration of the threat."

On the following pages are the presentations, slightly condensed, of the distinguished speakers who traveled to Dallas in September to help fulfill the AFA mission of keeping its members and the public abreast of developments in the field of aerospace power.—END

The Challenge of Soviet Science

DR. JOHN TURKEVICH
Professor of Chemistry, Princeton University

Newsman Fred Hight of Dallas radio station WFAA interviews Dr. Turkevich during the AFA Convention.

I DON'T think there is any point in emphasizing the fact that we are in a rather important competition with the Soviet Union, but I would like to emphasize this fact because it is not sufficiently appreciated in this country that the *vehicle* of the Soviet competition—the method by which the Soviets want to beat us in getting their ideas over the world—is Soviet *science* and *technology*.

There are very many elements in the Soviet threat. There is, first of all, an unscrupulous philosophy, a philosophy devoid of any ethical basis.

There is, too, the fact of the Soviet-planned state, which is consistent with Soviet philosophy.

There is also the aspect of people looking at problems and solving them differently from the way we do. We certainly cannot compromise on ethics. We have to give the Soviets whatever advantage accrues from their ruthlessness. Forgetting about people, letting people lose their personal

freedom, exterminating people . . . our philosophy of life, our spiritual values, aren't along those lines. If anything, the Soviets are overplanned and we are underplanned. They are overplanned in the utilization of their research and science, and we probably depend too much on individual effort to win out.

But there are many Soviet approaches which we ought to take advantage of. We must pay more and more attention to Soviet science because, Lord only knows, *they* are grabbing everything they can from ours.

The important aspect of Soviet science is the appreciation by the government, by the party leaders, of the importance of science in modern living. This permeates right through their whole structure. They appreciate the fact, I think more than we do, that the world has been in a tremendous scientific explosion in the last twenty years.

Starting with experiments that were carried out on a small scale, we have been projected into the space age. This is not everything that is going to happen in this world in science. Science is going to affect the world in many different ways.

One of the greatest phenomena of the twentieth century is this explosive nature of science. There are all sorts of indications to show that we will be able to increase the span of life, at the same time keeping the mind clear and the body strong. There are possibilities that we may attain immortality. There are all sorts of possibilities, and the Soviets appreciate them.

Now, what are the implements in this Russian appreciation? First of all, they have the leadership. They have inherited more in leadership from the Czarist regime than they give credit for. Their leaders are still the old intellectuals. And it is one of the interesting commentaries on modern dictatorships, that with all the power it has over the minds of the people, the dictatorship did not exterminate the old Russian intelligentsia. Leaders of Soviet science are very highly cautious people, very bright people. Some of them, surprisingly enough, have a sense of humor. Their leaders in atomic energy even do a certain amount of kidding, and their old look of bluntness is gone. They are out to get as much as they can out of us, not by threats in science but by being very hospitable and nice.

This scientific group wields a tremendous amount of influence in the government. Seventy percent of the Cabinet ministers in the Soviet Union have a scientific and technological education. But their university presidents, the directors of their scholarly academies, are not *social* scientists, are not *economists,* because in a system such as the Soviet Union, economists may be high one day and low another day. They are physical scientists. The presidents of all the major universities in the Soviet Union are physical scientists. Science permeates the top echelons.

There are a lot of interlocking relationships among the scientists. So the scientists have both a formal say in the decisions of state and much informal influence.

Another item that makes the Soviet challenge a tremendous threat is its organization. Russia is a highly organized state, and in a system like the Soviet Union where they are out to catch up with us, the objectives—scientific and industrial—are, in many ways, well defined. They can plan their forces and programs. There is a straightforwardness to their activity that we sometimes lack, because in most of the branches of science, *we* are the leaders. And leadership has in it a certain amount of indecision because you don't know where you are going. You have to grope around for the future. The Soviet ability at streamlined organization gives them a tremendous advantage in catching up.

There is a new aspect to the Soviet challenge that is a bit surprising. They used to talk about *catching up with* and exceeding the accomplishments in science and technology of the Western nations. Now they have a new strategy. This is calculated *not to catch up completely* but to catch up to a certain point and *then try a leapfrog operation.* We are seeing this in civil aviation; we are seeing this in some of their plastics work. We are seeing this in their satellite work. They are not waiting for us; in fact, they are holding back for a certain moment, for a certain time, letting us make the mistakes, then jumping ahead.

To do this, you must have a very good intelligence operation. To leap over your enemy's back, you have got to know where he stands. In the overt intelligence point of view, the Soviets have one of the most extensive scientific information-gathering organizations ever conceived by man. They scan every one of our journals. They try to get models of every one of our scientific apparatuses. They do this because they are building

on top of us. They are going to use our work as a platform to build on.

I saw an illustration of that three years ago at the Geneva Conference for peaceful uses of atomic energy, where I gave a scientific paper. Since I had quite a bit to do with the negotiations between our atomic energy group and the Soviet group, they were gracious enough to come to congratulate me on my paper, although there were some differences of opinion between my point of view and the Soviet point of view on the scientific subject.

I thanked the minister who complimented me and said it was very pleasant to have competition between the Soviet Union and the United States in areas which did not involve the military and economics, but were in pure science. I used the Russian word for competition, *konkurentsia.* He shook his head and said, "Professor, don't use that word *konkurentsia.* It has very bad connotations, and we don't believe in it. It means getting ahead by crushing the other fellow. We have another way of doing it and another word for expressing it now, and that is *sorevnovanie.* It means getting ahead by climbing on the other man's shoulders."

This is the key to the Soviet attack on science. It is very important for them to know what we are doing in pure science, to get as much as they can out of it, to find out all about our gadgets, because in the general development of science, in the general objectives, both sides seem to have the same point of view, same ideas, same principles.

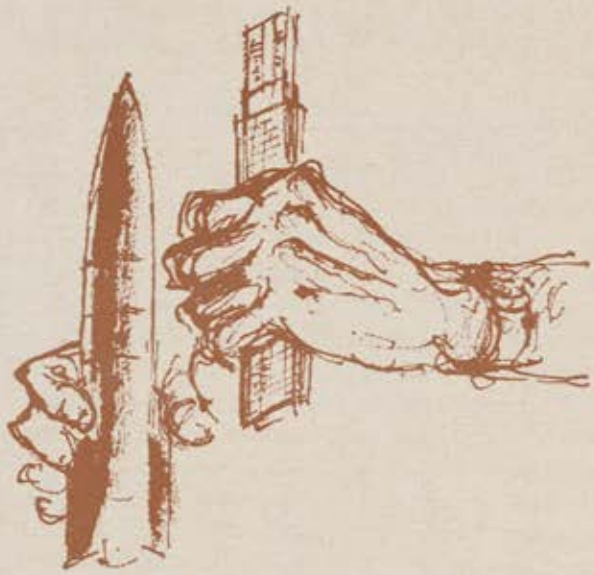
We've seen this in the first atomic energy conference in Geneva when they came up with reactors and we came up with reactors. We were doing the same thing.

We saw it again more recently at the Second Geneva Conference where we had the classification of the attempts of the two countries to control the hydrogen bomb, to control the thermonuclear reactor. The principles were the same. Science has come to the same points of view, but where one country has the advantage over the other is in the gadgetry, the details, and the drive of the organization, and the utilization of people.

I saw their educational program, and I still believe in ours. And they are dissatisfied with theirs. Khrushchev is taking it apart again. They do things big, but with no finesse. Some of the details may be crude but we must grant that the Soviet scientific administrators do things in a big way. They feel that maybe because it is big, it will succeed.

This is not a bad principle. If anything, we have got to realize that we are a big country and we can do things big. *There is no reason why we can't compete on bigness.* We have had a number of examples of this competition with them in particle accelerators. We build a 400-million-electron-volt (MEV) accelerator; they build a 680-MEV one. We build a six billion (BEV); they build a ten BEV. We are building a twenty-five-BEV accelerator at Brookhaven; they talk about a fifty-BEV one.

The same thing goes in the reactors and power reactors. Our Shippingport, Pa., plant is a sixty-five-thousand kilowatt hour plant. The Russian one just opened in Siberia is a hundred part of a six-hundred rather than sixty-five. Nothing is fancy, but it is big. Their controlled thermonuclear experiment is a crude model of ours, but it is big, three times bigger than what we have.



We have got to watch the Soviet developments in science very carefully. We have got to learn all we can from our opponents. We have got to take whatever advantage we can get from them, take it in those areas where it does not compromise basic principles, because if we look at the space age, which is a development of the atomic age, we have got to look at it in the perspective of history. We in the United States now are the carriers of a long tradition going back to the Greek concepts of the rights of the individual, the Roman concepts of law being greater than man, the spiritual values of Christianity. All of these developed in the history of Western Europe. We are the carriers of this tradition; we are the defenders of this tradition.

On the other hand, the Soviet Union has taken just one aspect of this development—Marxism—a theory of society and economics, and they think

of advancing science in an atmosphere that lacks most of the aspects of the Western tradition.

Our strength lies in the fact that we have all of this behind us in an integrated form. It is our duty to develop it further. The vehicle for this development is science and technology. But we cannot be soft. It is the duty of every scientist engaged in scientific work dedicated to the defense of his country to push any scientific methods which will help to defend this country better.

QUESTIONS

MR. DREIER: Does Soviet science really feel it can score its successes without interference from the political?

DR. TURKEVICH: This is rather difficult to tell and project into the future because, as you know, they can turn [political pressure] on and off any time they want to. They are treating scientists in the physical sciences very gently. They enjoy tremendous prestige and have great influence with the government.

I'll give you an example of how this scientific influence is great in one area and small in others. In the field of genetics, political liberty was very limited. Whenever political doctrine and genetics were in conflict, the politicians killed the geneticists off. Genetics *are* developing now, honest-to-goodness genetics. But where? Under the wing of the *nuclear physicists*. The nuclear physicists have so much prestige they can even protect a poor geneticist.

FROM THE FLOOR: Is there really a basis for believing that Soviet scientists control the satellite program? Or is it that the military simply says, "We will give you space aboard these vehicles. This is what you can have."

DR. TURKEVICH: Well, again, this is a bit hard to tell because, you see, the Soviet scene is a little more complicated than even our American scene. You have the scientists on the one hand and then the government organization, and then behind that is the Party.

The government acts as a screen behind which the Party operates. How much influence the scientists have on the Party, we still don't know. But there are evidences that the men who are more intelligent are getting into the Party organization and that they in turn will loosen up that whole structure. There is a hope that as more and more scientific education is given, as more and more scientists take part in policy decisions in the Soviet government and Party, they will appreciate that *our* point of view is the correct point of view. This is the reason behind the cultural relations program that the United States has under way. But while this is going on, we can't let our guard down, we can't bank on cultural exchange alone.

FROM THE FLOOR: Dr. Turkevich, did you find evidence of deliberate ordering by the Soviet government to scientific people to channel their work in certain lines, or did you find the government allowing them freedom to progress along any line they felt research would take them?

DR. TURKEVICH: Again, because of the secretive nature of their setup, one can't be categorical on this question. I do know of instances where scientists were called in by the government and they said, "You do this and you do that."

On the other hand, there is a subtle way of doing this. The scientists know that the government is interested in certain projects. They go up with their own proposals and say, "Give us money. Give us prestige." As one Soviet geneticist said, "You know, when the atom bomb drive was on in the Soviet Union, there were very, very many cranks who told the government: 'We want money for our ideas.' They got it." Scientists know how to ride the wave, also.

FROM THE FLOOR: How deeply do the majority or even the representatives of Soviet science whom you met feel about their way of life? Is it a matter of being satisfied with the extra prestige that they have, or is it a matter of not being familiar with Western tradition beyond a certain point?

DR. TURKEVICH: The last part of the question can be answered very easily. One of the most discouraging things about my Soviet trip was that as we went from one university to another we saw how little information there was about the Western life and our way of thinking. In fact, the only way they get an idea of what is happening in the States is through the *Daily Worker*, either New York or London, so they might as well use their imagination, as I told them.

On the other hand, as they are getting more and more information, as these cultural exchanges go on, I think they will appreciate our point of view better. This is the important thing; this is what we have got to strive for.—END

Dr. Turkevich joined the Princeton University faculty in 1936, becoming a full professor in 1952. He occupies the Eugene Higgins Chair in chemistry, and conducts a seminar in the Woodrow Wilson School of Public and International Affairs on the relation of government to science. He has been a consultant to the AEC.

Strategic Aspects of Space Operations

GEN. THOMAS S. POWER
Commander in Chief, Strategic Air Command

DURING the past few months, one word has been included in the titles of more publications, in the names of more organizations, and in the agenda of more meetings than perhaps any other word in the English language. I refer, of course, to the word "space."

Yet, until recently, few individuals would have ventured to give public expression to their thoughts on space, space travel, and space operations lest they invite criticism and even ridicule. Now, it has become accepted and, indeed, expected practice everywhere in this country to talk about manned space stations, exploration of the moon, and trips to Venus or Mars as freely and casually as if discussing a fishing trip.

This should not imply that Soviet successes in space technology are entirely responsible for our sudden spurt of interest and activities in the space sciences. It would be more correct to say that the Soviet successes have served to lend stature to and arouse public support for scientific investigations and endeavors that, to a limited extent, have been carried on for quite some time. This is particularly true for the military aspects of space operations.

The tremendous cost of maintaining our deterrent posture in the face of the rapid advances in the Soviets' offensive capability fostered understandable opposition to expensive military projects which did not appear to have a direct and tangible value to the defense effort. It took the spectacular launching of the first man-made satellite by the Soviets on October 4, 1957, to impress on the American people that the challenge of space was no longer an impractical and intangible issue, and that the military had not only the right but also the urgent need to do something about it.

Actually, the Department of Defense has been interested and actively engaged in space research for a number of years although, of necessity, this research had to be concerned mainly with the effects of space on high-altitude and ground-support operations rather than with operations in space itself. Despite their limited scope, however, the past space investigations of the Department of Defense have had both long-range and immediate significance. They created a growing awareness of some of the issues to be faced in future space utilization and, in addition, proved of value in dealing with a host of unprecedented operational

problems resulting from the exigencies of high-altitude, high-speed, and long-range combat operations.

For this reason, the Air Force's space research has been of considerable importance to the Strategic Air Command whose global mission can be affected profoundly by certain phenomena issuing from space. Studies of the nature of solar disturbances, the ionosphere, cosmic rays, and meteoric debris have helped greatly to improve the quality and reliability of SAC's worldwide communications network which is indispensable in maintaining instantaneous and positive control over the command's far-flung elements. Better knowledge of the effects of solar radiation on the atmosphere has enhanced understanding of the movements of polar air masses and the jet stream, and thereby has helped to improve existing methods for weather forecasting and flight planning. Probing ever deeper into space, Air Force scientists, together with their colleagues in science and industry, thus paved the way for continued advances in our strategic capability.

But that was yesterday; what about today and tomorrow? Today, space is no longer an exclusively scientific medium whose primary strategic significance lies in its effect on communications, navigation, weather, and other terrestrial factors. At this very moment, man-made vehicles are hurtling through space and circling the globe, carrying instruments designed to obtain valuable scientific information. But tomorrow's space vehicles, utilizing these scientific data, are expected to carry instruments designed to obtain vital strategic information and to accomplish other strategic missions not even dreamed of a few years ago. Hence, our first efforts in utilizing space will not only usher in the kind of space age man has been dreaming about for untold centuries, but will also initiate a new era in warfare—the era of strategic space operations.

It would be futile to speculate about the impact of the strategic use of space on future wars, just as the early pioneers of military aviation could not have predicted the impact of strategic air operations on World War II, let alone on a nuclear war as it would be fought today. The airplane revolutionized military doctrine because it added a third dimension to warfare. Prior to that, wars had to be fought on the earth's surface—on land and at sea—making the battlefield and battlefield operations strictly two-dimensional. It stands to reason that the airplane's addition of a third dimension—height—had a far-reaching effect on every facet of military strategy.

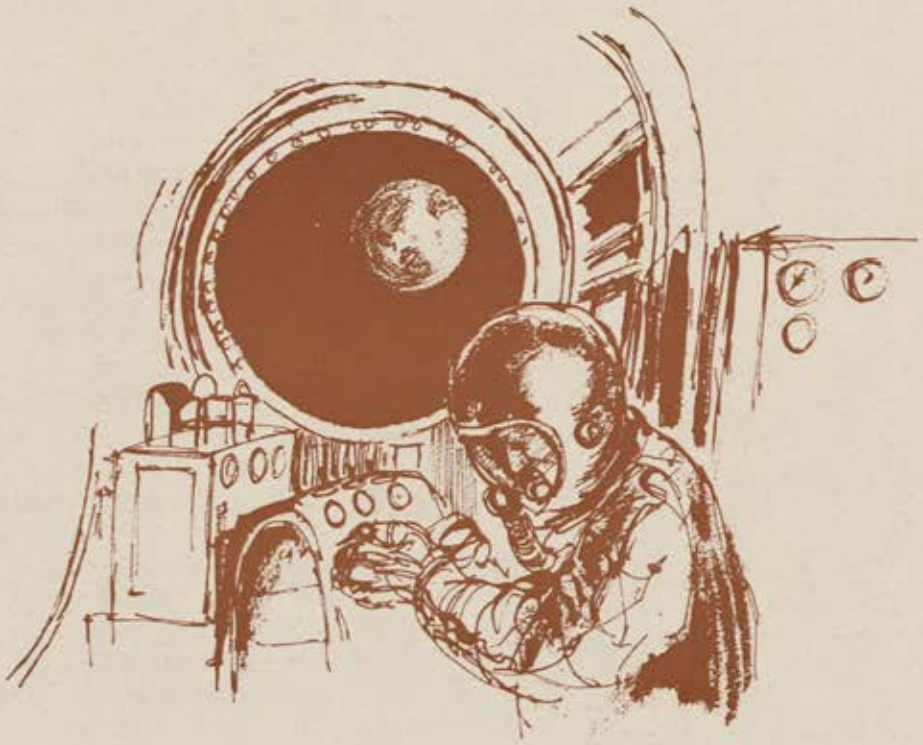
This change did not come overnight; its beginnings were very primitive and modest and date back many, many years. In fact, the evolution toward the third dimension in warfare can be said to have started in the French Revolution in the eighteenth century when hot-air balloons were first used for military reconnaissance. In the Civil War, the Union army refined this technique and added other uses, such as the directing of artillery fire. Then came the strategic bombing of England by Count Von Zeppelin's dirigibles in World War I and, during and after World War II, the gradual evolution of strategic air warfare from a relatively minor support activity to the principal offensive operation in modern war.

The point is that, no matter how sophisticated we may think we have grown in the meantime, our military space effort is presently at just about the same level as our military air effort was in the days of the hot-air reconnaissance balloons. Then as now, man faced a hostile environment of which we really knew very little. Then as now, military utilization of the new medium was initially being thought of entirely in terms of support operations. And then as now, it would have been impossible to foretell where the first halting steps into the new operational realm would lead.

Naturally, we know now what followed those first steps into the air age. But even though we cannot yet anticipate the full implications of the dawning space age, we should ask ourselves exactly what we expect to gain by continually expanding the third dimension of our operations. To answer this question, we must first try to ascertain what has been the most significant change in warfare brought about by the advances in military technology throughout history. In my opinion, the most profound effect of advancing technology has been the tremendous compression of time available for the achievement of a military objective.

It used to take weeks and months to move conventional firepower to within reach of a target. And it took still more months and even years to apply that firepower effectively in order to attain the desired objective. In modern war, the combination of jet bombers and nuclear weapons can achieve the same objective in a matter of hours. Before too long, ballistic missiles curving through space will be able to compress these hours into minutes. Still further compression of time may seem impossible, but, if it can be done at all, it will be achieved through increasing utilization of space.

Therein, I believe, lies the real significance of strategic space operations of the future—the com-



pression of time for both action and reaction to the point where the dramatic role of the time factor will, in effect, assume the significance of a new dimension in military strategy. Thus, our present concept of three-dimensional warfare will eventually expand into what may be termed warfare in four dimensions—warfare in which the operational relationship between space and time will become the most critical factor.

I realize that this is a rather liberal interpretation of the classic "space-time" relationship. But, from the standpoint of military operations in space, the four-dimensional concept helps to emphasize that we will be operating far beyond the present regime of aerial warfare when we start dealing with distance from the earth instead of altitude above sea level. Of course, no one can really tell where the one ends and the other begins. This aspect, however, is entirely a matter of semantics or definition which has no bearing on operational principles and should, therefore, have no bearing on questions of organization and responsibilities.

When the late Capt. Iven Kincheloe reached an altitude of 126,200 feet in the Bell X-2 in 1956, it was said that, for all intents and purposes, he had been in space. He was above more than ninety-nine percent of the earth's atmosphere, which meant that he was closer to a true "space environment" than any man had ever been before. Still, in comparison, this record altitude for powered flight was only equivalent to a distance of about one-hundredth of an inch from the surface of a regulation baseball.

To be sure, Kincheloe's flight as well as similarly successful research flights by high-altitude balloons, instrumented rockets, and rockets carrying animals have yielded many invaluable data concerning conditions in near-space. Nevertheless, we cannot simply depend on computers to extrapolate these data and, in this manner, furnish us with sufficient information about conditions in actual space to help us plan intelligently for future combat operations in that environment. While our own satellites are adding importantly to our limited knowledge about space, their most important contribution lies, perhaps, in teaching us that our knowledge is even more limited than we thought it was. That knowledge may suffice to encourage and support various theories on the possibilities of space warfare. But we should be realistic enough to always remember that military planning must be based on a more solid foundation than theories.

In analyzing the potentialities of military operations in space we should, therefore, bear in mind that the state of the art has to be advanced in many areas and along a broad front before we can expect increasingly sophisticated space weapon systems of the future to attain sufficient utility and reliability to warrant their integration into the operational inventory of a combat organization

such as the Strategic Air Command. As the nation's principal deterrent force in being, SAC can rely only on equipment and techniques which are proven and operational, that is, ready for instantaneous and effective use whenever and wherever the need arises. But while SAC's mission will remain the same, the threat which we face continues to increase. Hence, SAC's capability to cope with that threat must increase commensurately. Toward this end, SAC must remain responsive to changes engendered by advances in technology and keep its organization flexible enough to readily adapt itself to such changes without impairment of its day-to-day combat effectiveness.

The feasibility of this approach has been demonstrated ever since SAC assumed the responsibility for the initial operational capability of ballistic missiles. For SAC was fully prepared and organized to aggressively pursue the buildup of its missile capability without any effect whatever on the combat-readiness of its vital bomber force. This buildup is progressing rapidly and smoothly despite the unprecedented requirement of integrating a radically new family of weapon systems that have not yet been proven operationally. This called for the training of strikingly different and demanding skills, the construction of complex launching sites for operational use, and the establishment of highly advanced support facilities. Representative of the latter is the unique missile trajectory center which will be located in SAC headquarters at Offutt Air Force Base, Neb. It will be equipped with the latest electronic computers to calculate the vast number of intricate trajectories which must be furnished to all ballistic missile squadrons. This is probably the first time in military history that an operational unit in a combat organization will be staffed by mathematicians and physicists!

SAC's eventual ballistic missile capability will be significant not merely because of its military implications and unprecedented nature but, even more so, because it will entail the very first strategic use of space. Indeed, the ballistic missile will initiate what I previously referred to as "four-dimensional warfare"—a new regime of strategic operations in which utilization of the space medium will place a fantastic premium on action and reaction times.

The dramatic reduction in warning time has been of particular concern to SAC and required drastic improvements in its alert procedures in order to ensure the survival of an adequate percentage of its retaliatory force. SAC's present goal of being able to launch one-third of its entire strike forces within fifteen minutes after receipt of warning is specifically designed to meet the growing ballistic missile threat of the Soviets. Although this threat will increase in magnitude, it will not change in nature. In other words, there are bound to be continuous increases in the quantity and improvements in the performance of ballistic missiles, but the basic principles of their strategic employment and the implications of the time factor will remain the same.

The next major step in the strategic use of space will, therefore, be in a different direction. In fact, there are now under way efforts in several areas. First, there is the trend toward what is often called the "manned missile." Such a vehicle would be expected to combine many if not most of the advantages of both the missile and the manned bomber, and to minimize their disadvantages. Time does not permit me to repeat the frequently voiced reasons for the continued need for manned weapon systems. But the interest in the manned missile concept stems, essentially, from the recognition that missiles will supplement rather than replace the manned bomber, at least for the foreseeable future.

The evolution of a "manned missile" would, of necessity, be gradual and in measured steps. The forerunner of such a missile could well be the B-70 "chemical" bomber, which is presently under development as a successor to the most advanced bomber in SAC's present inventory, the B-52. The B-70 will operate at speeds and altitudes that approach missile performance although still considerably below the performance of a ballistic missile flashing into and out of space.

However, current studies concerning the development of a "manned missile" could, possibly, lead to a strategic vehicle that might even exceed the performance of the ballistic missile. I am referring to projects like "Dyna-Soar," which is investigating the feasibility of a manned orbital space vehicle. This vehicle would be rocket-boosted into orbit and, after circling the earth once or twice, skip-glide back to earth along a path which would avoid unacceptable heating of its surfaces due to atmospheric friction. Indeed, such a vehicle would represent the first true manned strategic spacecraft.

Also, there are now identified many varied uses which are technically feasible for military satellites. Undoubtedly, there are other and, perhaps, even more spectacular applications which cannot

be anticipated today and may not become obvious until there will have been considerable operational experience in the employment of these satellites. There is, however, one interesting aspect whose ramifications, although still in the more distant future, are certainly deserving of thorough study now as military satellites are entering the advanced development stage. That aspect relates to the political and military problems that will be created when both we and the Soviets will be sailing potentially or actually hostile satellites over each other's countries.

Satellites of both nations are circling the earth right now and will be augmented by more and bigger satellites as time goes on. So far, the emphasis has been on the scientific use of satellites, but it stands to reason that the Soviets are as well aware of the military utility of satellites as we are. Once satellites are capable of directed objectives including, for example, delayed or "on command" attack, the question will arise how nations should react.

This question could well come up in peacetime. In case of war, of course, the strategic value of a military satellite would be such as to necessitate both offensive measures against the enemy's satellites and protective measures for one's own satellites. What these measures would be and how they would manifest themselves is still a matter of conjecture. But this much is certain—whatever these measures might be, they would constitute the first instance of actual warfare in space!

In essence, these are the aspects of military space operations that we can talk about today because they pertain to projects under development or, at least, under serious consideration. We are now at the threshold of a new era in warfare which finds us just as ignorant about its future implications as the men who went up in the first hot-air reconnaissance balloons.

As we speculate about future operations in space, we cannot even estimate how deep into space we may have to go in order to obtain maximum strategic advantages, and what we would be doing about it once we managed to get there. Nor are we in any position to predict whether or not the moon may, some day, be of strategic value to us. What could Columbus have answered if someone had asked him whether and what strategic advantage America had to offer to Europe in the years to come!

It is enticing to speculate about questions such as these, but it can easily divert our attention from the pressing and more immediate problems at hand. Here indeed is our chance to prove ourselves, for never before in our history has the present offered so grave a threat and the future so promising a challenge.

QUESTIONS

MR. DREIER: General, how much of our SAC force is in being in flight twenty-four hours out of every day ready to let go if need be to the Soviet Union?

GENERAL POWER: The exact size of our alert force is our business and no one else's, so I will not tell you exactly what percentage of our force is ready to go.

Suffice it to say, we have a force ready to go. If anybody wants to start anything, I think we can make them sorry they started it.

FROM THE FLOOR: Wouldn't it be very possible that should SAC get over Russia, for Russia to have enough antiaircraft missiles to completely wipe out our force, or at least a major part of it, and thereby strike a deadly blow against us without our being able to strike back?

GENERAL POWER: If Mr. Khrushchev and the Soviets thought they had an air defense system that could shoot SAC down, we would be at war right now. They know that they don't. That is what is keeping them peaceful. In other words, we know pretty well there what our capabilities are against modern defense systems.

We train, we practice, we work against our own. It is not theory, it is not wishful thinking. We realistically know the percentage of airplanes that we can get through. And if our force is big enough, we think we can keep anyone peaceful or keep them strongly deterred from starting a war. Now, that is today. But this thing is moving all the time. Defense is becoming more sophisticated and you have to improve your weapon systems and your techniques and your tactics. So you are in a race and you have to modernize your force. But today we can do our job.—END

General Power commanded the Air Research and Development Command before succeeding General LeMay as head of SAC in July 1957. During World War II he commanded a B-29 wing on Guam, and later during the nuclear tests at Bikini he was Assistant Deputy Task Force Commander. In 1947 he was Chief of Training Division in DCS/Operations, and served as SAC's Deputy Commander before assuming command of ARDC in May 1954.

THE X-15

• *A FORUM*

Brig. Gen. Marcus F. Cooper, X-15 Forum Chairman

Man will soon take a daring step to the edge of space—in the X-15, combination airplane and rocketship, which will be carried aloft over Wendover AFB, Utah, by a "mother" B-52 to super-altitude from which point it will soar by rocket power to 100-mile-plus heights at speeds in excess of 3,600 mph in areas where the air is too thin to allow conventional aerodynamic control. Having soared, the X-15 will then be carefully decelerated downward through the atmosphere for a long glide homeward to Edwards AFB, Calif., the pilot landing with aerodynamic controls. Built by North American as an Air Force-NASA project, with some Navy financial support, the aerospace craft will be test flown by Scott Crossfield and flown for the Air Force by Capt. Robert M. White. Here, they and fellow panelists Walter C. Williams of NASA and Brig Gen. Marcus F. Cooper, Commander, Edwards AFB Flight Test Center, tell the X-15 story. For details of the X-15's rollout at North American's Los Angeles plant on October 15, see page 88.

GENERAL COOPER: Here's how the X-15 got started and what some of its objectives are. The X-15 program is being conducted as a joint endeavor with the NASA, the Air Force, the Navy, and the aircraft industry. In the spring of 1952, many months before man had flown beyond Mach 2, NACA (now NASA) directed its laboratories to initiate studies of the problems likely to be encountered in flight beyond the atmosphere. Laboratory techniques, missiles, and manned aircraft were all considered in this investigation.

On July 9, 1954, NACA met with representatives of the Air Force and the Navy, and presented a proposal on the extension of this research airplane program. Because of the importance of the project and the joint interests, a memorandum of understanding was signed in December 1954. This memorandum provided that the technical direction of the project would be the responsibility of the Director of NACA, acting with the ad-

North American's famed Scott Crossfield, left, who will test fly the X-15, tells of his role in the development of the craft as fellow-panelists Capt. Robert M. White, designated to fly the X-15 for the Air Force, and Walter C. Williams of NASA make notes. Each outlined the aims of the aerospace craft, describing how the project has evolved since 1952.

vice and assistance of the Research Airplane Committee, composed of one representative from the Air Force, the Navy, and NACA.

The administration of the design and construction phase of the project was assigned to the Air Force. In December 1954, the Air Force issued an invitation to industry to bid on the specifications of this aircraft. The go-ahead was given to North American Aviation, the winner of the competition, in early December 1955.

This contract called for the construction of three aircraft. The Air Force provided the bulk of the funds. The Navy assisted in the funding program.

NASA is charged with the technical direction of the over-all program. North American Aviation will perform flight tests to demonstrate structural integrity and satisfactory performance of the propulsion and control systems.

After these airplanes have demonstrated their initial flight group tests by North American, the Air Force, in collaboration with the NASA, will conduct a research flight program on the X-15 aircraft at Edwards Air Force Base, Calif. This program will be the main flight test investigation and will be directed by a joint Air Force Flight Test Center and the National Aeronautics and Space Administration in the joint effort at Edwards.

There is one question I know that is going to be asked, and I wish we could give you a precise answer. That question is *how fast* and *how high* will the aircraft go? This information is classified. However, I would like to read to you a statement made by General White at the American Ordnance Association meeting in 1958.

"We expect [the X-15] to attain speeds of 3,600 miles per hour and altitudes of over 100 miles above the earth."

Now, for the first question, I want to ask Walt Williams—What is the research mission of this aircraft?

MR. WILLIAMS: To describe the X-15's mission, I think we ought to look at the objectives. When we first studied this machine and what we wanted in the way of a machine, we said we wanted something capable of exploratory flight for the study of aerodynamic heating and the physiological problems of manned spaceflight. This doesn't mean the X-15 is a space machine. It really isn't. But it has a flight plan that covers many of the essential elements of spaceflight.

We will have a boost phase. We will study the control problems during boost under the high accelerating forces.

There is a vacuum phase, as you might expect, and here we can study the problems of control at low densities and then the problems of heating and control during reentry, and the problem of returning to base, plus the terminal guidance of such a vehicle as this. I think this, in a nutshell, describes the X-15 research mission.

GENERAL COOPER: Captain White, have you taken any special training to prepare yourself for this flight?

CAPTAIN WHITE: There are several areas that all the pilots have investigated to prepare for the flight program.

Initially, investigation is made of the aerodynamic and stability and control characteristics as predicted by analytic studies and wind tunnel information, and later on, of course, by flight demonstrations.

We have used static simulators. This is a flight simulator with input from an analog computor which allows us to duplicate certain flight profiles. This allows a pilot to use the controls and measure and get a feel of the airplane's responses and control characteristics by reading and interpreting his instrument display. Of course, this simulation is simplified since the pilot cockpit is fixed without freedom to move along or about the airplane's access.

To simulate flight more closely, a vigorous program has been pursued at the Johnsville, Pa., Naval Air Development Center, using a human

centrifuge. This consists of a gondola or cab in which the X-15 cockpit is located.

Here the pilots have been able to practice and evaluate flight profiles from launching to reentry while experiencing the same force and acceleration we expect in full flight.

GENERAL COOPER: Scotty, can you tell us how the aircraft is progressing at this point?

MR. CROSSFIELD: General, the first of three X-15s is essentially finished now. It will be rolled out the door on October 15. This has come about since July of 1955 by virtue of great effort by government laboratories, the services, and more than three hundred subcontractors, amounting to intensive interest by about several thousand people. This represents a rather unprecedented two weeks ahead of scheduled rollout. The second and the third airplanes are following very closely behind.

GENERAL COOPER: Scotty, have you taken any special training or physical conditioning to prepare yourself for the first flight, since you will be the man who will be making the first flight in this airplane?

MR. CROSSFIELD: All of the pilots have gone through essential basic training on the thing. For myself, six years from concept to delivery is essentially the training, besides training in physiological areas, centrifuges, and the like, as Captain White mentioned. We have all gone through the general tests that are required of Class 1 pilots. But I would like to make it known here that we have endeavored, and I believe succeeded quite well, in making the X-15 an airplane that is satisfactory, with enough flying characteristics—even though it has very broad requirements—for any competent fighter pilot or test pilot to fly.

This is *not* an airplane that takes some sort of a *super-individual* with *super-training* to fly.

GENERAL COOPER: Walt, could you accomplish the same mission with an unmanned aircraft?

MR. WILLIAMS: The answer to that is rather simple and direct. No. Because one of our aims with the X-15 is to study the problems of manned flight under conditions of the weightlessness and acceleration. With these objectives, we definitely want a man in the airplane.

GENERAL COOPER: Bob, with the experience of flight testing you have had within the earth's atmosphere, can you foresee any drastic changes in the future flight-testing procedure for this type aircraft?

CAPTAIN WHITE: Not specifically. It has been pointed out that advances in aeronautical science are moving at a fast pace. That's obvious to all of us today, and with the advent of manned space vehicles, flight testing will be carried out along ballistic trajectories.

Although the scope of flight testing certainly changes, the objectives remain exactly the same. We check our results, we develop the vehicle, we determine its best utilization, and we obtain research information.

GENERAL COOPER: Scotty, when do you expect to make the first flight?

MR. CROSSFIELD: Here is a chance to set the record a little bit straight. We are not going to climb in this thing and go for broke. It will follow more or less the pattern that has been established. We have no reason to deviate from previous research rocket airplane schedules. Perhaps initial glide flights prior to any power flights, and the first glider power flights may occur about in January. With our present good luck in keeping up with the time element with this, they should very definitely occur in January. It will be a step-by-step progressive program for about the next eight or ten months, performed by North American to demonstrate the functional working of the airplane so that we can deliver to the Air Force and NASA a vehicle that has been proof-tested so that they can go immediately into an extended and extensive research program.

GENERAL COOPER: Walt, is there anything different or unusual about the controls in this aircraft?

MR. WILLIAMS: Yes, there is. In this machine, since it will be flown under conditions of very low atmospheric density, controls had to be provided to meet such conditions. These consist of a series of rockets—reaction controls—to provide control where aerodynamic control is no longer effective.

I know we have had a little experience with this on some of our other machines, but the X-15 will give us our first opportunity to study these controls in their true environment.

GENERAL COOPER: Bob, what provisions have been made in the X-15 for the pilot's protection beyond the atmosphere environment?

CAPTAIN WHITE: The X-15 cockpit environment is an extension of that designed for present-day high-performance aircraft. A pressurized cockpit is provided that under normal conditions allows the pilot to function without any need for additional protective equipment. His only other requirement is an oxygen supply, as with present airplanes. In the event of loss of cabin pressure, the pilot is equipped with a specially designed full-pressure suit. This will create an environment within the suit itself that will give the pilot adequate oxygen supply and sufficient pressure to al-

low him to operate normally as he would within the earth's atmosphere and make a normal return flight and safe landing of the aircraft.

GENERAL COOPER: Scotty, I have seen pictures of you in a lot of magazines wearing the suit. Could you describe the suit?

MR. CROSSFIELD: The original conception of the X-15 and its performance requirements was that it was to be the fastest vehicle that existing engineering capabilities could make, with certain time limits imposed. To get the performance and hold the weight and size of the airplane, and the fuel-weight ratio where it should be, we went to a very highly integrated pilot test system in the airplane, which required the use of a full-pressure suit. It was a suit that would isolate the man from the environs of the airplane, if necessary, and also support his work in his office in the cockpit under normal conditions. It was felt this could be done because there were many pressure-suit efforts in the mill at this time which had had some fruitful results. So the X-15 requirements for the full-pressure suit were developed as part of the airplane design concept, and WADC has now made through contract a pressure-environmental suit that gives the pilot temperature protection, pressure protection, breathing, all his breathing requirements, with a very effective glass shield in case of bailout.

The pressure suit you have seen in the pictures is a prototype and looks essentially like the pressure suit that we've used in the X-15, which is being issued to all pilots assigned to the program.

GENERAL COOPER: Walt, what procedures or methods have been established to monitor the flights of the X-15, and also what will you measure?

MR. WILLIAMS: It would have been easier if you were to ask me what we were not going to measure. Actually, the monitoring procedure follows the usual pattern. We have a radar telemetering range through Nevada, from Edwards, where, during flight, a number of the critical quantities will be telemetered to the ground. The radar will serve as both a test device and an operational navigational device.

The telemetering basically will give details of system functions that you cannot make available to the pilot because of the number of items that have to be measured. I don't want to imply that we will use the telemeter as a complete monitoring system to tell the pilot, "Go ahead and we will tell you when to stop." That is a little hard to do sometimes, but it will be a check on our anticipated performance as we make the next step.

As for the quantities we will be measuring, we will measure the usual parameters, describe the motions of the airplane, and what the pilot did to cause these motions. We will be measuring structural temperatures, both external and internal, and some pressures over the surfaces. And there will be a certain amount of physiological measurement.

We will be measuring over-all loads on the airplane. We will also, by means of the radar, be able to describe its flight path in space. That is about it.

FROM THE FLOOR: When you finally go for broke, how long will the flight take?

MR. CROSSFIELD: The flight is broken up into a small percentage of mission, a large percentage of glide, a large percentage of landing, and a short percentage of power glide. It would probably be on the order of a third to a half hour total flight time.

FROM THE FLOOR: Do you expend all of your energy on each of these flights, Mr. Williams?

MR. WILLIAMS: Of course the airplane is landed dead stick without power. That's one phase of it. It will depend on the rate of expenditure of energy as much as the total energy expended. Each such flight plan won't necessarily be *the* design flight plan.

GENERAL COOPER: I think the question boils down to: Do you land without any power? The answer is in most cases, yes, although you do not have to.

FROM THE FLOOR: After the Air Force has completed its advance research, will the X-15 be *orbited*, and for how long a time and what type of reentry problems will it have?

GENERAL COOPER: Let me answer that myself. If you put enough boost on this building, we could send *you* into orbit. I think this is adequate, although it doesn't answer the entire question.

I personally do not know of plans for orbiting the X-15, but this is not saying it could not be done if it were desired to do so.

FROM THE FLOOR: General Cooper, is the launching method for the aircraft going to be similar to the X-1 system?

GENERAL COOPER: Yes. The aircraft will be put under a mother aircraft, a B-52, and will be taken up as high as the B-52 can take it, and at that point it will be launched and the powerplant will then be started.—END

First step of the X-15 into near-space was its rollout last month at North American's Los Angeles plant.

First X-15 Is Rolled Out

NORTH American's X-15 manned research airplane, rocket-powered vehicle that will take its pilots to the edge of space, has been moved to Edwards AFB, Calif., for flight tests. Built at a cost of more than $120 million in direct contract expenditures for three aircraft, the X-15 is a cooperative project of USAF and the National Aeronautics and Space Administration, with some assistance from the Navy.

Rolled out of its Los Angeles birthplace on October 15, the X-15 is scheduled to make its first powered flight in February. Pilot on initial flights will be North American's Scott Crossfield, who gave the Air Force Association a preview of his program at Dallas *(see page 84).*

The X-15 is black and low slung. Its wings are so small they look more like the fins on the side of a missile. It has a double nose wheel, and the two steel skids are far back under the tail. The aircraft will land, dead stick at 275 mph.

Officially, the X-15's speed is given as "more than 3,600 miles an hour" and the altitude at "over the 100-mile range." Unofficial estimates, based on comparison from official sources, say it can hit 4,500 miles an hour and go 400 miles into space.

The pilots who carry out this program will include, besides North American's Crossfield, USAF's Capt. Bob White and NASA's Joseph Walker. Their work entails research into flight conditions outside the earth's atmosphere. At the same time, they will convey new information on aerodynamic heating and heat transfer, recorded by measuring devices at 600 points on the aircraft's structure. The flights also will seek answers to questions about control requirements at high altitudes. The X-15 has both aerodynamic controls of the conventional type and ballistic controls. The latter are small hydrogen-peroxide rockets that will send jet blasts through apertures in the nose and wingtips.

The X-15 will weigh 31,276 pounds when it is launched at altitude from beneath a B-52 jet bomber. The X-15's weight will include 1,300

pounds of instruments. In addition to providing information on structural qualities, the instruments will test the pilot's reaction to weightlessness, acceleration, and deceleration. The pilot's capsule and pressure suit will provide a safe environment in event of emergencies above 60,000 feet; below that altitude he can bail out with the aid of a special rocket-powered ejection seat.

Fifty feet long and thirteen feet high, the X-15 is made of an alloy called Inconel-X, titanium, and stainless steel, all capable of resisting temperatures of more than 1,000 degrees Fahrenheit.

The engine, made by the Reaction Motors Division of Thiokol, is the XLR-99 with 50,000 pounds' thrust. It will burn liquid oxygen and liquid ammonia and will consume fuel twenty times faster than a conventional jet engine. For the first powered flights the X-15 will use two XLR-11 rocket engines, the same type used in the Bell X-1 research airplane program.

The X-15 represents a major accomplishment before it even gets off the ground. Building the aircraft presented problems in materials and fabrication never before encountered. It is significant that they were solved, successfully, by a major established aircraft manufacturer. North American had to develop a technique for welding Inconel-X, and tools and methods for working the metal into skin. There were new problems in aircraft plumbing, brazing, auxiliary power. More than 300 companies contributed components, subsystems, and accessories for the X-15.

—CLAUDE WITZE

The men who will fly the X-15—Joseph Walker, National Aeronautics and Space Administration; Capt. Robert White, USAF; and Scott Crossfield, North American—all experimental test pilots.

Artist's conception of an X-15 being launched from the belly of a specially modified B-52 at high altitude.

The National Aeronautics and Space Administration

DR. HUGH L. DRYDEN
Deputy Administrator, NASA

ON August 19, T. Keith Glennan, for the past eleven years president of the Case Institute of Technology, and I were sworn in as Administrator and Deputy Administrator, respectively, of the National Aeronautics and Space Administration. In the days since then, I can assure you, a very great deal has happened, even though—as in the case of the proverbial iceberg—most of what has taken place has not been apparent to the onlooker.

So much has happened, in fact, that Dr. Glennan has already announced he will proclaim, in accordance with the terms of the National Aeronautics and Space Act of 1958, that by the close of business September 30 the NASA will have been organized and will be prepared to discharge the duties and exercise the powers conferred upon it by the Act. On or about that date, it may be expected he will make appropriate announcements respecting the organization of the space agency and detail its plans and programs.

Today, rather than seek to anticipate these announcements, I propose to discuss some aspects of the task the President and the Congress have assigned to the NASA. Perhaps you will agree that there may have been some significance, at least symbolically, in the recent move of our headquarters in Washington to the premises occupied for many years by the Cosmos Club.

The Space Act of 1958 plainly states the policy of the United States to be, "Activities in space should be devoted to peaceful purposes for the benefit of all mankind." Repeatedly, the President has expressed his earnest wishes in similar vein, and only last week, the Hon. John Foster Dulles, Secretary of State, said in an address to the United

Nations General Assembly, "We must make every effort exclusively to the constructive pursuits of mankind." He then called upon the United Nations to "take immediate steps to prepare for a fruitful program of international cooperation in the peaceful uses of outer space."

As Americans, we can be rightly proud that our country is leading—has, in fact, led for nearly a year—in the effort to establish a workable system that will give meaning to the principle that spaceflight is, or at least should be, inherently international.

In this connection there can be no quarrel with the idea that use of space as may be required for national defense should be the responsibility of the Department of Defense. The Space Act makes such assignment, stipulating as of proper military concern "activities peculiar to or primarily associated with the development of weapon systems, military operations, or the defense of the United

NASA's Space Technology Assignments: As Listed by Presidential Executive Order

ESTABLISHED by Public Law 85-568, July 29, 1958, the National Aeronautics and Space Administration (NASA) formally went into business September 25 with proclamation by its Administrator, T. Keith Glennan, which stated in part: "I hereby proclaim that [NASA] has been organized and is prepared to discharge the duties and exercise the powers conferred upon it . . ."

Following is a rundown of space technology projects transferred by Presidential order from the Department of Defense to NASA, as a result of joint review by the former NACA and DOD.

- The US Scientific Satellite Project (Project Vanguard). Transfer of this project includes approximately 150 civilian scientific personnel under the direction of Dr. John P. Hagen, Director, Project Vanguard, Naval Research Laboratory.
- Four lunar probes and their instrumentation, and three satellite projects. These are transferred from the Advanced Research Project Agency. Two lunar probes are assigned to the Air Force Ballistic Missile Division and two to the Army Ballistic Missile Agency. (Pioneer, the October 11 shot, was one of the Air Force assignments.) The three satellite projects are assigned to Army Ballistics Missile Agency and call for putting into orbit two inflatable spheres—one twelve feet in diameter the other 100 feet in diameter—and a cosmic-ray satellite.

Total cost of these ARPA programs is approximately $35.5 million, mostly funded in fiscal year '58. Fiscal year '59 funds, needed to complete these programs, is $9.6 million and will be made available to NASA. Also, $49.6 million originally designated for scientific projects, will be transferred from ARPA to NASA.

- Several engine development programs now being carried on in USAF will be transferred to NASA. These include basic research in areas such as nuclear rocket engines, flourine engines, and the million-pound-thrust, single-chamber engine study. The executive order specified that $57.8 million will be transferred from USAF to NASA for these programs.

ARPA will continue to work in activities peculiar to or primarily associated with weapon systems development. These include projects related to antimissile defense, solid propellants, warning satellites, and super-thrust boosters. A man-in-space program is being jointly pursued by ARPA and NASA. ARPA's military budget for 1959 is approximately $420 million.—END

States (including the research and development necessary to make effective provision for the defense of the United States)."

There will be areas of space activity where there will be a duality of interest. The Select Committee on Astronautics and Space Exploration of the House, in its report of May 20, recognized this fact, and then commented:

"Although weather and communications satellites, manned platforms, and the like have obvious military uses, their primary purpose should be declared civilian. If we do not do this, we automatically commit the world of the future to the same stalemated life in armor which is lived by the world of today. If the very efficiency of current weapons virtually denies the practicable possibility of total war, further strides made in our rocket development would probably intensify this denial. . . . The entire purpose of our effort should be to ensure that the peaceful uses of these devices prevail. This is the stated philosophy behind our space exploration. It is the philosophy of this country."

Now, I must add that I am aware—I could say, *painfully aware*—of the belief stated in some quarters that unless there is a definite military potential to our work in space technology and space exploration, adequate financial support will not be forthcoming for long from future national Administrations and future Congresses. I am aware of the dangers of predicting what will happen in the future, but on the basis of what we already know, I think that in a relatively short time the economic payoffs of our civilian space effort will have been so large as to make the entire space effort fully self-financing.

Dr. Fred L. Whipple, Director of the Smithsonian Astrophysical Observatory, is on record as saying that space technology will permit weather forecasting to "become a science instead of an art," and that the value of this revolution in meteorology, "will greatly outweigh the cost of the entire program." Similarly, Dr. Francis W. Reichelderfer, Chief of the Weather Bureau, estimates the value of the more accurate, longer-range weather forecasting and storm warnings that we can expect to attain from good use of space technology will be several billion dollars a year.

Similarly, Dr. Wernher von Braun, Director of the Development Operations Division of ABMA at Huntsville, Ala., estimates that, using man-made satellites to transmit commercial messages and TV programs on a global basis will not only be commercially practicable but will "pay for trips to the moon and other ventures in this business."

In my personal opinion, it is factually incorrect to state that the only proper justification for supporting work in space is military. Plainly, it is a perversion of the facts to suggest that all non-military space activity should be considered mere "fun in space."

Fortunately, determination of our national space policies will be established at the highest level. To ensure this, the Congress wrote into the Space Act a National Aeronautics and Space Council and further that the President himself should preside over its meetings. The organization meeting of the Council [has already been] held.

Sometimes, the best way to obtain a good understanding of the real meaning of a piece of legislation is to refer to such congressional publications as a conference report. Such a report was written after Senate and House conferees had resolved differences over the language and terms of the Space Act.

Let me quote a few sentences from that report: "The function of the Council is to advise the President in the performance of the following duties: To survey all significant aeronautical and space activities, including those of the United States government; to develop a comprehensive program of such activities to be carried out by the United States government; and to allocate responsibility for major aeronautical and space activities and provide for effective cooperation and resolve differences among departments and agencies of the United States. These duties represent the most important single means for carrying out the purposes of the act. . . ."

The composition of the Space Council includes the Secretary of State, Secretary of Defense, Administrator of NASA, and Chairman of the Atomic Energy Commission, plus not more than one additional government member, and not more than three additional members from private life. The President has therefore designated the Director of the National Science Foundation, Dr. Alan T.

Waterman, from government, and, from private life, Dr. James H. Doolittle, Dr. Detlev W. Bronk of the National Academy of Sciences, and William A. M. Burden, long active in aeronautical matters. I am quite willing to look to such an eminent group as this for recommendations leading to the determination of the scope and direction of our national space programs.

I would, however, add the personal conviction that our planning for space must be with the awareness that sustained and intensive effort will be required for many years to come. Some of the projects not yet fairly under way—such as development of rocket motors in the million-pound-thrust class—will take as much as five years to complete. Still others, such as the electric propulsion systems that will be needed when we venture on really long voyages into space, may require ten or more years of effort.

We must plan long range. We must be confident that long-term projects will receive long-term support. It would be tragic indeed if our national space programs were to be subjected to the uncertainties of a "blow-hot, blow-cold" kind of financing. This possibility, I believe, is most fortunately remote because of an awareness of how grave the urgency is for us to become and remain leaders in the exploration of space.

Now, I should like to discuss briefly the National Advisory Committee for Aeronautics *vis-a-vis* the National Aeronautics and Space Administration. For eleven years I was privileged to head the NACA staff. The work of the 8,000 scientists, engineers, and other employees, seeking solutions to the problems of flight, represented one of the best returns ever made on the taxpayers' dollars. I am proud, and I believe my feeling is shared by all others of the organization, that the NACA was the choice of all other government agencies to serve as the nucleus of the NASA.

But make no mistake, the NASA is a new agency. It will be different from NACA in many ways. The vital functions of NACA, research into the problems of flight, will be continued and perhaps even intensified, but this activity will be only one part of NASA's programs. NASA will have to administer substantial programs of research, development, and procurement, on a contract basis. It will be spending large amounts of money, outside the agency, by contracts with scientific and educational institutions and with industry. It will be developing and launching into space, the vehicles needed to obtain scientific data and to explore the solar system. It will be preparing for the day, probably within a few years, when man himself ventures on voyages into space.

NASA will have to broaden and extend the excellent teamwork relationships that NACA enjoyed over the years with the military services and with the airplane-missile-space industry. It will be

using facilities of the armed forces, such as the launching pads at Cape Canaveral in Florida, and Vandenberg Air Force Base in California. It will be expanding its own facilities at Wallops Island, on the Virginia coast, to permit launching satellites of up to, say, 100 pounds in size. It will be operating satellite-tracking stations around the world. It will be collecting great masses of scientific data and reducing them to useful form.

In summary, the scope of NASA's mission is in many, many ways different from that of NACA during its forty-three years of fruitful life.

This week Dr. Glennan addressed a message to all NACA employees. Referring to the September 30 takeover date, he conceded that one way to describe what will happen would be to quote from the legalistic language of the Space Act: "The NACA shall cease to exist . . . [and] all functions, powers, duties, and obligations and all real and personal property, personnel [other than members of the Committee], funds, and records of that organization" shall be transferred to NASA.

Then he continued, "My preference is to state it in a quite different way. I like to say, and I believe I am being very realistic and very accurate when I do, that what will happen September 30 is a sign of metamorphosis . . . an indication of the changes that will occur as we grow to where we can do the bigger job that is ahead."

Finally, let me tell you a little about Keith Glennan, the Administrator of NASA. I have known him, not intimately, but from fairly frequent contacts, for the past eight or ten years. Our people at the Lewis Flight Propulsion Laboratory have known him for at least that long; he became president at Case Institute in 1947. They have watched him direct the building of that institution until today it ranks among the best of our country's scientific schools. In Cleveland, Keith Glennan has earned the respect and admiration of the community.

For the past several weeks he and I have worked together most closely. I can say he is not afraid of work, and that he expects his associates to be equally industrious. During the Senate confirmation hearings he was asked what he thought was called for in the job of NASA Administrator. I quote his answer, because I think it is typical of the man: "A great deal of energy, a lot of application and understanding. . . . Application and understanding, I think, of the manner in which some of these things get done. It isn't just a matter of the money that is involved, but it is a matter of the people involved and how best one can motivate the people to highest performance."

Many times since he reported on the job, he has said he prefers to get things done first and to talk about them second.

What does Dr. Glennan think about private industry and the role it must play in our national space program? I haven't talked with him about this, but I have read a major address of his, titled, "Industry's Next Step in Atomic Energy," made late in 1952, just after he had completed two years as a member of the Atomic Energy Commission.

"Among the things I brought with me," he said of his going to the AEC in 1950, "was a strong belief in the essential rightness of the American system of free competitive enterprise, and a strong conviction that it could be made to work in the development of atomic energy just as effectively as it has worked in all the other industries which have helped to make the United States the great free nation it is today."

Later in this speech, he said, "I believe you will see why the government cannot be expected to carry the ball alone on this matter of industrial participation. The Commission's main job, as described in the atomic energy law and as dictated by the times, is to guarantee the common defense and security. It is a big job, and a time-consuming one, and if anyone thinks that the Commission can take time off from its defense work to look around for something to hand to industry on a solid plutonium platter, he is not being very realistic. Let there be no mistake about it: Industry will get only those things that it can prove it really wants, it can really handle, and it really should have in the public interest."

As I said, I haven't talked to him about his views about the part of private industry in the space programs, but if I were a wagering man, I'd bet a penny or two that if you substituted *space* for *atomic energy* in what I've just quoted, you'd be very close to knowing what Keith Glennan, NASA Administrator, thinks on the subject.

For my own part, I am convinced that what needs to be done to bring us to a position of leadership in space research and exploration will require the very best efforts of all of us.—END

Dr. Dryden, Deputy Administrator of the new National Aeronautics and Space Administration, is a native of Maryland who earned his doctorate at Johns Hopkins University, was Director of the former NACA for nine years before being named to his present post, and is a leading authority on aeronautics.

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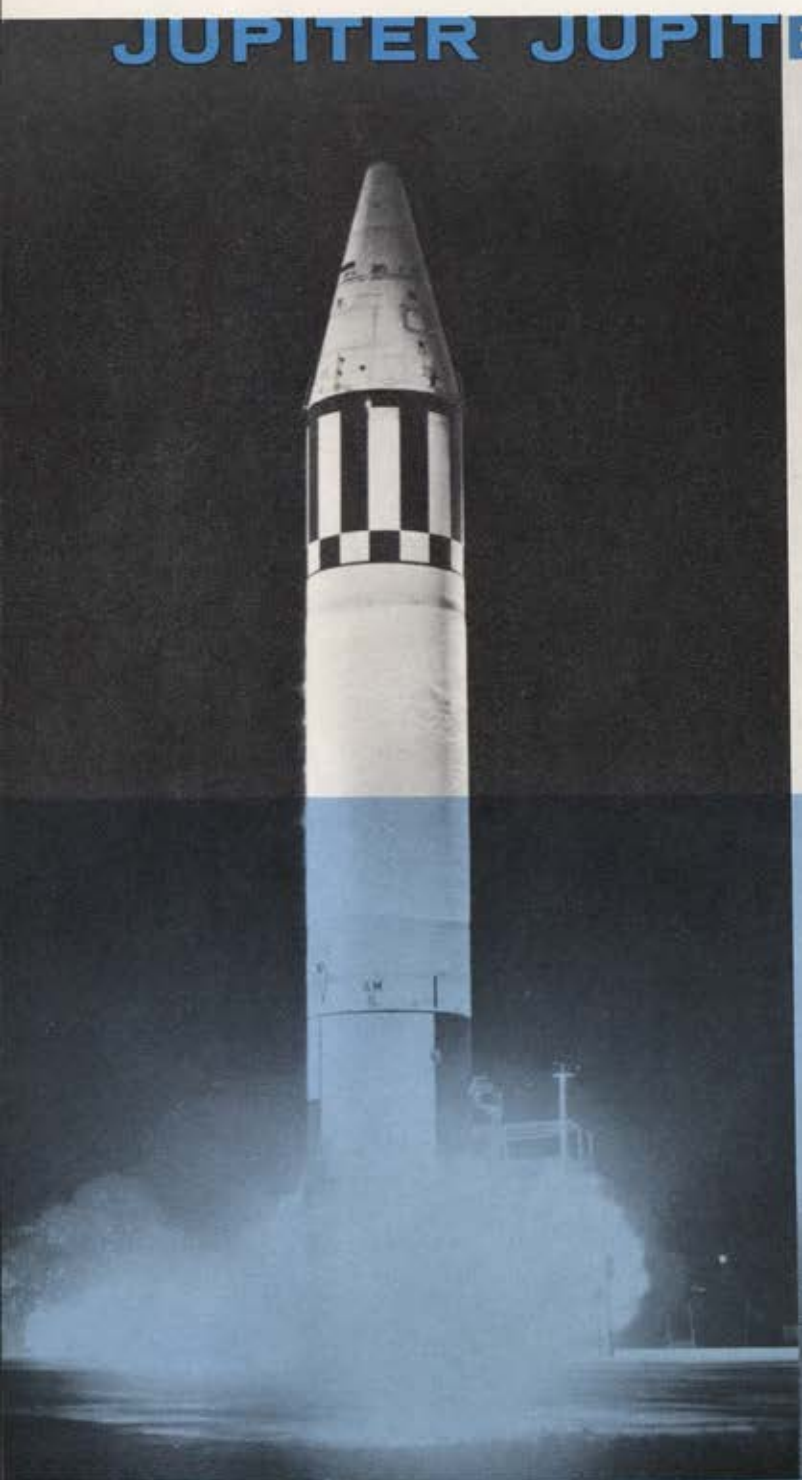


missile experience...

includes systems, subsystems and components for many of our country's most advanced missiles

Ford Instrument Co. is currently engaged in research, development, and production on a wide variety of missile projects. Notable among these are the complete inertial guidance and control systems for the Army REDSTONE and JUPITER missiles; many such components for the satellite-launching JUPITER C; launching and control order computers for the Navy's TERRIER and TARTAR missiles; Air Force missile projects, including a no-gimbal inertial system; and a wide variety of ground support and production test equipment.

Today, Ford Instrument has the experience, facilities, and capabilities to enable it to undertake complex missile contracts of every type from component or subsystem to complete weapons system. And, as a Division of Sperry Rand Corporation, Ford Instrument's own weapons skills are backed up by the resources of a vast and diversified organization of complete technical and financial responsibility.

TERRIER Missiles on U.S.S. Boston. Ford Instrument-built computers solve launching and control order problems for this beam-riding missile. U. S. Navy Photo.

U. S. Army JUPITER (left) and REDSTONE Missiles. Cover shows satellite-launching JUPITER C. The guidance and control systems for these ABMA missiles were developed and produced by the scientific team at the U. S. Army Ballistic Missile Agency and Ford Instrument Co. U. S. Army Photos.

More than four decades of military systems engineering insure operational equipment . . . whether systems, subsystems or components

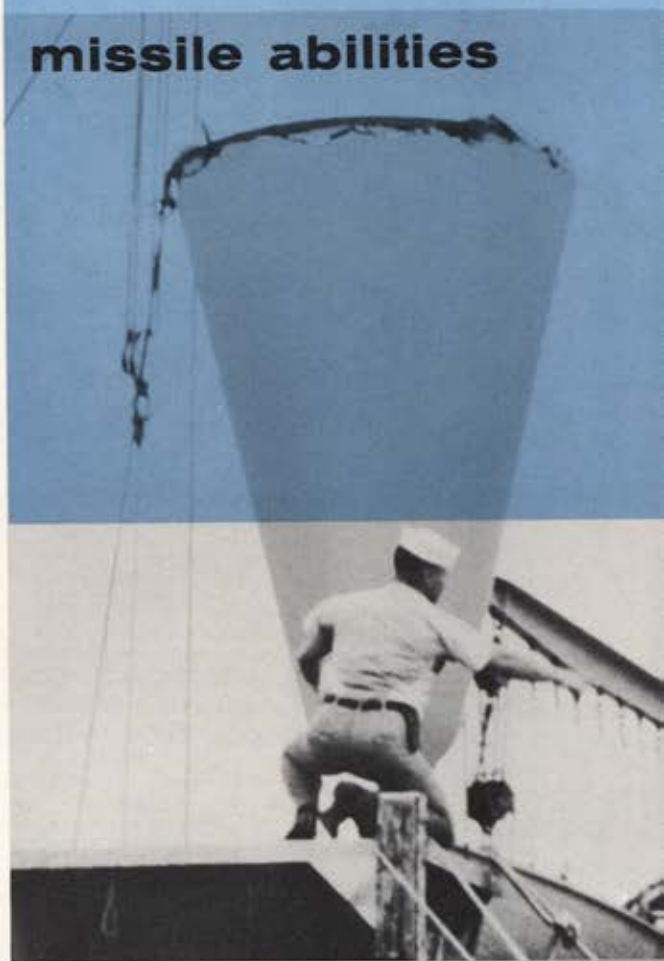
FORD INSTRUMENT missile abilities

A unique combination of electronic, electrical and mechanical skills, devoted since 1915 almost exclusively to furtherance of military science, is the basic strength of Ford Instrument Co. Almost all of Ford Instrument's existence has been devoted to research, development and production of highly complex equipment, with laboratory precision and accuracy, yet able to withstand the rigors of military environments.

The proven reliability and extreme accuracy of the REDSTONE and JUPITER missiles, which employ guidance and control systems built by Ford Instrument—as well as the record of the JUPITER C—indicate clearly the company's capabilities in the area of guidance and control.

Another recent example of this type of work is Ford Instrument's design and manufacture of intricate warhead safety, fuzing and arming devices capable of withstanding the roughest environments. Few manufacturers are willing or able to undertake projects such as this and to carry them to completion. Ford Instrument has earned the reputation—which we are proud to acknowledge—of being able to do the "toughest jobs" in missile development and manufacture.

Contracting agencies or industries, with requisite security clearance and "need to know," are invited to examine further Ford Instrument abilities in difficult phases of missile research, development and production . . . whether for complete systems or specialized subsystems and components.



Warhead devices for missiles and other modern weapons. This precision warhead device (inset) made by Ford Instrument, successfully withstood atmospheric re-entry in the nose-cone of an Army JUPITER missile, shown here shortly after recovery from ocean.

Stable platforms. Technicians here are performing test operations on a stable platform for the U. S. Army JUPITER Missile; these platforms are in quantity production at Ford Instrument.

Launching and control order computers for TARTAR Missiles. Electronic and electromechanical portions of this all-transistorized modular computer are shown at left and right.

Actuators for jet vanes, air control-surfaces. This rotary actuator is driven by 1 hp d-c servo motor (shown in foreground with cable attached). Both motor and actuator are made by Ford Instrument.

Missile-borne inverter. Vital missile component gets rigorous, precision performance checkout at console. All of the missile products delivered by Ford Instrument undergo full and complete testing procedures.

Missile-borne computers. Ford Instrument computer experience covers every phase of ballistic missile guidance and control. Typical is this control computer, shown during test, for U. S. Army JUPITER.

Specialized gyros and accelerometers. Ford Instrument pioneered in the quantity production of air-bearing gyroscopes and accelerometers. Air-bearing gyro here undergoes final test in special Ford-built test equipment.

Ground support equipment. Here pre-launch computer undergoes final adjustment. Modular techniques enabled this unit to be produced and delivered in less than 6 months.

current missile projects and equipment

SYSTEMS

- Inertial guidance and control systems and related ground support equipment
- No-gimbal pure integration inertial system
- Launching and control order computers
- Command guidance systems (for both missile and drone applications)
- Trajectory data system
- Missile velocity indicating system for test range applications
- Target locating system
- Radar target prediction and interpretation systems

SUBSYSTEMS (Missile-Borne)

- Safety, fuzing and arming devices
- Stable platforms
- Computers (control computers, guidance computers)
- Programming devices
- Inverter-regulators
- Transmitters

GROUND SUPPORT EQUIPMENT

Maintenance area, launch site and monitoring equipment, including:

- Impact prediction computer
- Aiming correction computer
- Pre-launch computers
- Test panels for computers and stable platforms
- Shipboard dynamic testers
- Monitor panels for guidance, stable platforms, alignment, and laying
- Test fixtures for a wide variety of components
- Combined sensor displays

PRODUCTION TEST EQUIPMENT

Systems and component test equipment including:

- Special environmental test units
- Quantity production test units
- Planetary test stands

SPECIALIZED COMPONENTS

- Gyroscopes
- Accelerometers
- Actuators
- Mechanical integrators
- Transistorized amplifiers
- Relay packages
- Computer modules, both analog and digital, for a variety of missile problems
- Timing devices
- Shipping and storage containers

Drafting. One of Ford Instrument's many drafting departments, where topflight design draftsmen and technicians support research and development and also produce production drawings.

Technicians perform final checks on stable platforms for U. S. Army REDSTONE Missile in ultra-clean assembly area.

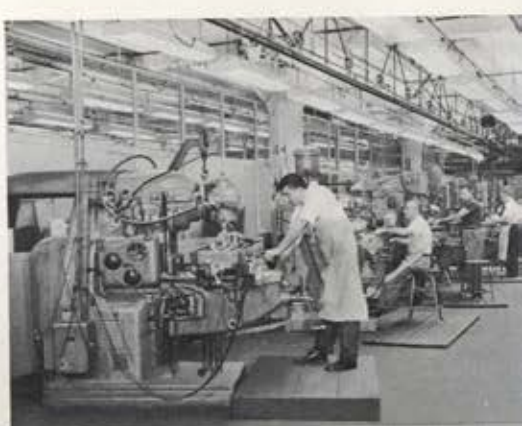
FORD INSTRUMENT

Extensive production and laboratory equipment implement engineering skill

Ford Instrument physical facilities make it one of the largest high-precision shops in the United States, fully equipped to handle every phase of development and production of complex missile systems. Initial studies, research, development, design, prototype construction and testing, final quantity production and quality control are expedited and facilitated by the most modern and highly developed equipment available for precision work.

Contracting agencies and industries possessing requisite security clearance are invited to make an on-the-spot inspection of Ford Instrument facilities.

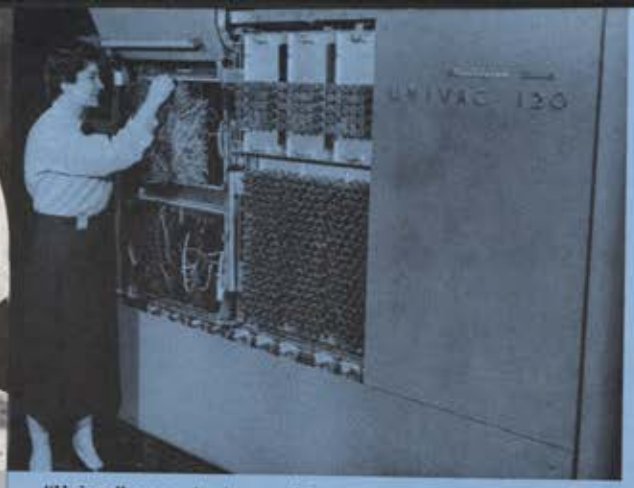
Equatorial test stand, built by Ford Instrument for its own laboratory facilities, is used for conducting basic drift error research. This type of unit can also be built to contractor order.



Many hundred standard machine tools, a few of which are shown here, are available at Ford Instrument for missile applications, as well as a wide variety of special machine tools.

Missile-borne tape programmers being assembled. Continuous development in this field is under way at Ford.

Air-bearing gyro accelerometer is tested here in Ford designed and built special fixture.



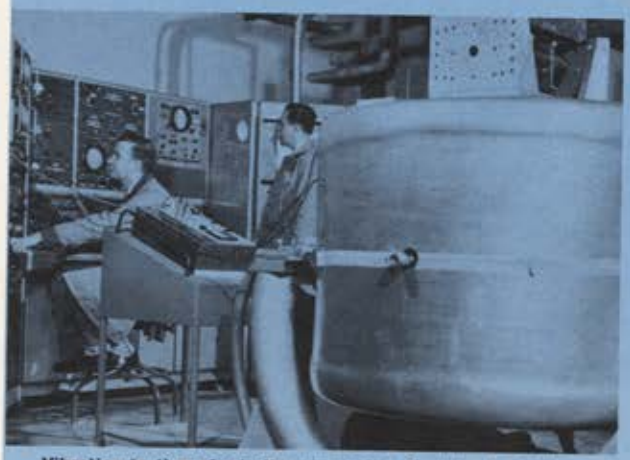
"Univac" computer is one of the general-purpose high-speed digital computers at Ford Instrument for engineering computations.

missile facilities

Typical of Ford Instrument Facilities:

- More than 30 laboratories for research, development and design in electronics, hydraulics, magnetics, mechanics and nucleonics, including fully equipped, ultra-clean gyro facilities.
- Advanced digital computing facilities with high-speed general purpose computers, including a Remington Rand "Univac." Ford Instrument scientists also have access to computing facilities of the Remington Rand Univac Division.
- An engineering shop, as large as many small manufacturing concerns, staffed by expert machinists and technicians, working under direct engineering supervision. The company also has fully staffed and equipped "short run" and prototype shops.
- Full production facilities—machine tools, shops, finishing and inspection facilities—for *large-scale* precision manufacture.
- A series of "clean rooms" for assembly of missile components. These rooms are dust-proof, temperature and humidity controlled areas with full environmental control procedures.
- Complete, elaborate environmental and other test facilities.

Giant centrifuge in special building at Ford Instrument can attain 60G's. Complete stable platforms—as well as components—are tested in this unit.



Vibration testing of missile component. Such tests duplicate inflight environments that components undergo when missiles are fired.

A special machine is used to mill irregular internal contours by an "electrical discharge" method, with extreme dimensional accuracy.

Technician grinds gyro part to a length within 20 millionths of an inch—typical of tolerances being met in missile work at Ford Instrument.

Engineering Shop. This shop makes breadboard models and other experimental products. It has much specialized equipment, e.g., toroidal coil winders, lapping equipment, in addition to standard machine tools.

Over four decades

of exacting weapons

control systems

FORD INSTRUMENT related experience...

Ford Instrument Co. has been devoted to weapons control since its inception, originally pioneering computers and other automatic equipment for direction and control of naval gunfire. Today, Ford Instrument develops and produces equipment of wide variety for every branch of the armed forces and the U. S. Atomic Energy Commission, both directly and as a subcontractor through major manufacturers. The illustrations here give a small cross-section of the many hundreds of activities (other than missile) under way at Ford Instrument.

Ford Instrument welcomes inquiries from responsible contracting agencies in government or industry. Liaison engineers are available to discuss specialized requirements or to assist in generation of requirements for any service.

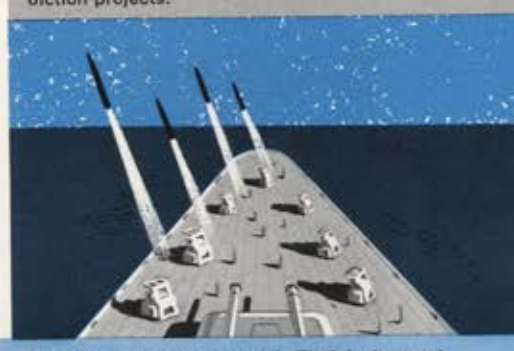
Navigation computers. Ford Instrument develops and produces automatic navigation systems for both U. S. Air Force and U. S. Army —for aircraft and surface vehicles.

Special-purpose computers. Ford Instrument computers are in wide use in all branches of the armed forces.

Telemetering and radar systems. A variety of projects at Ford Instrument range from "data-link" and other high frequency techniques—to radar intelligence interpretation and prediction projects.

Drone control. Battlefield surveillance aircraft are remotely controlled by Ford Instrument system (radar, transmitting, computing and plotting equipment).

Mission control systems. Latest results of operational research and linear programming theory are implemented by Ford Instrument techniques.



Rocket and gunfire control. Ford Instrument has developed and produced a tremendous variety of fire control equipment for naval and land-based guns and rockets, as well as torpedos and missiles.

Nuclear development. Ford Instrument nuclear activities include reactor designs, instrumentation, control systems (including studies of digital techniques in reactor control) and highly classified weapons projects.

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A CREATIVE TEAM OF SCIENTIFIC, ENGINEERING AND PRODUCTION TALENT

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Exploration of the Moon

DR. GERARD P. KUIPER
Director, Yerkes Observatory, University of Chicago

"We are adding basic knowledge which can be applied . . . to improve our understanding of our environment."

WHY DO we aspire to space exploration? Speaking as a scientist, I would think that the first reason is because these things are of value scientifically. We are adding basic knowledge which can be applied in many ways to improve our understanding of our environment.

There is a second reason which has assumed very great importance, yet which is perhaps not sufficiently realized within the United States. I have just come from Russia, where this second reason was enormously impressed upon me—the reason of national prestige.

If one asked the simple people in Western Europe, or the simple people in Russia, about prestige, they might put it this way: The skies and the heavens above have been considered traditionally as the work of God. Thus penetrating the heavens and putting a star between the stars is almost a God-like act. The Russians have understood this very well and have announced that they have placed among the stars the first new object since the God of the Old Testament.

Now, we may not like such terms, but that is the way the Russians present them. The impact of Russian propaganda has been enormous, in Russia and the rest of the world. National prestige is something we should not overlook.

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Surface of the moon as seen through a 100-inch telescope, showing the region of Ptolemy and Eratosthenes. Observation of the moon from earth is enlightening but does not tell us all we need to know.

Before trying to carry out accurate experiments *on* the moon, we must certainly acquire all the information we can from the ground, because trying to go so far away from the earth is not only risky but is enormously expensive, and there are bound to be many failures. Since the program is terrifically expensive, we must do anything we can to make it more efficient. Thus, there must be a scientific program on the ground which prepares for the time to come, for the work to come, just as it is necessary to have cosmic-ray physicists on the ground to interpret the data which the Explorer and other devices are sending back to us. Otherwise, we will have merely new data but no new scientific understanding.

Notable advance has been made by balloonists. Very successful observations of the sun have been made from high-altitude balloons. Now, why can't the same be done for the moon? The answer is simple. The full moon is half a million times fainter than the sun. Therefore, exposure times must be a million times longer, and therefore it

is very much more difficult to keep a telescope in a balloon stationary long enough to get a good image. That is point one.

Point two is that daytime conditions for observing the stars and the sun are far worse on the ground than nighttime conditions because of the heating caused by the sun itself. Therefore, you have a double disadvantage, when you observe the sun, of having poor daytime conditions and having an extremely bright source to work with when you are up. The moon is faint and the other planets are faint and the nighttime conditions are good. So at the moment there is not yet any advantage to getting a telescope up in a balloon, unless telescopes of really enormous size could be carried up and kept stationary with a precision which is entirely unobtainable at the moment. We are still ground-based as far as such observations are concerned.

What have we been able to learn about the moon from ground observation?

In addition to the straight looking at the surface, one can make studies, make heat measurements, and one can examine the polarization of the reflected light, plus a number of other things. All the aspects taken together from ground observations give a reasonably oblique picture of the moon, but there is no doubt at all that we would like to know very much more, particularly about the composition of the lunar material.

The moon has a low specific gravity, 3.3, about the same as that of basic rock. Very often the assumption has been made that the moon is just a piece of the earth's mantle, which reduced to low pressure has the same specific gravity. But one cannot really understand how a body like the moon could form without its share of metallic iron. So the moon very likely does have an iron core, a small one like that of Mars, and must have a surface density less than its specific gravity of 3.3 to compensate for its iron core. It is extremely important that we find out what it is, and I think it is entirely possible that when you land instrument packages on the moon, you will find out what its composition is.

We must learn the oxygen ratio, and much other data. A program of lunar exploration by means of rockets is thoroughly worthwhile, very important. Just think what problems we would have if we could study the earth from very high up and couldn't touch it. We would certainly be in the dark. The moon is simpler than the earth; it doesn't have water or atmosphere. Even so, we cannot learn all we want from ground observation.

What is the Russian attitude toward space exploration? I have some Russian literature, with some questions the Russians ask their audiences, whoever they may be.

Question one: "Was the success of the first artificial satellite of the earth a matter of chance?"

Then they give the answer themselves. I don't have to quote it.

The second question:

"How do you explain the fact that the Soviet Union was the first country to launch artificial satellites?"

That is a question which many people ask. I think we should ask it ourselves, too.

I have another pamphlet which I think I should quote:

"We shall be glad to compete in peace with any country and any system, firm in the assurance that the Socialist principles of economy will bring us victory in that competition."

I believe that this observation represents the Russian point of view. The Russian people are appalled at the idea of war. It is moving to see how the people look upon war. They suffered terribly in the last World War, some twenty million of them were killed and a good part of their cities were destroyed. They have certainly no desire for a repetition.

A great deal can be accomplished by international cooperation to brush away the many, many differences we have. Of course, economic differences will remain, but I think we can do a great deal through a program of exchange between the two countries on the largest possible scale.

That doesn't mean that we shouldn't have any military protection. We should, of course, but we must have people on the other side. It is surprising that perhaps eighty percent of the Russian scientists, maybe more, would jump at the opportunity to make a visit to the United States. In fact, this problem is so serious to them that there is competition among groups as to who will be the favored people to be sent. We should realize how many friends we have among the ordinary people on the other side.—END

Dr. Kuiper was born in Holland and holds degrees from the University of Leyden. He came to the US in 1933. In World War II he served as a consultant to the Eighth Air Force. In 1947 he became director of both Yerkes and McDonald Observatories, and in addition in August 1957 he became Chairman of the University of Chicago's Department of Astronomy.


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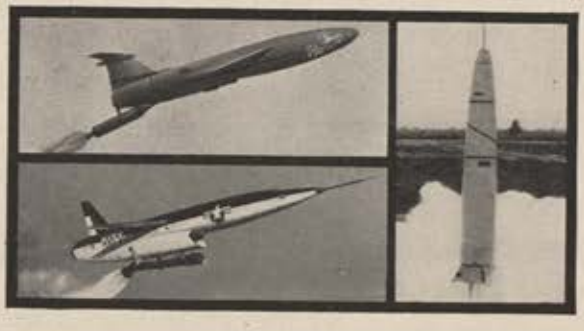
If you are a scientist or engineer capable of making a contribution to AC's advanced research and development program—and are not now a member of our armed forces —write or phone R. E. Allen of AC in Milwaukee. There may be a place in this vital program for you.



Today AC produces AChiever inertial guidance systems for three of the leading weapons in this country's missile arsenal—Mace, Regulus II and Thor.

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AC SPARK PLUG ✣ THE ELECTRONICS DIVISION OF GENERAL MOTORS

Man in Space

A FORUM

The significant task of preparing man for his greatest adventure, flight into space, is in the hands of experts, men like the members of the panel which follows. The panel chairman, Brig. Gen. Don Flickinger, is Director of Life Sciences in USAF's Air Research and Development Command, and in that role supervises much of the Air Force's aeromedical planning for spaceflight. His present assignment caps a long medical career which started with his receipt of a physician's degree in 1933. Lt. Col. Rufus R. Hessberg is Chief of the world-famous Aeromedical Field Laboratory at Holloman AFB, N.M., site of some of the earliest experimental studies in space medicine. Fellow-panelist, Dr. Paul P. Webb is Chief, Environment Section, Wright Aero Medical Laboratory, Wright-Patterson AFB, Ohio, and in that post, is a recognized authority on problems of providing safe environments in projected spaceflight. Capt. Clyde H. Kratochvil is Chief of the Department of Physiology and Biophysics, School of Aviation Medicine, Randolph AFB, Tex., and an expert in instrumentation. His colleague at Randolph, and Director of Research at SAM, Dr. Pickering, is noted in the nuclear field.

Brig. Gen. Don Flickinger

GENERAL FLICKINGER: As far as the medical problems of man in space are concerned, it doesn't really make any difference whether we are talking about a man in space looking through a telescope or one up there on a military mission. But I do think that we must learn a lot more about space before we can make a decision and a commitment as to man's total usefulness in space.

We who have been working in Air Force medical R&D areas for the past ten to twelve years and have been thinking and working on man-in-space problems for a long time believe we are prepared to support the total effort of the national space program as Dr. Dryden has so ably described it.

We would like to feel that we are prepared to support this completely on our end and at the same time be prepared as good soldiers to be able to provide an effective military component if it appears necessary.

To open the discussion of man in space, our first panel member, who will talk about weightlessness, is Colonel Hessberg.

Lt. Col. Rufus R. Hessberg

I WOULD like to shed a little optimism on this entire subject from the human factors research standpoint. Dr. Turkevich has told us about the challenge of Soviet science. Others have compared our capabilities with those of the Russians. I am not going to try to make any comparisons. But I do feel that we are at least abreast of the Russians in getting a man into space.

A year ago, in the month of October, General Flickinger called together a small group in Baltimore to discuss the state of the art in human factors research. Not engineering, but strictly human factors type of research—physiology, psychology, aviation medicine.

This group said, among other things:

"We can send a man out into space now for two hours, a trip once around the earth. There would be some calculated risk involved but our current research and development with adequate support will reduce these risks to acceptable levels."

Why could this group a year ago make a statement that we could send a man out into space for two hours, at least once around the earth? They could, because, as far back as 1952, people like Dr. Jim Henry, who was then at the Aero Medical Lab at Wright Field with his coworkers, Dr. Edward Ballinger and Col. David Simons, then a captain, used the Aerobee rocket to send animals thirty-five miles, or just above that, out into space to study accelerations and weightlessness. That was six years ago, not last year or the year before. They were studying weightlessness and rocket accelerations that far back, and, as you know, they recovered these animals alive. One of those monkeys is still in the National Zoo in Washington. You can go down and ask him about his trip.

Again, in 1954 and '55 Preston Thomas, the English mathematician, and Jim Henry exposed men in the semi-supine position to three-stage rocket accelerations which Preston Thomas worked out theoretically as the accelerations required to boost man into actual orbital flight. Man has withstood this in a semi-supine position; he has withstood it now in a sitting-leaning forward position.

The statement I read a minute ago said that there were some calculated risks. I would like to point out two of them right now. One is actually the subgravity state. We live on the earth under one G. If we add acceleration, we increase this to two, three, five, eight Gs, whatever the factors happen to be.

If we reduce this to less than one G, we are in a subgravity state, commonly referred to as weightlessness. This is a problem we hear a lot about.

We know a little about weightlessness. We know it isn't a great big monster out there waiting to grab us in space. We can put this out of our minds. We know that man has been exposed to it for short periods of time. By "short," I mean in the neighborhood of twenty-five or fifty or sixty seconds. Men who have been exposed for these short periods of time do not react violently or anything else. Most of them enjoy it. It is similar to riding a roller coaster. Some people just love it. They will ride it until you tell them to get off. There are others who wouldn't get on a roller coaster for love or money.

As far as performance in weightlessness is concerned, we have run short tests giving a man a pencil and having him hit a target while he was in the trajectory of weightlessness or subgravity state. We have found that in one or two tries the fellow finally hits the target. He overshoots at first because his arm doesn't weigh anything and he is used to resisting the force of one G. But he reduces this to less than one, and his arm feels right. After one or two tries, he is right on the money.

The one thing we don't know about is the long-term exposure of the metabolic system, whether man's muscles and bones would waste away without exercise.

In terms of eating and drinking, a man can perform with no trouble under zero-G conditions —as long as his aim is good. If food is served in packages of bite-sized pieces so you can introduce the pieces into the mouth, and have no problems once the food or liquid is in your mouth, you are the master of the situation.

Another factor that concerns us when man does come back from an orbital spaceflight and has been in the weightless state or the zero-G or subgravity state for extended periods of time is, will he be affected so as to change all the things we have said today about reentry accelerations? We have duplicated on the human centrifuge the accelerations needed to get man *out* of orbit and *back from* orbit, but now we may have to lower some of these figures if the man is going to react to G stresses as we have seen in tests.

GENERAL FLICKINGER: Now, a discussion of the provision of a habitable atmosphere in a vacuum of space, by Dr. Paul Webb.

Dr. Paul Webb

SEALED and isolated spaces with artificial gaseous atmospheres for man have been used in submarines, in balloon gondolas, and experimental chambers in the laboratory. Tomor-

row's space vehicles will also require a proper gaseous environment for man.

The artificial atmosphere for a space vehicle differs from earlier experience in several important ways. A whole new array of techniques and equipment will be needed. These and the new approaches they call for, will be discussed here.

Let us begin by examining the functions to be served by an isolated atmosphere. Then we shall list some unusual external conditions, which strongly influence the choice of method, and finally we will show by example what sorts of machinery are needed for flights of different durations.

The functions of an artificial atmosphere are first of all respiratory. Of most immediate importance is the supply of oxygen to the lungs; related to this is the need to remove from the atmosphere the carbon dioxide man produces. Traditionally also we include in respiratory functions the need for maintaining a certain minimal gas pressure around the man. There may also be a need to keep a certain amount of nitrogen present for flights of extended duration.

The additional functions of an atmosphere are no less critical, even if failure to meet them causes trouble less suddenly than does failure to meet respiratory needs. Our atmosphere must remove the heat and water vapor constantly produced from the man, or thermal imbalance develops and may bring death. The atmosphere must be circulated past the man and through the reconditioning equipment. Remember that there is no convection in a low-gravity field, and air would stagnate if not forcibly directed.

The atmosphere must also handle odors and various other waste products from the man, and here we are not yet sure of all the problems which will come in long-duration flights. We do know that many volatile substances escape from skin and lungs, in small amounts, and if they build up in a sealed space over a long enough time they are first irritating, and then toxic. The important thing to realize is that there is no way to "open the window" to let out unwanted components such as carbon dioxide, water, and toxic vapors. Here on earth our vast ocean of air dilutes and carries away these things automatically. Further, on earth there are complex recycling mechanisms involving man, plants, bacteria, soils, and energy from the sun. When man goes into space, we must be ready to supply him with all the many services which we take for granted on earth.

The unusual external conditions under which the space vehicle will operate include a number of things which dictate the type of equipment needed. The low-gravity conditions calls for circulating blowers, for new kinds of coolers and heat exchangers, and for a special design for liquefied gas converters, if they are used. The absence of air around the vehicle means that we are working with heat loss and heat gain purely through radiant pathways, except for relatively brief periods when a stored heat sink may be expended, or the thermal mass of the vehicle drawn upon. The balance between losing the heat generated within the isolated atmosphere, preventing too much gain from solar radiation, and excessive loss of heat to the void of space is an interesting problem.

In some ways the vacuum of space will be useful, for it can readily receive wastes, and its presence may be used to "purge" spent chemicals used for conditioning the artificial atmosphere. Of course, one most important limit is set by the need to conserve weight, space, and power on board the vehicle. First vehicles impose most serious restriction on what equipment can be used—there is not the space and weight available to use submarine-type equipment, and no large power source on board to draw from. Later vehicles should provide more leeway, and this will be needed for the equipment which must support man for weeks.

The relation between equipment and time of flight is a very important feature of future artificial atmospheres. We can illustrate this with some examples. For a mission which will last months and years, a completely self-sufficient closed ecological system is needed—probably some derivative of today's research in algae. But that is a complex solution which we will not need for a long time.

The opposite extreme is the equipment needed for a flight lasting a few hours. At the Aero Medical Laboratory we have developed a rather simple and quite compact apparatus for supplying a man in a sealed pressure suit, or else a small sealed cabin, for twelve hours. This device measures about two feet by two feet by eight inches and weighs about fifty pounds. It contains the oxygen and pressure needed for life in a vacuum; it removes carbon dioxide, ventilates the man, and carries off his heat and water vapor. It also provides enough cooling to keep the man in good physiological condition during periods of rather high external heat.

Recently two systems have been designed to

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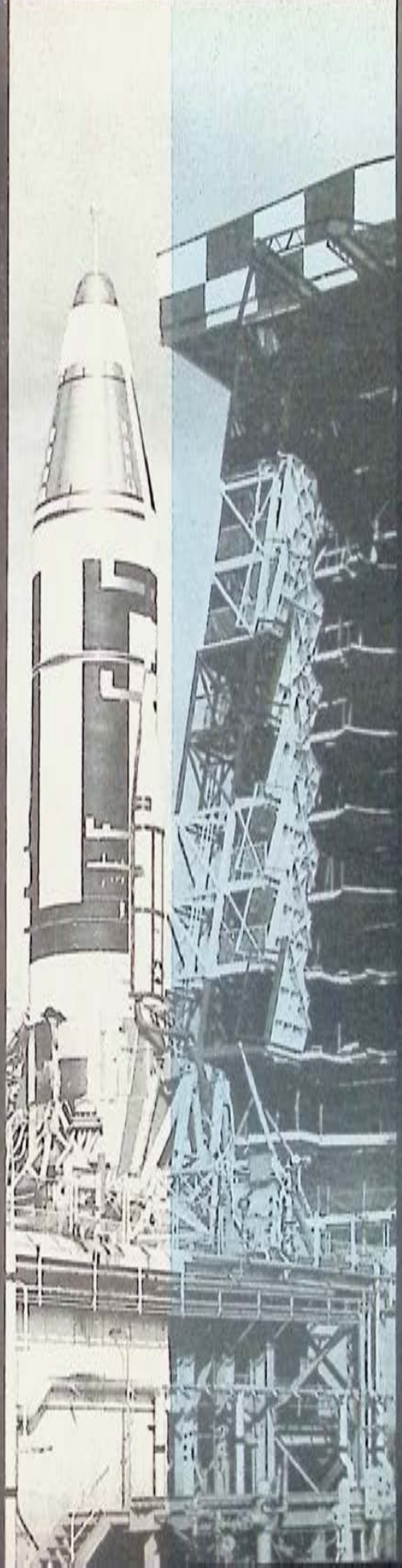

All is in readiness. The gantry is being rolled away. This missile is ready for its journey into space.

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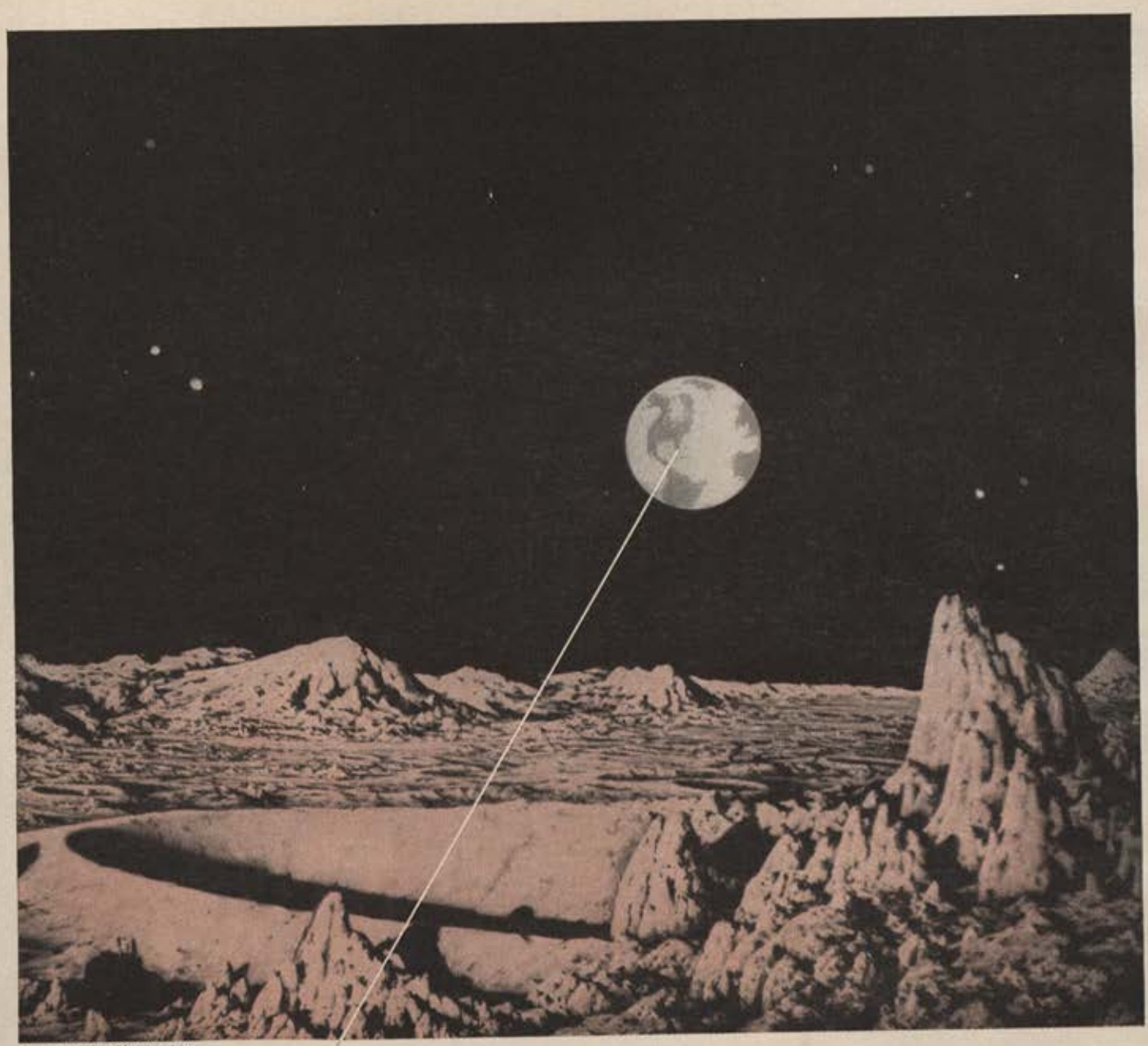

Photo Hayden Planetarium

ANYONE FOR THE MOON?

Yes, many of us perhaps, and in the foreseeable future . . . maybe tomorrow . . . maybe next month. But certainly moon travel, unmanned at first, then complete with men and complex scientific equipment, will tell us more about the Universe and the laws of nature which govern our existence. ➢ ➢ The same resources and technological skill . . . greatly augmented by the now vital aeronautical, astronautical, and atomic brain-power which Republic has developed over more than a quarter century . . . are now concentrating on solutions to every problem . . . designed to strengthen the Free World which we insist must and will live.

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support a man for forty-eight hours. They are direct descendants of the development I have mentioned. The interesting thing is that in between this short-term system and the ultimate solution of the biological closed ecology there are many different systems to be designed. Our present systems get heavier and heavier with time because of the stored oxygen and water, and because of the non-renewing chemical absorbers used for removing carbon dioxide. If a system is designed for ten or twenty man-days, water must be conserved and recycled, and a way found to dump carbon dioxide into space. Flights involving more man-days will need to conserve oxygen by recycling at least some carbon dioxide back into oxygen. Nutrients in dehydrated form can be stored rather cheaply, but eventually even these will have to be recycled, and this leads to the ultimate biological solution.

In conclusion, I would say that extension of today's techniques will allow support of manned spaceflight for flights lasting days and weeks. The special problems of longer flights will require ingenious solutions, but there is every reason to believe we shall have solutions in good time.

GENERAL FLICKINGER: Surveillance of man's performance capability, or medical instrumentation in spaceflight, is one of the key areas of manned spaceflight. Dr. Kratochvil will discuss Medical Instrumentation in Spaceflight.

Capt. Clyde H. Kratochvil

THE weight and complexity of the average piece of medical lab. equipment precludes its use, at least in early space vehicles.

This means we have to design new instruments. This is our number one problem.

Number two, those of us who are biological scientists are not allowed the luxury of asking the engineer to give a measurement on just about every bodily function that goes on. In the laboratory on earth, if we are studying blood, we can say: "Let's study urine, too," because it doesn't take much more effort to do so. But this is not going to be true in the space vehicle or in a satellite. So, as biological scientists, we must outline *what we want measured* and *why we want it measured*, and we must establish an order of priority. Two types of measurements can be and have to be made. These are the *environmental* measurements, and measurements from the man or animal.

On a small animal such as a mouse, we may have to lean primarily on environmental data. It is a little bit of a problem to tie an animal up with a bunch of wires. This can be done in a conventional laboratory, but you have to visualize this animal or a man, for that matter, being fired off where you can't get your hands on him, where you can't readjust anything, where you can't correct anything. Once your subject is placed into orbit, everything has to go right the first time.

If you confine a mouse where he can't turn around, the mouse panics. He has to have room to move about. So flexible leads, or anything like that, are out of the question. Mice will chew their way through anything, or they will hang themselves in the wires. Such approaches are out. We have to develop new approaches to this type of problem. Of course, on larger animals, we do hope to get information successfully direct from the subject.

Environmental measurements we want to get include: temperature, total pressure, carbon dioxide, partial pressures, and acceleration profile. We assume we will get temperature data from the aeronautical engineers also on these vehicles. Relative humidity is desirable but not a mandatory measure.

From the subject, we want to get blood pressure, heart rate, pulse (which would come from the heart rate), the electrocardiogram, and perhaps an electroencephalogram.

We should also like to measure our oxygen intake and output.

Part of the X-15 program, of course, is devoted to studying the physiological responses of man. We have an on-going instrumentation program in cooperation with the Aero Medical Lab at Wright Field to instrument the X-15 to find out just what happens to the man.

We have developed a couple of instruments which may be of interest to you. We have an oxygen censor, about the size of the ordinary checker. This replaces a machine about half the size of a podium, certainly a suitable saving in weight and space. This device, we hope, will work for carbon dioxide too.

We have developed a respiratory flowmeter which will tell us how much a man will breathe in terms of liters per minute.

We have an automatic blood-pressure device which works. We don't need a doctor to pump up the cuff and deflate it. So far, we are rather satisfied with the progress we have made in this field.

Another thing we would like, of course, is television to watch the man. However, television transmitting equipment is very heavy, and right now it does not look too practical for early satellite or spaceflights.

GENERAL FLICKINGER: Colonel Pickering has the very interesting topic of The Significance of Cosmic Radiation to Manned Space Travel. I think I should say before he starts to talk that we do not in any way, shape, or form know the exact answers to what biologic effects are contained in space radiation. There is a certain amount of work that has been done by both ourselves and the universities, as regards both short- and long-term effects of heavy primaries. These compose only a small percentage of the total space radiation. For what we can say about biological effects—Colonel Pickering.

Col. John E. Pickering

WITH the advent of the A-bomb we became extremely interested in ionizing radiation. That interest still exists. Our interest in radiation stems from the fact that ionizing radiation has the ability to penetrate matter. It has the ability to penetrate biological tissue, to produce biological damage in certain instances to cause sickness, and, in sufficiently large doses, even death.

I am going to speak about information that came from the bombing of Hiroshima and Nagasaki, information that is available from accidental exposures to humans in industry, from reports on individuals in the Marshall Islands area who were exposed to radioactive fallout, information on persons who have been treated with therapeutic radiation in the treatment of cancer, and from reports of certain other laboratory experiences.

In your October AIR FORCE Magazine there is an interesting article ["Cosmic Radiation—How Much of a Barrier?"] that suggests pinpoints of concern on radiation. From the Japanese we found out that there is a suggestion that there will be an increased incident of leukemia. There may be a shortening of lifespan. There is a possibility there will be a temporary sterility, and there are some suggestions concerning genetic effects. It has been our job to endeavor to place dose parameters on these biological effects.

We feel radiation will be encountered in our extraterrestrial environment, and we hope to better understand the mechanism of radiation damage. In so doing, perhaps we can better prepare the individuals who will be exposed in these environments. And perhaps we can choose safe dosages for these individuals.

GENERAL FLICKINGER: Let me briefly summarize what we have tried to say about the man-in-space situation.

We in the Air Force feel that before the first step of man into space in a modest circular terrestrial orbit—something in the neighborhood of 150 to 200 nautical miles in altitude, for short duration of twenty-four or thirty-six hours—the principles behind our studies can provide available engineering solutions.

The heavy band of ionizing radiation found by Explorer IV, as I understand it, doesn't begin to build up until you are up to about 600 miles. Again, we think the normal extension of a state of engineering art in terms of the ability to package lightweight, life-supporting components, will allow us, without any other considerations of depth of space penetration, within a period of two or three years, to *extend* our time of keeping man in a space environment to perhaps something in the neighborhood of a couple of weeks.

As we look beyond that into true ecological systems with complete reconversion and complete energy utilization, which would be required for trips to Mars, this seems to us (again entirely apart from the business of traversing this potentially very dangerous radiation layer) a very large step. We feel that it is in such long-term studies for completely closed ecological systems that the armed services must join with the civilian and industrial counterparts for an aggressive, well-thought-out, long-range plan to utilize the life sciences' part of our man-in-space program.—END

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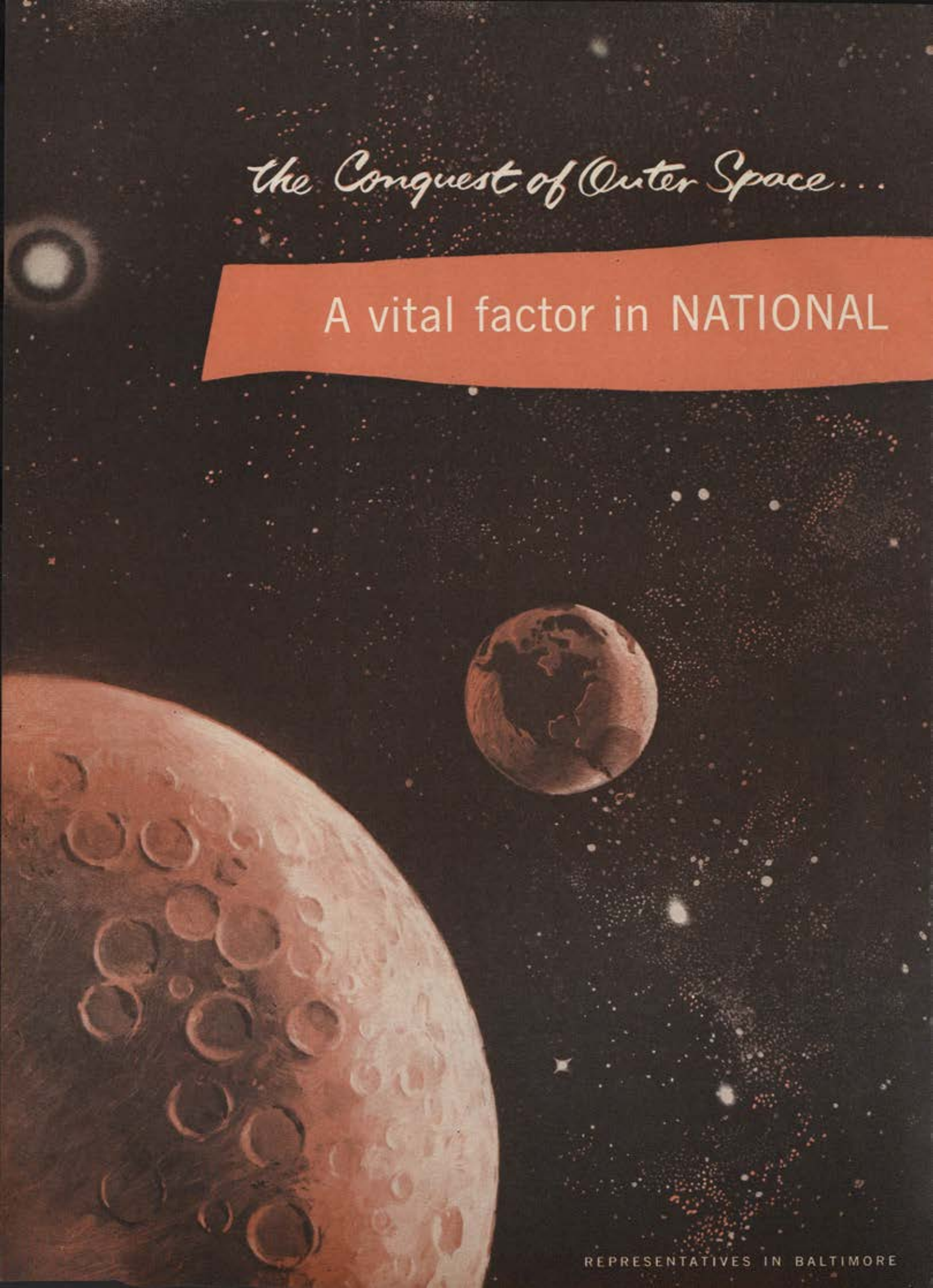
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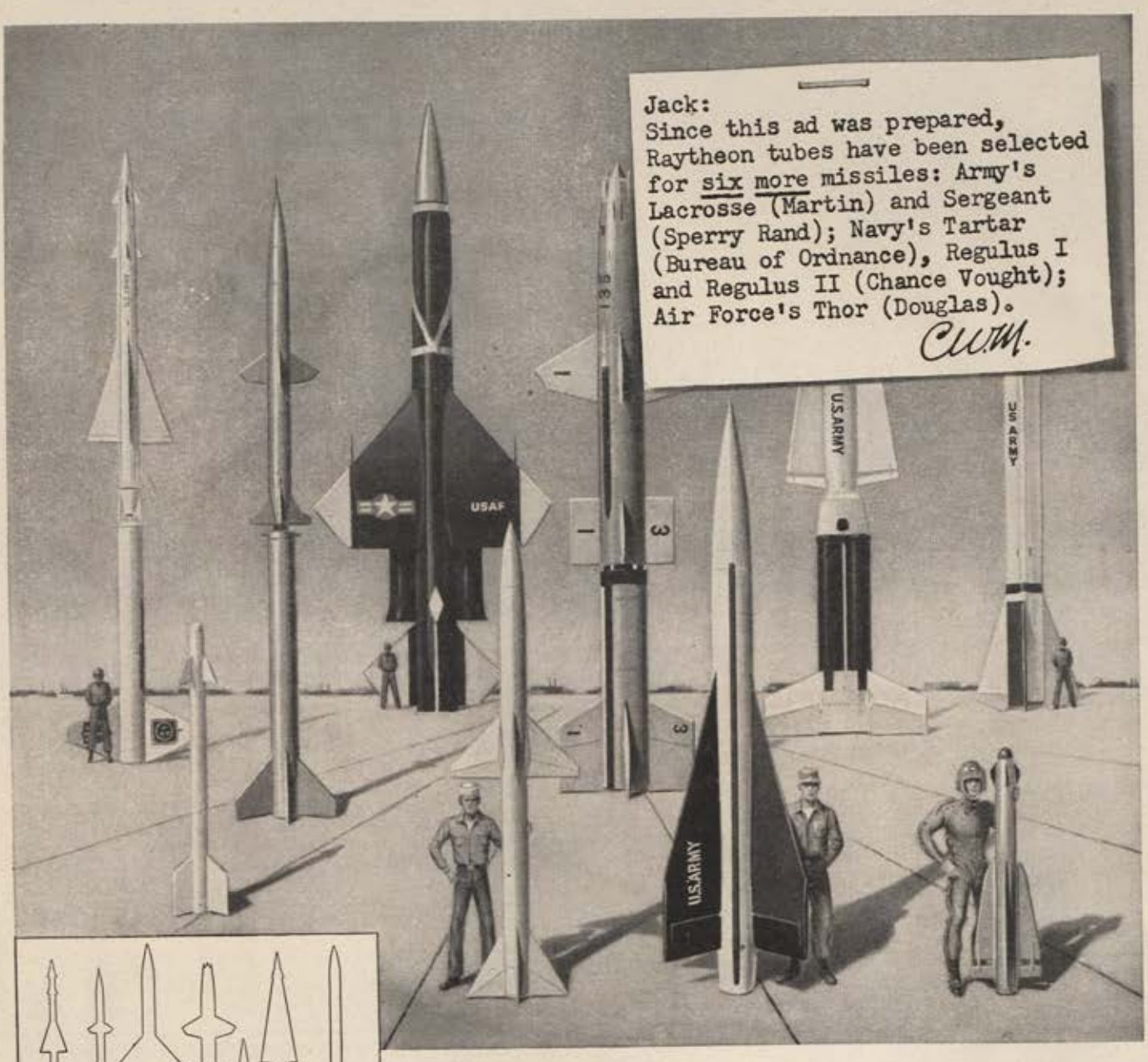

Jack:
Since this ad was prepared, Raytheon tubes have been selected for six more missiles: Army's Lacrosse (Martin) and Sergeant (Sperry Rand); Navy's Tartar (Bureau of Ordnance), Regulus I and Regulus II (Chance Vought); Air Force's Thor (Douglas).
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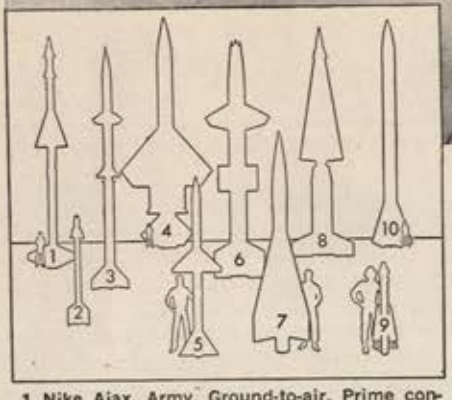

1. **Nike Ajax.** Army. Ground-to-air. Prime contractor: Western Electric.
2. **Sidewinder.** Navy. Air-to-air. Prime contractors: Philco; General Electric.
3. **Terrier.** Navy. Surface-to-air. Prime contractor: Convair.
4. **Bomarc.** Air Force. Ground-to-air. Prime contractor: Boeing.
5. **Sparrow III.** Navy. Air-to-air. Prime contractor: Raytheon.
6. **Talos.** Navy. Surface-to-air. Prime contractor: Bendix.
7. **Hawk.** Army and Marine Corps. Ground-to-air. Prime contractor: Raytheon.
8. **Nike Hercules.** Army. Ground-to-air. Prime contractor: Western Electric.
9. **Falcon.** Air Force. Air-to-air. Prime contractor: Hughes Aircraft.
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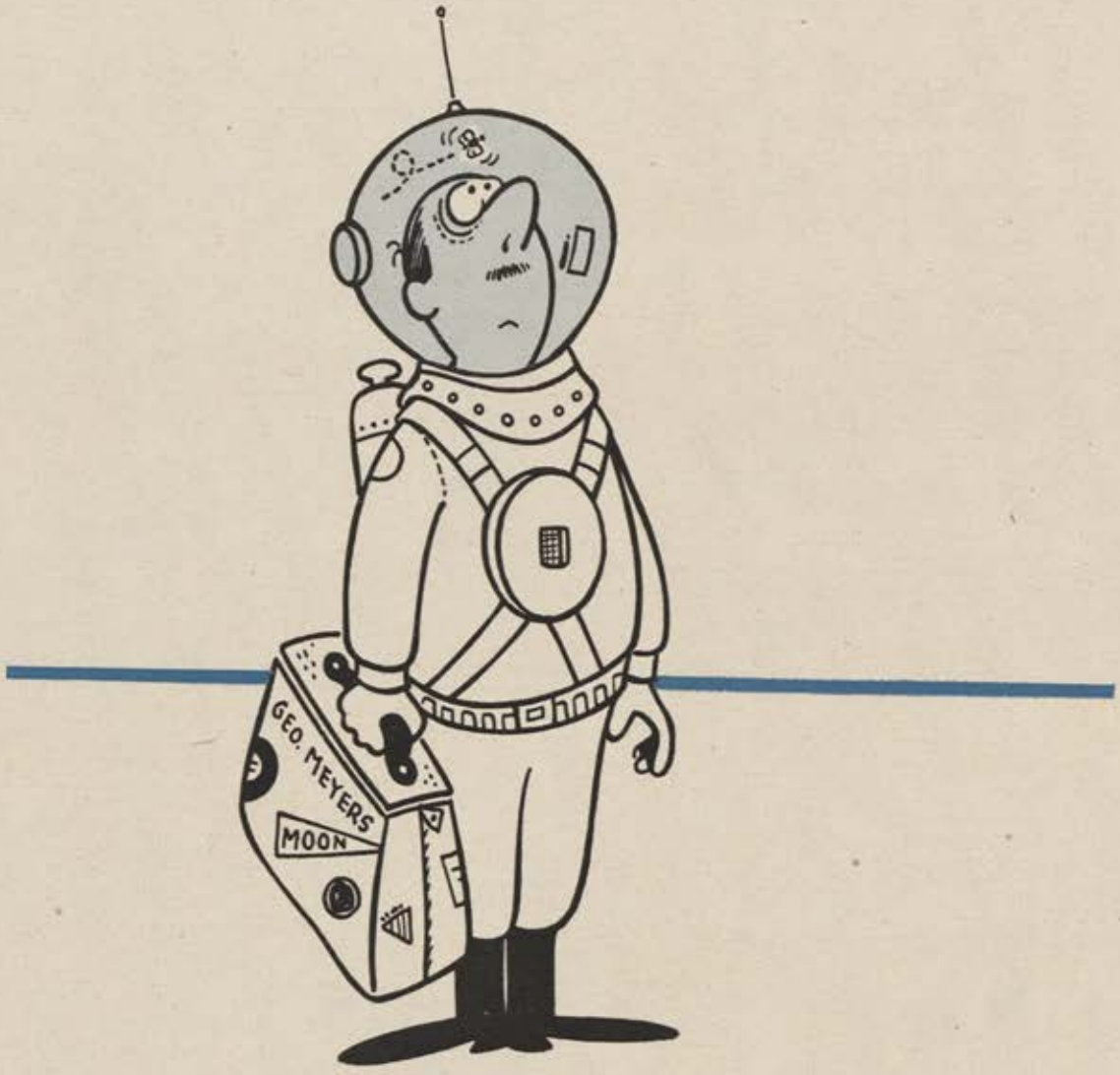
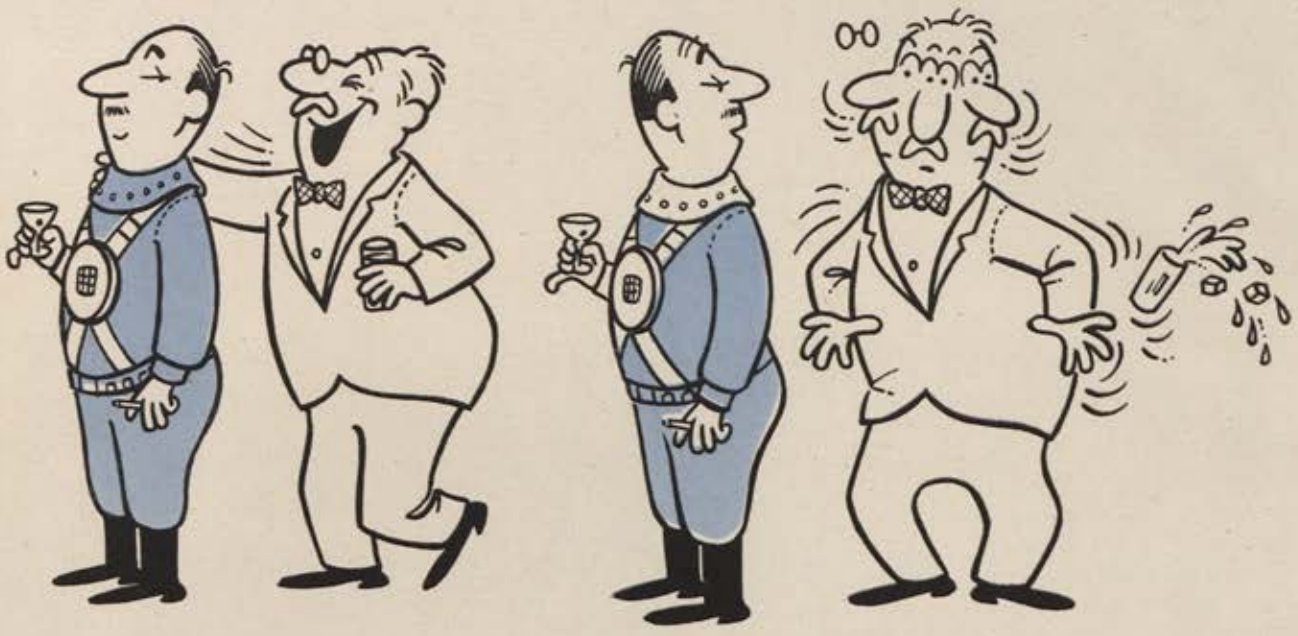


"The Moon you say...?"

DRAWINGS BY JACK D. TIPPIT

The future will note that space travelers divide their trips into three phases—the going, the coming back, and the returned. *The following pictorial account depicts the experiences of space traveler, Colonel George Meyers . . .* Returned.



"George Meyers. . . . You old scoundrel! Where've you been hiding out this past year?"

"On the moon . . ."

"But, Georgie honey, I'm married now . . . didn't you get my letter?"

"Hey, Mom, look what I found in Uncle George's flight bag!"

"So, actually it would take 4¼ years to travel from our sun to Proxima Centauri, which is the star closest to our solar system. Now, of course, this is traveling at 186,000 miles per second since this star is 25,000,000,000,000 miles away, and . . ."

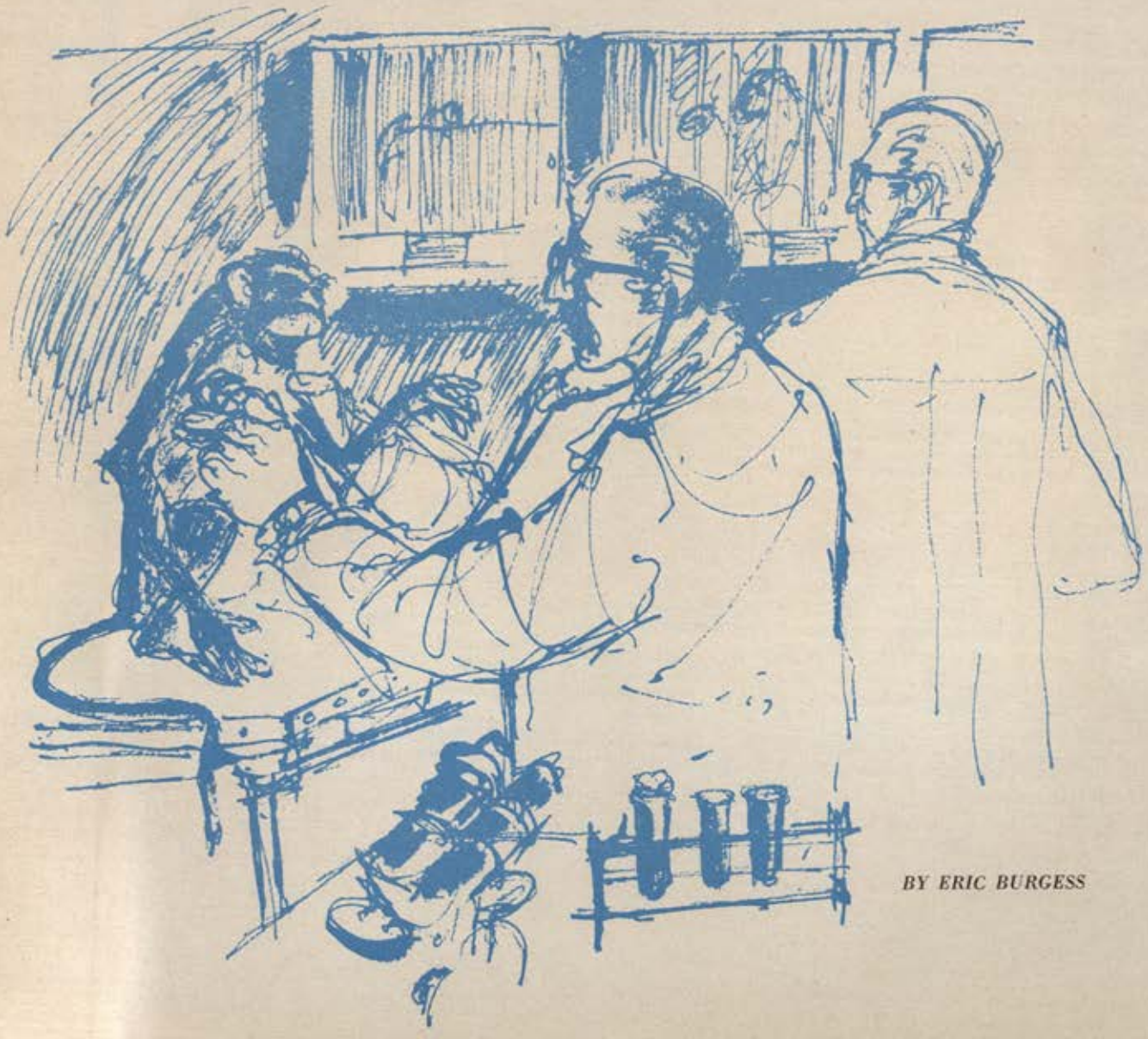
". . . and in conclusion, gentlemen, I think it's a nice place to visit but I certainly wouldn't want to live there!"

The ultimate goal

of man in space depends heavily

on what we learn from our . . .

BIOSATELLITES



BY ERIC BURGESS

ALTHOUGH instrumented space-probe vehicles such as Pioneer sent toward the moon by the Air Force will be invaluable in the gathering of extraterrestrial information, particularly cosmic-ray intensity, man's own venture into space continues to depend just as heavily on data learned from a much older Air Force program—the firing into space of animal-carrying vehicles—or, in the "trade term," biosatellites.

To the free world's embarrassment, the biggest biosatellite yet has been a Russian one, the Laika-carrying Sputnik II, but its proof that an organism could survive the shocks of blastoff and orbital flight merely bore out what Air Force researchers had seen for years in experiments at places like Holloman AFB, N.M., where mice and monkeys had been launched up to heights of 236,000 feet as far back as 1951.

Those experiments on the New Mexican sands, which included the concurrent development of recovery techniques allowing the mice and monkeys to come "home" safely for examination, are bearing fruit now as the Air Force nears the day of the monumental X-15 flight to the very fringes of the atmosphere—the project that will lead the true orbital, manned flight and the manned space station that could follow.

This early work is being continued with larger rocket vehicles. Attempts using the Thor/Vanguard combination (Thor-Able) have been made to send a living payload consisting of a small animal—a mouse—to extreme altitude and at extreme velocity and to recover it safely through reentry techniques. Eventually, Air Force rockets will carry a small animal into space at speeds approaching satellite velocity and will return it safely to earth for recovery. Since the prime purpose of such experiments is to ensure survival during reentry, mice are used in preference to other animals, such as monkeys, because of their acceleration resistance. As reentry techniques are improved, larger animals, more similar to man, will be flown.

Recovery is vital; what are its problems?

First, the biosatellite must be lowered from a high-altitude permanent or semipermanent orbit to an altitude at which the effects of the earth's atmosphere become important. This maneuver is most easily accomplished through the use of retrorockets. Then the returning life compartment has to reenter through the atmosphere, during which phase it must dissipate a considerable portion of its kinetic energy. This is no mean task. Consider this example: If the reentering body weighs about fifty pounds it will possess as much energy as a transatlantic liner moving at thirty knots. The energy can be conveniently lost only as heat, and the process has to take place with a minimum heat input into the returning satellite. Once all this careful balance is assumed, the life capsule must be further decelerated so that it can land safely with minimum impact.

The most severe problems are experienced during the second phase of reentry, during that part of the descent when the tremendous energy of the vehicle must be dissipated without raising the interior to intolerable temperatures and without destroying its structure and cargo by excessive rates of deceleration.

Both heating and deceleration appear to be most easily limited by the use of drag devices. Already the ability of properly designed units to withstand a reentry into the atmosphere has been demonstrated by the recovery of nose cones of modified military vehicles. Actually, the reentry problem of a returning biosatellite could be less than that of a ballistic missile. This is due to the fact that although its *velocity* is greater, its reentry path is more nearly tangential to the atmosphere. Moreover, its loss of energy happens at high altitudes in the low-density regions of the atmosphere. Some researchers have suggested that if high-deceleration forces can be tolerated, the reentry could be effected by using large drag areas at high altitudes to minimize aerodynamic heating.

But to keep the deceleration within the limits of human endurance, the reentry path must not dip more than two degrees below horizontal. Even lower accelerations are possible if the drag area can be varied during the reentry. This might be achieved by varying the physical dimensions of a drag canopy or by changing the field intensity of an electromagnetic drag device.

Where large areas are needed for drag purposes the most suitable device seems to be the parachute. Unfortunately, the most commonly-used parachute materials, including nylon, cannot withstand the aerodynamic heating of reentry. Sheet metal or Fiberglas cloth are suitable from the standpoint of strength at high temperatures, but they are hard to pack compactly.

Some proposals for reentry have suggested the use of lifting surfaces. These, however, lengthen the path and increase the total heat input. But such an approach has the advantage of reducing the peak acceleration and peak heat input.

For the final stage of reentry, during which the vehicle has to be slowed sufficiently for a safe landing, conventional parachute devices would probably be suitable.

Once the landing has been safely made, the problem is to find the life capsule—with its mouse or monkey—over a wide expanse of terrain or ocean. Satellites are more easily located at sea than over land, and live passengers stand a better chance of survival by impact with water than with a land mass. Unfortunately, a safe reentry from a satellite orbit makes it necessary for the angle of dip into the atmosphere to be small. A long reentry path results, and it becomes difficult to pinpoint the landing area. Making a steeper angle of descent improves the chances of quick recovery but brings high peak loads of heat input and deceleration.

Even in the historical experiments at Holloman, where mice and monkeys were sent aloft in Aerobee and other rockets, this problem of recovery had to be met. Another point—it is not always appreciated that rocketing animals have to survive in a simulated environment for much longer periods than their actual flight time. They have to be ready inside their pressurized compartment during the countdown and again after landing until the recovery crews can reach them. In extreme cases the animals could be in their controlled environment for several days.

There are other, newer problems which will be met when the space capsules are carried entirely beyond the appreciable atmosphere. One such stumbling block is the potential danger of meteoroids penetrating pressurized cabins and causing rapid decompression.

The main hazard in decompression is oxygen starvation. Damage to the lungs need not be fatal provided air passages are not obstructed, and the expansion effects of gases within the body, and the boiling of body fluids can be tolerated. It has been ascertained that animals exposed to near-vacuum conditions of 30-mm mercury pressure can recover without ill effects providing they are not left under those conditions for more than about ninety seconds. Exposure for longer than two minutes is invariably fatal.

Design of manned satellites must accordingly ensure that any rapid decompression is automatically followed by recompression. This may not be possible for the whole life capsule and would probably be accomplished by individual spacesuits. Although unconsciousness will result from the decompression, recovery without ill effects will take place. For this kind of safety, the crew members of early manned space vehicles will accordingly have to wear spacesuits at all times. Preferably these spacesuits would have pressure-operated switches automatically closing the face plate if pressure were lost in the surrounding cabin.

Although early results of the Explorer satellite experiments have indicated that meteorites do not present as great a hazard as formerly believed, meteorite punctures could be serious. If, for example, a high-pressure gas bottle of oxygen were penetrated, the puncture could lead to explosion or fire. High-pressure gases will doubtless be required in manned space vehicles, and it has been suggested that Fiberglas bottles be used to resist fire and provide shatterproof containers.

At one recent scientific meeting, one researcher suggested a program for space biological experiments to be split into three specific tasks—first, requirements for creating a proper environment for human survival must be determined; second, that environment must be maintained in a space vehicle; and, third, the environment, once established, must be controlled. In other words, the objective of a program of space biology must not be to find out what happens to man when he is exposed to space conditions but *to create an environment* in which humans can survive and operate efficiently. Men in space must be able to use all their senses; they cannot be compromised to make up for deficiencies in engineering techniques.

What will man's value in space be? He will be able to apply all his immense background of knowledge and experience to the interpretation of events which can never be foreseen by the designers of instrumentations. He will make decisions, something which a machine cannot do. If he decides a particular phenomenon is interesting he will investigate it. Instruments can only blindly record what they have been told to record.

A good example is a planetary-probe operation. While a rocket vehicle dispatched to Mars might be instrumented to gather certain data which we at present feel might be of interest, how much more valuable would it be to have a man circling Mars, able to decide—on the spot—what is or is not useful and interesting data to gather. Moreover such an individual would be

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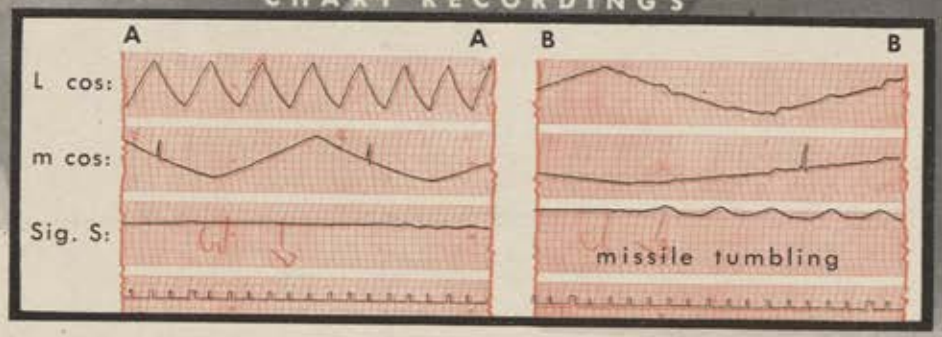

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able to vary the progress of an experiment in space to suit the conditions found and to take advantage of his on-the-spot interpretation of observations.

The main reason then for any biosatellite experiment is to advance the time when man himself can be sent into space. Ignoring philosophical reasons—and some of these are very compelling—man must go into space because he is needed there to made decisions. Moreover, he is a compact and versatile package of observing instruments with computer facilities. But for a man to serve his purpose in decision making he must be packaged in a suitable environment, one which will enable him not only to function but to function efficiently. He must not labor under excessive physical stress or mental strain. The provision of a suitable environment calls for tremendous ingenuity on the part of engineers. It is important that the man-machine complex be optimized to avoid weightlessness if possible, dangerous radiation, emotional stress, fear of destruction by meteorites, etc. There must be the assurance of adequate means of survival.

There have been schools of thought that have suggested that proposals for spaceflight pamper man too much in trying to give him all modern conveniences in the first space vehicles. It is argued that the early adventurers, the explorers who opened new continents on earth, had no comforts. The early aviators, too, had to battle the elements, often suffering grave physical discomforts. But spaceflight is different from these earlier achievements which took place in what can almost be termed a natural human environment. Man could survive. In space, conditions are very different. Man is not in a natural environment. Everything is against him. The slightest failure of the man-machine system can lead to his destruction. Accordingly, in spaceflight man must not have the physical or mental distraction of an inadequate environment.

The selection of biosatellite crews is also fraught with difficulties, even greater than the selection of men for the highly specialized crews of modern military aircraft. Early space vehicles must be designed so that crews require a minimum of adaptation. Early biosatellites will be as cluttered with equipment as a modern jet fighter. They will also be out in space for extremely short periods of time, and there may be considerable hardships and lack of personal convenience. They will be somewhat analogous to aircraft test flights. But deep inroads into space will not be made in this way. Space missions will be more akin to Antarctic assignments than to test flights. Long tours in space vehicles will be a way of life. It will be necessary for the spaceship candidates to make the decisions to lead that life.

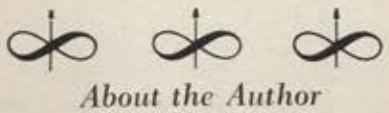
The earliest spaceflights will necessarily be of short duration. Later, satellite orbits for only a week, or perhaps a month, might be contemplated. And, early biosatellites, developed from high-speed aircraft and large ballistic missiles, will probably be recoverable spherical vehicles.

But for more ambitious space missions, it is possible that crews will have to be selected at a much earlier age than now. Because of the limitation on the number of crew members that can be carried on any mission, each individual will have to be multi-talented and have cross-disciplinary training. Also, certain individuals might be chosen for lone missions while an entirely different type of individual would be needed to form part of a group of several people.

Involved selection and training programs will undoubtedly be necessary. Men will have to be tested for resistance to acceleration, heat tolerance, for swift reaction in emergency under low pressures. In addition to physical tests they will have to show their resistance to stress isolation and to emergencies. They will have to be capable of applying self-medication and firm emotional control.

A training program will follow selection and will consist of an extension of the selection program using extensive simulation techniques with intensive schooling in selected areas of space technology. During the last few weeks prior to a launching they would be isolated to prevent contact with disease carriers. Training requirements would be extremely rigorous, designed to simulate all conditions likely to be encountered in space. As soon as the mission begins, all the crew must be ready and trained for any emergency.

Not *homo superior* but *homo astronautics* will be tomorrow's spaceman, successor to the mice, monkeys, and dogs which are taking today's rides in biosatellites.—END



About the Author

Eric Burgess is the author of numerous technical books on rockets and space. His Frontier to Space *was recently reprinted in Russia without his consent. A native of Great Britain, he now lives in California where he is a scientific writer and technician for Telecomputing Corporation, Van Nuys. He is an American Rocket Society member.*

SPACE *Lines*

At 6:30 a.m., October 8, Man High III, a three-million-cubic-foot balloon and nine-by-three-foot sealed capsule, ascended from the AF Missile Development Center at Holloman AFB, N.M., to an altitude of 99,600 feet. The balloon's pilot, Lt. Clifton McClure, twenty-five, had been sealed into the capsule at 1:30 that morning, so that the nitrogen could be decreased and the oxygen and helium increased to avoid the rapid decompression known as the "bends." Rising quickly, the balloon, designed and developed by Winzen Research Inc., soared to its zenith within three hours, but the capsule's heat and humidity rose to an extreme degree, and Lieutenant McClure was advised by AFMDC Aeromedical Field Laboratory to return to the ground. Despite premature termination of the flight, Air Force scientists were provided with a wealth of information on the fringe of outer space.

Man High III was a continuation of the experiments in which Capt. Joe Kittinger rode to 96,000 feet in June 1957, and Lt. Col. David Simons rode to 102,000 feet in August 1957, and stayed for thirty-two hours.

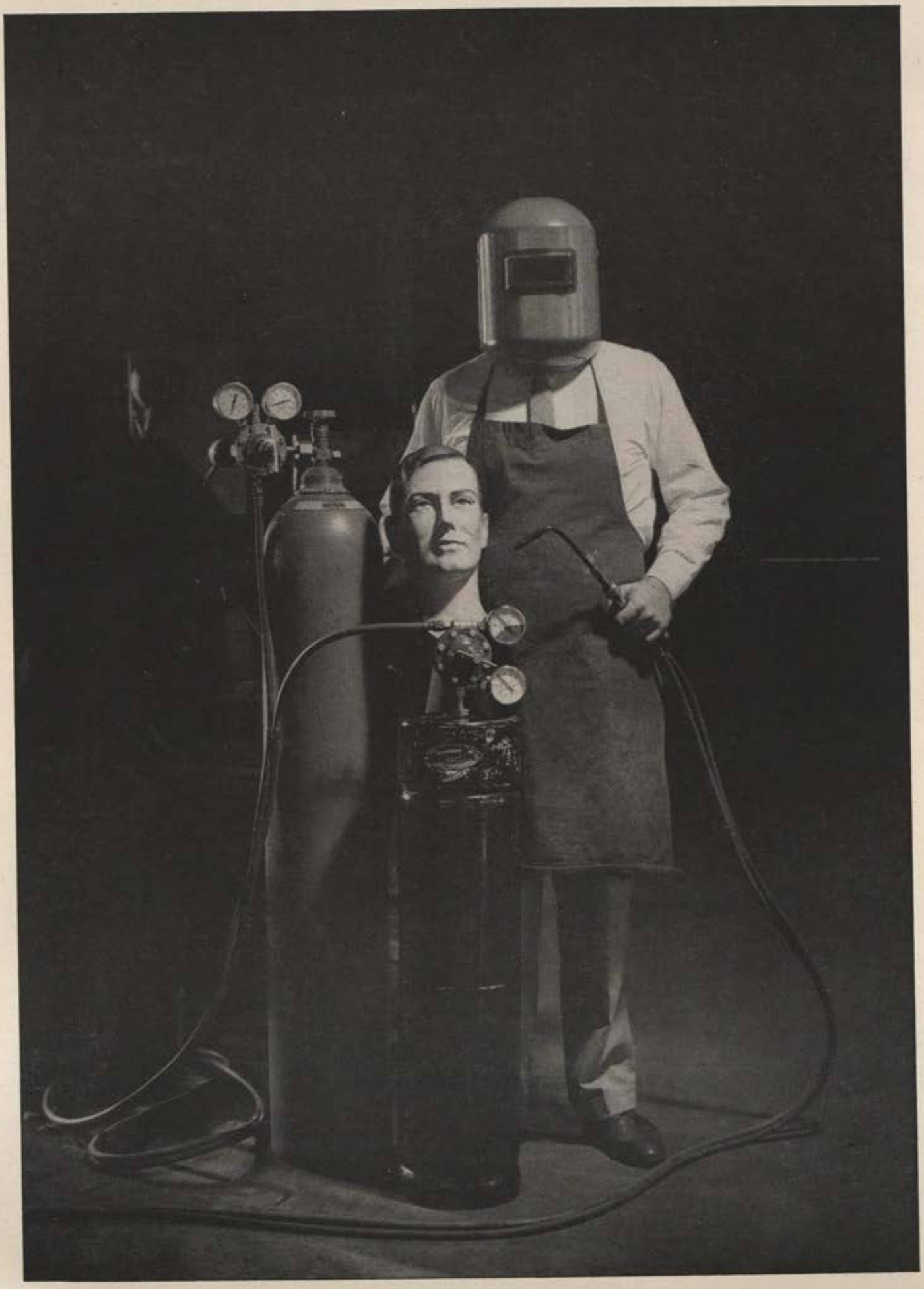
On behalf of Space Education Foundation, Gill Robb Wilson, left, accepts Ex-Cell-O Corp. check for $1,000 from CAP's Col. Edwin Simenson.

Known as "Haley's Comet," or "Rock 'n Roll, Mark I," this dynamic analyzer is the invention of James C. Haley, shown pointing to the outside collimeter shutter.

ARDC's Wright Air Development Center has displayed a prototype model of a unit to test space reconnaissance camera systems under simulated spaceflight conditions (*see cut*). Called "Rock 'n Roll" by its inventor, James C. Haley, the system is designed for photographic camera systems, but will be adapted for use with electronic and infrared systems of aerial reconnaissance. A production model, scheduled for completion by early 1960, will permit simulation of altitudes up to 100 miles, and of ground haze and radio transmission interference, and will include television monitoring, provisions for the future addition of detrimental factors of spaceflight, and data-logging and data-reduction facilities—in effect, simultaneous static and flight testing.

The General Assembly of the International Council of Scientific Unions, sponsor of the International Geophys-

The Air Force's third Man High balloon flight to the stratosphere ended on October 8, 1958, about twelve hours short of its goal to remain aloft at approximately 100,000 feet for a twenty-four-hour period. At left, the huge polyethylene balloon climbs into space. At right, its sealed-in pilot, Lt. Clifton M. McClure, III.



SPACE LINES CONTINUED

ical Year, met in Washington on October 3. The council formed a fifteen-man global scientific committee, to be known as the Committee on Space Research, COSPAR. Its chief task will be to develop a plan for coordinating space research and exchanging information on a global scale, and to present its views to the general assembly within a year. The council embraces thirteen international groups of scientists, ranging from astronomers to biologists, and forty-three national academies or similar scientific bodies. Dr. Lloyd Berkner, president of the council, is chairman of the Space Science Board, whose task is to plan American research in this field.

The ICSU also accepted a report from its committee on Contamination by Extra-Terrestrial Exploration, CETEX, which is expected to be absorbed soon by COSPAR. CETEX warned of possible contamination of the moon and other celestial bodies by lunar probes and further exploratory rockets. Nuclear explosion might make it impossible for future explorers to determine the nature of the moon's atmosphere or to analyze the possible beginnings of life on the lunar surface.

Abatoli A. Blagonravov, member of the Soviet Academy of Sciences and one of the Russians who played a large part in the development of Sputnik, has predicted that the Russians will send up a man-carrying Sputnik to circle the earth. He also said: "Up until now we have had no failures. We hope that we will meet with no failures and all measures are being taken to make the launching of every Sputnik a success."

A radio telescope with the highest resolving power produced in the US is nearing completion at the Radio Propagation Laboratory of Stanford University. Prof. Ronald N. Bracewill, designer and builder of the telescope, said it will be able to scan the sun like a television camera. So far, the instrument consists of sixteen solid aluminum dish antennae, ten feet in diameter, in a 375-foot row. These will soon be bisected with a similar row, altogether presenting the resolving power of a dish antenna 375 feet in diameter. To date, the largest standard saucer-shaped antenna is a 250-foot instrument in England.—END

Sovfoto

Design for a Soviet spacesuit.

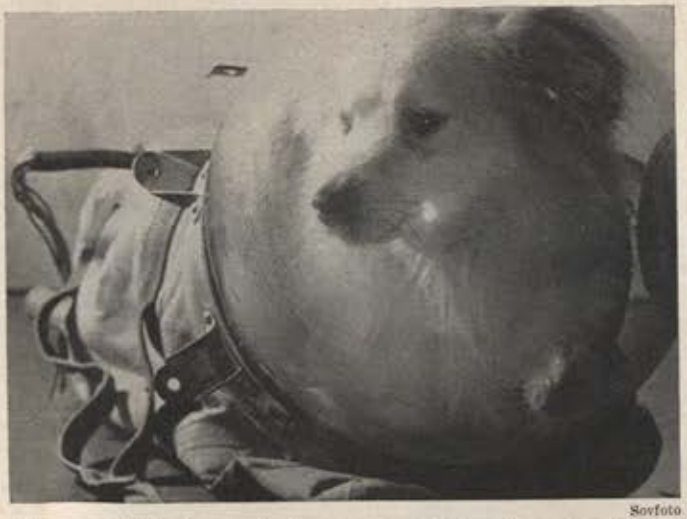
SOVIET SPACEPOWER

Four Russian lunar shots have failed so far. Guidance problems apparently are the principal reason. One other contributing factor: Other projects having to do with missiles have a higher priority in the USSR. One of these is manned spaceflight.

* * *

The recent Russian missile flight in which two dogs were shot to an altitude of about 180 miles and then recovered some distance away from the point of launching had a high priority. Probable reason: The Russians want to be first to launch a man into space and recover him safely, and the dog experiment was the first checkout of equipment for such a flight.

Actually, the Russians may not shoot a man much farther into space in their first such experiment than will the North American-USAF X-15, expected to make its spaceflight try next year.



Sovfoto

Sovfoto

Photo at left shows Soviet spacesuit for dogs, to ensure safe traveling at high altitudes. At right, two dogs that have passed all of their space-travel tests take their place in the cabin of a Soviet space vehicle.

LIGHT UP THE SKY • *Target Knowledge*

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THE DECKER CORPORATION

Bala Cynwyd, Pa.

Russia has been working on a manned space vehicle, designated the T-4A, which can be expected to appear on the scene before long.

Such a space vehicle, capable of passing over the US at 200 miles' altitude or more, would be a useful adjunct to the Soviet guided missile program. It would give reconnaissance or perhaps even guidance capability to missiles on part of their course.

° ° °

Propulsion, missile aerodynamics, nose cones, and nuclear warheads are some of the things the Russians have shown themselves to be proficient at. But there now are indications and even admissions that they have things to learn in trajectories, telemetry, and missile and space satellite tracking. These shortcomings were revealed by their experience with Sputniks I, II, and III, and the misfiring attendant to the launchings.

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Russia is popularizing Sputniks and spaceflight by providing several lectures each day in twenty-seven planetariums. The lectures are well attended, and are factual, with very little propaganda. Em-

phasis is laid on interesting Russian youth in science.

° ° °

Norwegian experts have come up with these figures on the Russian threat to the Scandinavian countries. They indicate that there are some 250 missile-launching sites poised against the Scandinavian peninsula, and that these are equipped with missiles of several types and ranges. At the same time, there are 180 complete airports and 250 advanced fields that could funnel aircraft against the peninsula. Some 5,000 to 6,000 aircraft are reported to be stationed on the fields.

The figures could be exaggerated, but they indicate the degree of concern in Scandinavian military circles.

° ° °

Russian production of missiles, short-, long-, and intermediate-range types used surface-to-surface, air-to-surface, and surface-to-air, now run about 2,000 per month.

° ° °

To memorialize the world's first space satellite, the Russians have commissioned designers to create a suitable monument to Sputnik I. The structure will be put up in Lenin Hills, where the natural sciences faculties of Moscow University and the new apartments for government and technical workers are located. The site is near the road to Moscow's Vnukovo airport.

This column is a summary of the latest available information on Soviet spacepower. 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.—THE EDITORS

The monument will be about 150 feet high and will include a model of the three-stage, stubby-winged launching vehicle for Sputnik I. Over a thousand designers took part in the competition for the monument.

° ° °

It isn't confirmed, but projections from what is known of the launching equipment used for Sputniks I and II suggest that the first-stage engine for Sputnik III was on the order of 800,000 pounds of thrust.

° ° °

Russia's production-model antiaircraft missile is a two-stage affair. The second stage is something like the Nike, but the first stage is equipped with a large trapezoidal wing. The missile is believed to use a solid propellant, for which the Russians have exhibited no fondness, perhaps because their chemical industry is not nearly so far advanced as the West's in development of such fuels.

The missile is carried on a truck, and the rack can be elevated. The entire unit is tied into ground radar for control after launching, and it employs many of the principles the Germans were working on to control antiaircraft missiles at the end of World War II.

° ° °

The Russians are building missile complexes to handle IRBMs and ICBMs, and possibly protective missiles for use against enemy aircraft.

The complexes are well hidden in forests, and basic installations and storage are underground.

By using this technique, the Soviets ensure security, and at the same time reduce their fuel problems. Since most Soviet missiles employ liquid fuels that must be made on the spot, this fact has in part forced them to adopt the complex system, so that missiles can be fueled from a facility which is centrally located.

Vladivostok now is getting a missile complex aimed at Japan and the US West Coast. For that reason, the Russians have declared Vladivostok a closed port. And although they profess great friendship for the Japanese these days, they nonetheless take into tow any Japanese fishing boat venturing too close to Vladivostok.—END

ANTI-MISSILE SYSTEMS

A Research Project of Dr. Harry Nyquist,
Senior Scientist, Stavid Engineering, Inc.

Dr. Nyquist is a pioneer in advanced areas of electronics such as Information Theory and circuit noise, and is credited with nearly 150 patents in the field of communications. He is now contributing his exceptional analytical ability to Stavid's work on a far reaching anti-missile system. Men like Dr. Nyquist are typical of Stavid's outstanding scientists and engineers who are working on advanced concepts . . . years ahead of actual systems development.

In Stavid's objective engineering atmosphere, scientific, development and manufacturing teams are producing a wide range of electronic systems for all branches of the military. Typical of such projects is the REGULUS missile command guidance system, designed, built and maintained in operational status by Stavid.

CURRENT STAVID PROJECTS INCLUDE:

- Airborne Search, Bombing and Terrain Clearance Radar
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challenge to
the resourceful
Almost every remote area
of the Canadian north
is aware of the planes and
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Trained and experienced to
meet the constant demands
of its harsh environment,
aircrew and groundcrew
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CF-100'S ARE ON GUARD IN CANADA—AND IN EUROPE WITH NATO AND THE BELGIAN AIR FORCE

AFA's Airpower Panorama in the Dallas Memorial Auditorium attracted crowds of nearly 100,000 to the nation's largest aviation trade show . . .

AEROSPACE WORLD'S FAIR

Outside Dallas Memorial Auditorium, visitors to the 1958 Airpower Panorama passed the Convair Atlas, USAF's ICBM.

GUARDS were clicking mechanical counters at the gates of the $12 million Memorial Auditorium in Dallas for four days. Their final figure: 94,802.

It was the biggest and most enthusiastic crowd ever to see an AFA Airpower Panorama, now easily the biggest and most important aviation trade show in the US. There were 75,000 square feet of displays provided by the Air Force and 125 industrial firms.

The diversity of the exhibition and the number of new technological fields that were exploited in the displays brought searching examination, even from veteran showgoers with relatively jaded appetites. Most of the products were geared to tomorrow's aviation equipment, for use on everything from the vehicle itself to the new and elaborate devices needed for ground support.

Over-all, the 1958 Panorama gave first-hand proof, if it was needed, of the changing character of the aircraft and related industries in the opening days of the space age. There was new material shown by major companies with names famous for many years in the aircraft and engine business. There were new companies, offering products in competition with the veterans, and others offering services that the major contractors find essential to their business.

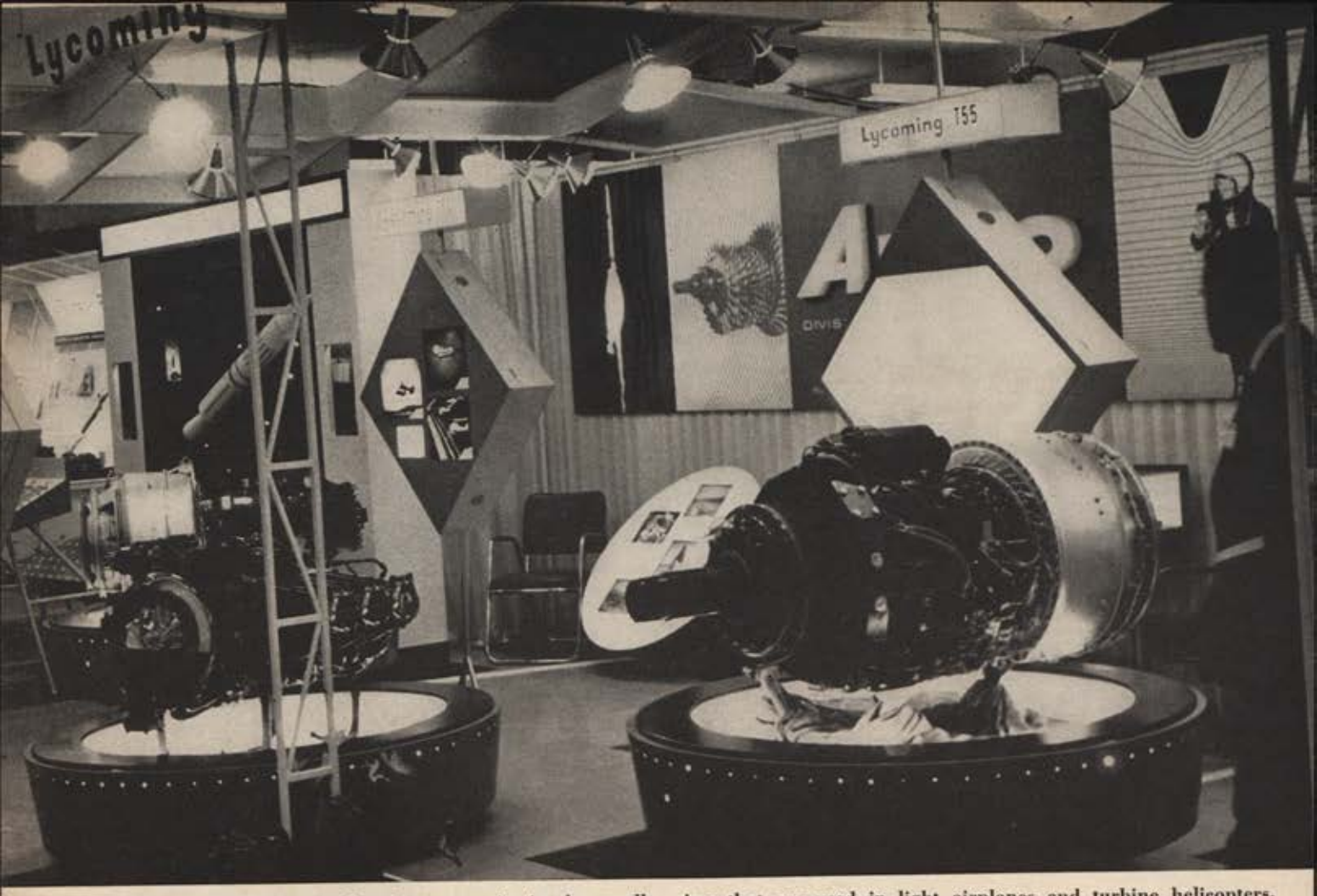
Just as airplanes were joined a few years ago by electronic systems and plastic products, now all three are represented at the Panorama along with such things as computers, chemical rockets, plasma propulsion, and the *Encyclopaedia Britannica*.

One exhibit was that of the International Telephone and Telegraph Corporation, with representation from at least six divisions. This type of industry helped emphasize the growing complexity of weapon systems as well as the fact that reliability has become a basic requirement for everyone from the prime contractor to the maker of the tiniest component.

The nature of this year's Panorama resulted in increased interest on the part of the crowd. Not only the Dallas young people, more alert than ever to aviation's possibilities because of the big advances made toward space in the past year, but the military as well paid maximum attention to the products.

On top of all this, the position of Dallas as a major center of the industry stimulated both participation in and benefits from the big show. It helped make Texas in 1958 the ideal spot for the Showcase for Airpower.

(Continued on following page)



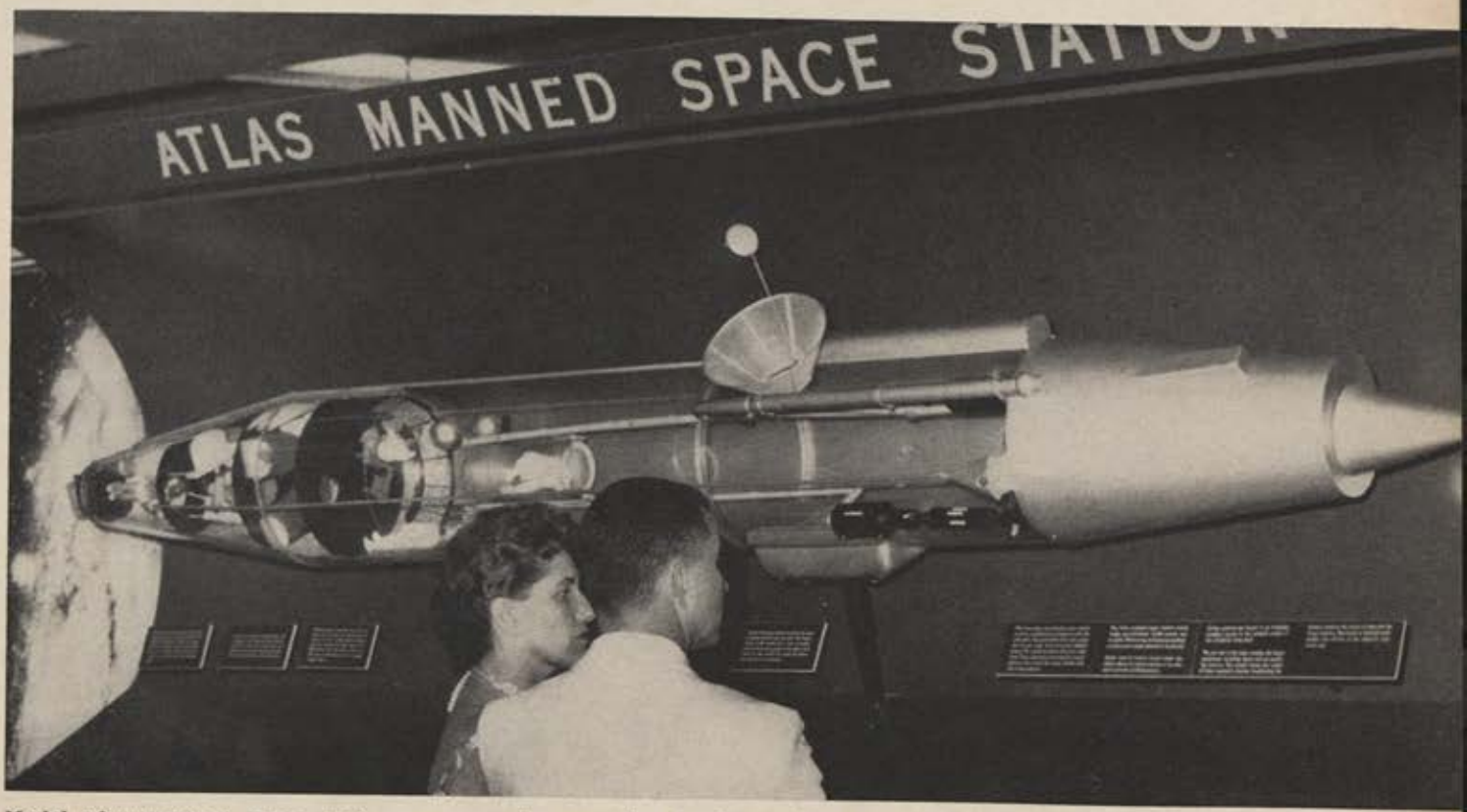
Lycoming engines displayed power units in the smaller sizes that are used in light airplanes and turbine helicopters.

Young and old alike found fascinating new experiences in the Panorama's industrial exhibits. Moving pictures and demonstrations of the equipment provided entertainment.

USAF's booths put the emphasis on space and the rigors that man will have to endure when he gets out of the earth's atmosphere. Here the recruiting service is busy.

The 94,802 Panorama visitors included thousands who work in the aircraft and related industries in the Dallas area.

Growth of the weapon system concept was apparent in big displays, emphasizing new problems, such as "integration."



Model of a manned space station was a major attraction in the satellite era as USAF contractors look into future.

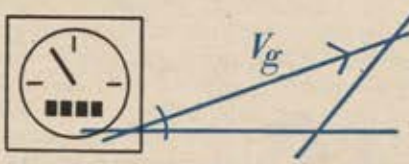
Teen-agers hear the story of Lockheed's contributions to aerospace power on taped telephone message transmitted by attractive hostesses at the Lockheed Aircraft display.

(Continued on following page)

Mace, newest version of the Martin Matador, was shown with stress on its capability, mobility, and use in other nations.

Registrants get a close look at the aft end of an Orenda jet engine. The display was geared, as was the entire Panorama, to the Air Force-industry team's efforts in the astronautic age.

USAF's auxiliary, the Civil Air Patrol, made good progress at the Airpower Panorama enlisting recruits from teenagers for the Dallas area. They demonstrated their mission with photographs.



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This vital data, never before available, is displayed on the flight panel automatically and continuously.

The dials "read" the key unit in GPL's revolutionary Doppler auto-navigation systems. Other phenomenal units in these systems tell where you are and how to get where you're going. The systems operate entirely without ground aid or celestial fixes, have proved themselves globally in millions of operational miles.

GPL's auto-navigators are the result of GPL's harnessing of Doppler-effect to air navigation—an achievement comparable in magnitude to the breaking of the sound barrier.

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Today's military and jet-liner crews have an added member – an 80-pound navigator named RADAN!*

Guiding the plane with pinpoint precision; telling the pilot his exact velocity second by second; working automatically, continuously, without fatigue – RADAN takes a big load off the rest of the crew. More important, it aids immeasurably in the successful completion of military missions.

RADAN navigators are members of the famed GPL family of Doppler systems developed in conjunction with the USAF (WADC). GPL auto-navigators have literally revolutionized flight. They are the only self-contained systems in the world proved over millions of operational miles.

Recent release of RADAN Systems for civilian use now makes their benefits available to everyone. RADAN saves time and precious fuel for the air lines, provides a priceless margin of safety for all.

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GENERAL PRECISION LABORATORY INCORPORATED, Pleasantville, N. Y.

*Trademark

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the past as sharply differentiated areas of responsibility. The tendency has been accelerated by a number of factors: changing maintenance requirements for missiles; development of new techniques of direct support; the expanding use of electronic data-processing equipment, which can be exploited to the best advantage when independent of organizational boundaries and arbitrary limitations. In establishing permanent maintenance and supply specialists in the project offices of the Aeronautical Systems Center, we are taking a major step toward a tighter functional alignment of the future logistics system.

In a similar way we have redesignated the ballistic missiles office as the AMC Ballistic Missiles Center. This office is also organized around WSPOs for the ballistic missiles and space vehicles under its jurisdiction.

With the responsibility for integrating procurement and production, supply, maintenance, transportation, etc., on their respective weapon systems, both the AMC Ballistic Missiles Center and the Aeronautical Systems Center will operate on the same level as the Air Materiel Areas and Air Force Depots. Thus, with these streamlined channels of communication and decision-making, we have a more direct concentration of effort on total weapon systems management.

We believe that industry, as well as the operating commands, will find the new structures easier to work with and much more responsive in the team effort. At first glance this separation of the aeronautical systems operating units from the elements concerned with total industry-wide responsibilities and policies may appear to create an additional point of contact for those of you who deal with Headquarters AMC as contractors. In actual practice, however, the sharply defined division of responsibilities has been emerging for some time, and represents a functional sifting dictated by contractor and combat command relations as naturally as by considerations of internal management. Moreover, we feel that the physical relocation of the staff policy element in close proximity to such other staff policy areas as supply, maintenance, and transportation will contribute to a closer intermeshing of over-all policy for the logistics mission as a unified effort.

I have gone into this realignment at some length . . . because it is a great deal more significant than most of the changes on organization charts that all of us tend to view with a tired eye. The changes I have outlined have been under study for many months. As such, they are a basic acknowledgement of new forces and necessities within the logistics mission with which we must keep pace if we are to meet today's defense imperatives. We are confident that the new organization will help us to do the job better, faster, and with greater economy of our resources for airpower in the space age.—END

The above text and the one immediately following are cleared versions of presentations by AMC commander Gen. Edwin W. Rawlings and his colleague, Maj. Gen. Frank A. Bogart. Both presentations were given at a classified briefing for industry on Saturday, September 27, at AFA's Convention.

LOGISTICS IN THE SPACE AGE

Maj. Gen. Frank A. Bogart

DIRECTOR, PLANS AND OPERATIONS, AMC

DURING the past year we have seen the evidence of tremendous and sometimes startling technological advances, both by ourselves and by the Soviet Union. Satellites, unmanned and elementary indeed, but space vehicles nonetheless, are circling the earth. Ballistic missiles have in fact proved that any place on earth is within range of any other. Transoceanic and transcontinental speed records have been broken. Nuclear-powered submarines of the Navy have crossed beneath the polar ice cap under inertial navigation. These events are so dramatic that at times they tend to overshadow the many years of careful planning and development which made them possible. Yet we, as logisticians—both military and civilian—know the importance of the "behind the scenes" effort which culminates in a satellite, a lunar probe, or a trip under the polar ice cap.

In a very real sense it can be said that the mission of logistics remains constant. It must provide the weapons and equipment of war, replace or repair broken or worn-out weapons and equipment, and sustain the combat forces

in the field. The logistic systems of Alexander, Napoleon, Grant, and Eisenhower all had the same reasons for existence, and history records somberly that whenever the logistics have failed, the combat forces were destroyed.

Yet though the logistic mission remains constant, the way in which it must be carried out is changing constantly as weapons and force structures change, as new concepts of warfare are developed, and as new techniques of transportation and communication become available. In World War II the combination of tremendously large forces, rather complex equipments, great distances, relatively slow transport, and voice and teletype communications resulted in an air logistics structure consisting of huge repair facilities and massive stores of stocks deployed all over the world. This structure had to be massive to support the huge fleets of aircraft characteristic of that stage of warfare, and it was condemned to slowness by the transportation and communication limitations of the time. But we could and did live with these things, for in that war massiveness of action was the key to victory.

You are as familiar as I with the striking technical changes that have occurred since then. These developments have produced corresponding changes in the nature of war itself. The World War II type of warfare, with its emphasis on mass production and mass logistics, has become outmoded by the development of vastly improved weapon systems. Military competition between nations now seems to be at a developmental, rather than a mass production, level. The key element has become technological progress itself.

What type of logistics will be required by this new military orientation? The main outlines are becoming rather clear. [What about] the size of this logistic structure of the future, its response characteristics, its management organization, and the respective roles which industry and the Air Force will play within it?

In the first place, it will not be as large as it has been. Since modern weapons are so much more efficient we should not need as many of them. The mass logistic requirement of World War II is passing from the scene, but it is being replaced by a requirement for a much more precise, specialized type of logistics tailored to the individual needs of the complex, costly, and constantly changing weapon systems of today. The Air Force is making rapid progress in shifting over to this new type logistics. Faster transportation and communication, high-speed electronic data-processing, and highly sophisticated statistical methods of requirements computation are all techniques which are being utilized as we replace logistics by saturation with logistics by specialization.

As we adopt these new techniques we are able to make significant reductions in both facilities and personnel. Since 1952, four depots at an estimated cost of over a third of a billion dollars which were authorized to be built have been canceled. In addition, we have been closing existing depot level facilities both abroad and at home whenever possible. Twenty-three have been closed since 1952, and an additional eighteen are scheduled to be closed by 1962.

There also have been significant reductions in depot level personnel. Since 1952 almost 53,000 manpower spaces have been eliminated, and by 1962 this reduction, even after deducting functions and spaces transferred to other commands, will total well over 65,000 personnel. Nor have all the reductions been in the field. Since 1951 AMC Headquarters personnel have been cut by over 5,000, a reduction of fifty-six percent.

The picture, then, is one of a logistic structure in transition. As it adopts new techniques, not only is it possible for it to give the more highly individualized type of support required by new weapon systems, but it also is able to effect significant reductions in both personnel and facilities.

But it is doing something else as well. It is developing the ability to respond instantly to the demands placed upon it. This need for instant response arises from the requirement for constant operational readiness imposed upon our combat forces by the nature of the threat facing us. These are new concepts to us, for always in the past we were assured of enough time to bring our tremendously productive industrial structure into support of our military forces. But this type of industrial mobilization may now be impossible. We can no longer regard time as a military resource. The combat forces must be operationally ready at all times. In essence, this means that the distinction between peace and war has disappeared for the logistician. He must treat each minute as though it is H-hour minus one, for what he has not done when the whistle blows, he may not be able to do at all.

This requirement for responsiveness expresses itself in a number of different ways. Because we desire to minimize the amount of stock in the system (spares not only are costly but also become quickly obsolete), we must replace those which are used much more quickly than before. Because even the most sophisticated requirements computation techniques cannot anticipate demands which arise from natural emergencies (such as hail or wind storms) or from political or military emergencies (such as the Suez, Lebanon, and Formosa incidents), the logistic structure must have the inherent flexibility to respond quickly to the unexpected, whatever it may be. It is not easy to build this type of responsiveness into a logistic structure, but it is being done.

How are we going about developing this precise, specialized, highly responsive logistics support? Improved transportation, communication, electronic data-processing, requirements computation techniques already have been mentioned. But changes also are being made in the basic management structure of logistics. I will try to sketch in some of the main elements of these changes.

The management structure which we have been utilizing had its origin in the logistic support given the mass fleets of aircraft of World War II. The two factors which were most influential in shaping its development were the basic similarity of the different types of aircraft and the tremendous numbers of aircraft involved. The logistics structure which we created resembled a vast system of automotive type repair shops and parts supply houses capable of servicing all makes and models. Because it had to deal with many different types of aircraft, we found it advantageous to organize in terms of what it did (supply, maintenance, transportation, etc.), and to manage in terms of the materiel it handled (generators, landing gear, etc.). The success of US airpower in World War II and the succeeding years testifies to the basic wisdom of these techniques.

But the changes we have noted were under way. Individual weapons were increasing in complexity and diversity. The weapon system concept of today, with its increased emphasis upon a completely integrated package designed and engineered together, began to evolve. Much of the interchangeability between weapon systems at component and subsystem level began to disappear. It became more and more difficult for a system of "common garages" to serve all aircraft.

After considerable analysis we decided to adopt a form of weapon system management. Each new weapon system is assigned to a Logistic Support Manager who will be served by the latest data-processing and communication equipment and who will have the necessary authority over resources to enable him to ensure effective support.

(Continued on following page)

This technique of management has definite advantages—it concentrates in one place all the vital information about a weapon system and thus simplifies many support management problems. It also gives the command using that particular weapon a single point of contact within the logistics structure for all matters relating to that weapon. For these and many other valid reasons the Logistic Support Manager will play an important role in the management structure of the logistics system of the future.

But a logistics structure is an extremely complex organization. It must be oriented in at least three different directions at the same time if it is to perform its mission effectively. It must face forward to its customers, the using commands. Here the weapon system Logistic Support Manager is the ideal solution. But logistics also must face backward to its suppliers, the producers of the many things which it purchases. Here the growth of the single manager concept, the adoption of the federal supply catalog, and the commodity nature of industry itself, all require a management oriented by commodity rather than by weapon system.

But there is a third orientation as well. A logistics system must look within itself to see what type of management will best enable it to maintain that vital technical competence so essential to the goals of flexibility and responsiveness. This scarce and highly valuable engineering capability, which lends itself ideally to organization and management along subsystem lines such as propulsion or guidance and control, can be lost through too great a dispersion along either weapon system or commodity lines. Subsystems cut across weapon system lines and have a continuity through time beyond that enjoyed by the individual weapon systems themselves. A logistic system with an engineering capability oriented along subsystem lines has the continuity of existence to receive and nurture each new weapon system as it emerges from the developmental process and enters operational inventory.

We thus find ourselves with three possible types of management, each of which seems best suited to its own particular area, but none of which seems capable of managing the total logistic complex by itself. The solution of course is to make use of all three. A similar situation exists in research and development from whence came the weapon system concept originally. There we find that basic research is oriented toward increasing knowledge without reference to end product or, at the most, with reference to a major knowledge area such as metals, propulsion principles, etc. When we move to development we see effort being organized in terms of major subsystems (guidance, propulsion systems, etc.). Only in the final stages of development do we see the weapon system management concept being utilized to cut across these other fields and assure a completely integrated weapon in the shortest possible period of time.

A similar pattern now is emerging in the logistic structure with commodity management, subsystem management, and weapon system management all coexisting within the same logistic structure, each being utilized in those areas of management in which it is most effective. The specific problem we are engaged in now is the delineation of these management areas. Each must be oriented toward a significant type of logistic problem and must include the information flow and authority over resources necessary for effective management in that area. The Logistic Support Manager in particular must have information aggregated at the proper level to enable him to manage his weapon system as a separate entity. Above all, the relationship of the management areas to each other must be carefully prescribed.

[What] is the nature of the relationship between the military and the industrial sectors of the logistics structure? Under the broad meaning of logistics, which includes the functions of research, development, and production, as well as the more commonly recognized ones of supply, maintenance, and transporation, the logistics structure always has included both military and industrial elements, with the exact nature of the role played by each changing as the circumstances required.

During World War II these roles were perhaps more clearly defined than they ever will be again. The industrial sector was engaged in an all-out productive effort while the military sector devoted itself to the job of keeping the aircraft coming off these production lines supplied and maintained. The massiveness of the total requirement brought about tremendous expansion of each within its particular area without bringing either into direct competition with the other. As this requirement diminished in the "peaceful" years following the end of the war, contraction took place in both the military and the industrial sectors—being tempered somewhat in its harsh effects by the ability of the booming civilian economy to absorb considerable amounts of idle personnel and resources.

Toward the end of the 1940s, however, we began to be concerned over the loss of productive capacity in the aircraft industry. The then current concepts of war were still based on industrial mobilization, and our mobilization base in the aircraft industry was withering away because of malnutrition. In an attempt to prevent this, a program of offering depot level maintenance contracts to some of the major producers was initiated. However, before it could get well under way, the Korean conflict generated a requirement for a huge expansion of the inventory, and the Air Force found itself with another reason to let out maintenance contracts: It could not handle the projected workload without expansion of the depot logistic structure. But the production lines of the major producers were once again running at full steam with little room left for maintenance work.

As a result of these circumstances a new industry arose for the express purpose of picking up this workload. For the most part it was made up of concerns other than the major producers—many of them being facilitized by the Air Force to enable them to enter contract maintenance. Very recently, however, these firms have been joined by some of the major producers who now look upon contract maintenance as a method of utilizing idle production facilities and personnel.

Depot level contract maintenance grew from less than ten percent of the total workload in 1950 to approximately fifty-five percent at the current time. Thus it was during the decade of the 1950s that a dramatic change in the traditional industry-Air Force logistic relationship took place with industry entering—by invitation—into the area of maintenance formerly occupied almost exclusively by the Air Force.

The question we now face is the proper role of each in the logistics system of the future. It is inevitable that total depot level maintenance will decrease as the increased effectiveness of newer weapons enables us to perform our missions with a smaller force structure and as missiles, with their smaller maintenance workload, replace aircraft. Industry and the Air Force must adjust to this decreasing workload. In defining the precise role of each, there are several factors we must keep in mind.

In the first place, the firms now engaged in contract maintenance have served the Air Force well, and we recognize an obligation to do everything possible to ease the effects of this adjustment on them. We also recognize the real benefits to be gained by contract maintenance and are desirous of continuing to utilize it to the greatest extent possible.

But we recognize another obligation as well—an obligation for the defense of the country. This obligation is the sole reason for our existence. It is one responsibility we cannot contract out. To fulfill it we must retain the capability of maintaining our first-line weapons within the Air Force. Maintenance and in-service engineering capability are essential to guarantee operational readiness under all types of conditions and to maintain the necessary flexibility to be able to cope with emergencies. The importance of this flexibility is so obvious that it needs little emphasis; several very brief examples will serve to illustrate how vital it is to the logistics mission.

Immediately upon the outbreak of the Korean hostilities, depot personnel and facilities were diverted from routine maintenance and modification to around-the-clock processing of large numbers of aircraft for combat. Within two weeks 145 F-51 aircraft had been processed through Sacramento and were on their way to the Far East. Skilled maintenance technicians also were dispatched to tactical bases to assist in readying other combat aircraft for immediate deployment. Hundreds of critical items such as propellers, armament, and communications components were processed through the depots on an emergency basis and airlifted to the combat theater.

It is difficult for contractors to achieve this same degree of flexibility. For instance, during the Suez emergency movement of SAC KC-97 and B-47 aircraft to both depots and contractor facilities for routine maintenance was temporarily stopped. The depots were able to redirect over 130,000 manhours to immediate support of SAC bases and to the emergency repair of critically short supply items. On the other hand, the contractors who had been processing the same SAC aircraft did not have this capability and were forced to reduce their work force instead.

Another example of depot flexibility and versatility occurred recently when hail and high winds damaged vital first-line aircraft at two SAC bases. Within twenty-four hours after the damage to KC-97, B-47, and C-124 aircraft at Dyess Air Force Base, Tex., last June 8, San Antonio had dispatched 115 highly trained technicians to assist SAC in making repairs. In the case of a similar incident at Ellsworth Air Force Base, S.D., three weeks later, Oklahoma City and Ogden were able to provide the same immediate emergency support for damaged B-52 aircraft.

Engineering emergencies also arise. A recent example was project Milk Bottle, which required the Air Force to mobilize Oklahoma City and Sacramento on an emergency basis to assist contractors in dealing with B-47 fatigue failures. Personnel of other depots were dispatched to these two facilities to assist them, and within seven days KC-97 aircraft being modified at Oklahoma City and F-86D and F-100 aircraft at Sacramento were buttoned up and B-47s were undergoing "milk-bottle" changes in their places.

To further complicate this problem, on May 7 Lockheed at Marietta was closed by a twelve-day strike. A general strike also threatened the entire industry. The Air Force depots increased B-47 output and made up the slippage of sixteen aircraft during the period of the Lockheed strike. Plans also were laid for immediate mobilization of additional depots to accomplish the total requirement of the B-47 milk-bottle project in the event of an industry shutdown.

Examples like these clearly demonstrate that we must maintain sufficient capability within the Air Force to ensure the combat readiness of our first-line weapon systems and to meet emergencies as they arise. Our obligation to the nation will not let us diminish our capability below this point, although we are reducing our own depot level maintenance effort to minimize the effects of changes in the force structure on private industry.

Of course, it is extremely difficult to define precisely what the cutoff point is. There is no hard and fast rule which will enable us to state precisely which jobs will be done by contract and which will be done within the depot structure. Generally speaking, we will follow the present policy of contracting out maintenance work on those weapon systems which are so new that they have not yet become integral elements of our primary strike force, on those not assigned missions requiring immediate response in defense emergencies, and on aircraft engaged in support activities. In addition, maintenance on our primary strike force weapons will be considered for contract whenever it exceeds available Air Force manpower, skill, or facilities.

Yet even this statement is an oversimplification. We desire to avoid duplication of facilities built up by the contractor during the development and production of a weapon, especially where the projected inventory life is short. Therefore, decisions will be made on an individual weapon system basis. In some cases we may assume only that part of the total support for which it would be necessary to additionally facilitize the contractor. For some subsystems we may never develop a complete in-house capability. Thus, while we intend to upgrade our own internal skills and to modernize our facilities to provide first-line support to both missiles and aircraft, this will be done on a rational basis with as much use being made of existing contractor facilities as possible without compromising over-all operational readiness. Our only fixed guideline is the integrity of our military strength; to sacrifice it for any reason whatsoever would be to betray the defense trust which the nation has placed in us.

We now reach perhaps the most important point of all. Regardless of the precise makeup of this logistic structure, it must be a truly integrated one. As weapons are introduced into the inventory with shorter test periods, there must be more and more feedback from maintenance to development. In-service engineering inputs become especially important. As more sophisticated techniques of requirements computation are utilized and "logistics by saturation" becomes a thing of the past, the elements of the logistic structure must be highly responsive to one another. If the new techniques of management we are now developing are to be effective in a logistics structure made up of elements of industry, the Air Force—and in some cases the other services as well—this structure must become a truly integrated one. Special attention must be paid to the design of data-flow systems; our data-processing machines, no matter whose plant they might be in, must be able to talk to one another. Even the concept of partnership becomes inadequate; the logistics structure must function as a single entity.

Industry-Air Force logistics cooperation has played a vital role in bringing our nation to its present position of strength. Together we have surmounted many problems. We will overcome many more problems in the days ahead.—END

PRIMARY TASK: FORESEEING THE FUTURE

Lt. Gen. Samuel E. Anderson
COMMANDER, AIR RESEARCH & DEVELOPMENT COMMAND

General Anderson's presentation and the presentation by General Carpenter, which begins on page 151, are excerpted from cleared versions of reports given during the Dallas meeting at classified sessions for industry on Industry Day, Saturday, September 27. ARDC classified sessions were in the afternoon, AMC's in the morning.

THE primary task of the Air Research and Development Command is to anticipate the offensive and defensive requirements of the combat commands of the Air Force, and to aim its research and development efforts toward more advanced weapons to meet those requirements.

In our planning we must be from ten to twenty years ahead of today's combat requirements.

In the area of offensive warfare, we will have a requirement for both manned and unmanned vehicles for our strategic operations. As the satellite and ballistic missile extend their performance capabilities, they will gradually come into greater prominence. We then foresee a balanced force composed of both manned and unmanned weapon systems, each complementing, but not replacing, the other. During this time period, a considerably improved manned vehicle system may well be required. It is an ARDC objective to provide such a vehicle, should the need arise and the Defense Department have a definite requirement for it.

Another very desirable weapon system during this period would be a highly reliable primary strike missile with improved CEP (circular probable error) and extended range.

In the latter stages of this time period, we must anticipate the appearance of new concepts of warfare. These may include the launching of nuclear weapons from satellites, or the control of ground-based missiles to selected targets from satellites on fixed or controllable orbits. Such a capability would provide this country with a tremendous psychological deterrent and a decisive military force.

Turning to the area of air defense operations, our immediate objective is to provide a radar screen which will detect enemy ballistic missiles and offer a minimum of fifteen

(Continued on page 150)

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minutes' warning. Similarly, we must have radars and other tracking devices able to provide surveillance against space and satellite vehicles passing over our country. Because of the limitations of radar, the application of other sensory techniques is being widely investigated.

The operational life of present defensive systems will continue for some years. It is possible that, during the latter part of this period, unmanned warning satellites may be feasible to detect hostile activity. If so, such vehicles could provide a more complete warning system for the entire western hemisphere and would augment the ground-based early-warning radars.

Defensive combat forces will include weapon systems defending against vehicles operating both in and above the atmosphere. Both manned interceptors and guided missiles will be required to carry out defense combat missions against atmospheric vehicles. Throughout this period, we must improve our capability for defense against ballistic missiles and glide-trajectory versions thereof.

Naturally, as we look into the far future, it becomes increasingly difficult to conceive all the aspects of space warfare. It may require the abandonment of existing concepts of force employment. Future wars may divorce themselves entirely from the home planet, and enemy strategy might employ dispersal techniques, such as space stations and lunar sites for munitions stockpiling. This possibility demands that the strategic and defensive forces be sufficiently versatile to destroy enemy offensive capabilities wherever they may be found.

In discussing possible future weapon systems we must not lose sight of the basic research that must be carried on across the board before these advancements can become possible.

Our research program is carried on, both by ARDC centers in their laboratories, and by contract with outside agencies. In 1958, over 950 basic research contracts were in effect, sixty-eight percent with universities and colleges, thirteen percent with independent laboratories. Only eight percent of the total effort was conducted in-house by ARDC center laboratories. The remaining eleven percent was performed by other government agencies and industrial laboratories.

One most important research area is propulsion. A facet of research in this area is the study of energy sources. Some of these sources must be stored within a vehicle. For example, the solid propellants. Others may be available in the environment in which the vehicle operates. Possible sources of energy are chemical, nuclear, or electromagnetic.

In the field of chemicals, of continuing interest is the study of high energy chemical bonds, their groupings into compounds, and their synthesis into storable propellants offering high performance. We must not overlook the study of bond dissociation energy, ionization energy, and the mechanisms of free radical formation. We must seek ways and means of employing the vast amount of energy available from sources capable of fission or fusion. Other possible direct energy sources to be considered are radioactive fission products and artificially produced radioactive isotopes. Various fields of investigation and their mutual interactions must receive intensive and continuing study. Examples of these are the radiation field of the sun, the magnetic and gravitational fields of the earth, and fields for accelerating ions and plasmas.

Another most important area for research is that of materials. Progress in materials has reached a point where only marginal improvement can be anticipated unless, and until, research unlocks some of the numerous secrets still guarded by nature. These secrets concern the basic principles of matter, its structure and energy relationships, and their correlation to the physical and mechanical properties required by the designer. Only when we have discovered these secrets and reduced them to new theories and concepts can we hope for really significant progress in the materials area. And only exploratory research can point the way to new, unique, and unusual materials.

As man attempts to venture beyond his familiar planet into the unknowns of space, he must learn more about both *earth* and *space*.

We spend many of our research dollars on geophysics because precise data are required on the size and shape of the earth, and on its gravity and magnetic force fields. We need to know more about the lower atmosphere—that region roughly bounded by the surface of the earth and the ozone layer—in order to determine its chemical composition, electric field and phenomena, optical properties, visibility factors, etc. We must study the upper atmosphere, because this is the region in and through which vehicles and missiles of the future may operate. Here a thorough knowledge of all its properties is essential environmental information. Extensive research into the unsolved problems of electrodynamics and celestial mechanics will lead to a clearer understanding of the gravitational, electric, and magnetic fields throughout the universe and their influence on and possible employment by space vehicles.

Research in the biosciences is emphasized because we must learn as much as possible about the human organism and the limits of human performance and tolerance. Our broad objective is to improve human performance of *required* duties and tasks. To improve that performance, we need to know such things as: G-time tolerance; thermal tolerance; radiation tolerance; chemical toxicity loss of sensory perception and association; and psychic stress.

Our task is not just to find the answers. We must, in many cases, invent and develop the methods, tools, and techniques used to obtain those answers.

All of us realize that we must strive for less complexity and more reliability in the design of future equipment and weapons. These have always been our objectives. For example, the Minuteman is expected to be a less complex and more effective weapon than its predecessors. But, although reliability is a primary objective of design, we also realize that 100 percent reliability cannot be expected. We must, therefore, always consider the possible consequences of failure. Failures occur all too frequently and are too costly in equipment and manpower. The very possibility of failure calls for "fail-safe" design.

As we look to the future, it appears that we shall not be producing weapon systems in large quantities as we did the B-17s and P-51s of World War II, nor the B-47s and F-86s of the post-World War II era. Today's and tomorrow's new weapons will be able to deliver far greater punch per weapon system, therefore, fewer systems will be required. Although quantity-wise, weapon system production may not be comparable to that of the past, total defense effort will not be less; it will be invested differently.—END

A graduate of West Point, class of 1928, General Anderson won his wings in 1929. After serving in Hawaii and at bases in the US, he served with the Air Staff in Washington, later going to England in 1943 with the Ninth Bomber Command. In 1945, he was named Chief of Staff, Continental Air Command, and later commanded SAC's Eighth Air Force. In 1953, he became FEAF's Fifth Air Force commander. General Anderson is a native of Greensboro, N.C.

GETTING THE MOST FROM OUR R&D BUDGET

LT. GEN. ROSCOE C. WILSON
DEPUTY CHIEF OF STAFF, DEVELOPMENT, USAF

The following excerpts are from the remarks of Lt. Gen. Roscoe C. Wilson, Deputy Chief of Staff, Development, USAF, before the AFA Industrial Briefing at Dallas, Tex., on September 27:

This year [fiscal year 1959], the total research and development program approximates $3.0 billion. This is almost one-sixth of the total Air Force appropriation. This large amount does not provide funds for the development of all systems and components for which the Air Force has a requirement. Consequently, it is going to be necessary to take a closer look at our weapon system developments and to limit the work to those only that can be accomplished within the resources available for R&D. . . .

The realization of this goal will be based on our ability to more accurately cost the full development of a weapon system. . . . Before we give the go-ahead for an expensive weapon system we need to have better methods of knowing what it is going to cost from the very beginning to the very end.

It seems evident to me that with increasing demands for performance and reliability, and with limited funds to spend in the future, we cannot continue with only incremental improvements in techniques and minor adjustments in methods. Barring a war, the prize of future R&D contracts must certainly go to those companies who are starting now, as many are to devise new, better, quicker, and therefore less expensive, ways of fulfilling their obligations to the nation.—END

PLANNING TOMORROW . . . TODAY

Brig. Gen. John W. Carpenter, III
DIRECTOR, PLANS AND PROGRAMMING, ARDC

THE AIR Research and Development Command's mission is to anticipate what the Air Force's needs are going to be fifteen to twenty years in the future.

From the angle of planning and program management, we are faced with two major problems. They are the conversion of knowledge in scientific disciplines and technical fields to applications enabling us to produce new weapon systems, and the forecasting of what will be feasible in the future.

The first problem requires us in ARDC to look like scientists and engineers to the rest of the Air Force and to look like military people to the industry and scientific community. We must be the converter through which information from basic research areas, such as mathematics and solid-state physics, is encouraged in the scientific community. We must assist in bridging the gap between basic

(Continued on page 155)

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and applied research, so that knowledge gained in fields of basic research can be applied to the problems confronting the Air Force.

Likewise, in technical areas such as propulsion, electronics, and geophysics we must provide the conversion factor to encourage component development and the assembling of those components into weapon systems for use by combat and operating commands of the Air Force.

The national objectives are reflected in Air Force war plans. In turn, it is the responsibility of USAF Headquarters to provide ARDC with research and development objectives.

The building of USAF objectives is a cooperative effort of the operational elements of the Air Force and ARDC. Part of our job is to forecast what will be feasible in the future and to suggest new types of possible weapon systems. This is a "chicken-and-egg" proposition. We take a look, make a forecast, and tell headquarters what we see as possible, and they tell us and the rest of the Air Force in their planning and programming documents what they want done. Then we draft specific research and development objectives.

Planning for research and development has been studied by industry in the past eight or ten years. To the normal businessman, a long-range plan may run as far as five years in the future. From that point on, he hesitates because of uncertainties.

In Air Force research and development planning, on the other hand, five years is hardly a start when you consider that many of our weapon systems development cycles take as long as ten to fifteen years. Our long-range planning must go out far beyond that time if basic and applied research are to provide the knowledge and the developments necessary to build weapon systems which have not become operational for twelve to fifteen years.

Planning of this nature will never be attained by extrapolation of the present state-of-the-art. We believe that our long-range planning efforts must be for the next generation system, and the one following. They must be *so revolutionary* that we will be seeking scientific breakthroughs rather than wondering what to do with them if and when they occur.

It is our belief that such planning can be done and done with validity. In this country we have but one outstanding example of such an attempt. I have reference to the long-range development document covering the period to 1965 prepared in 1945 by Dr. Theodore von Kármán and associates, and entitled *Toward New Horizons*. This document has proved to be accurate in its broader aspects and appears to be valid in many respects for the future. For example, it recommended, in 1945, that a large guided missile development center be established to develop an ICBM capability. In 1955, the Ballistic Missile Division of ARDC was established—ten years later.

The next obvious point is that we must *not* keep our conclusions with respect to future requirements of the Air Force to ourselves. Since we work as a team with industry and the scientific community of the nation, it's necessary for us to give other team members results of our thinking as to where the Air Force of the future should go.

If you follow the planning cycle, you will see that we arrive in the technical planning area at the point where we develop Technical Program Planning Documents—TPPDS, and Research Planning Objectives—RPOs. The TPPDs are written in twenty-three technical areas:

These are: (1) deceleration devices techniques; (2) secondary power; (3) support equipment techniques; (4) mechanics of flight; (5) materials; (6) propulsion; (7) geophysics; (8) protection and sustenance of personnel; (9) human performance; (10) surveillance techniques; (11) communications techniques; (12) electromagnetic warfare; (13) electronic techniques; (14) computer techniques; (15) reconnaissance; (16) electromagnetic vulnerability reduction; (17) intelligence techniques; (18) nuclear warfare; (19) advanced weapon; (20) vehicle defense; (21) weapon fire control; (22) flight control; and (23) navigation and guidance.

In each, we look specifically at the technical possibilities for a period of fifteen to twenty years ahead and point out goals and objectives which should either be achieved or explored.

In basic research, we have six research program objectives: propulsion, materials, electronics, geophysics, biosciences, and aeromechanics. These RPOs are more general in nature than our TPPDs and point out areas of particular interest to the Air Force.

In the weapon systems area, we also have more detailed plans based on the guidance of our long-range plan. These are known as Development Plans and Systems Requirements. A development plan is written by ARDC, generally with the assistance of industry, to outline how a specific weapon system will be developed; the system requirements are established in the following study areas:

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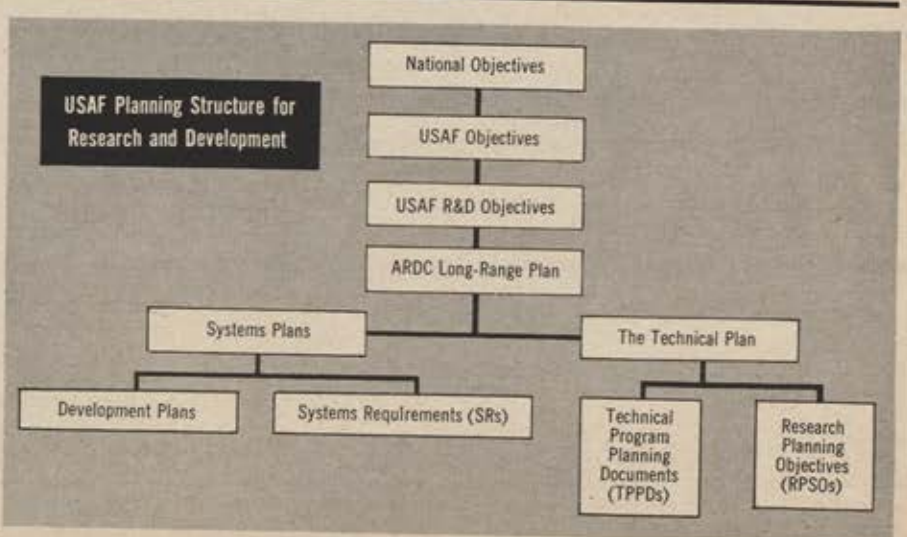

Chart at right illustrates schematically the Air Force's planning structure for research and development, an increasingly complicated job in today's world of speedy technological advances, complicated budgets, and "lead times."

- Aircraft studies run the range from very heavy, long-range nuclear aircraft to hypersonic boost-glide strike vehicles with increased emphasis on the defense and quick strike systems.
- Missile studies center on development of simplified missile systems with increased payloads. Parallel studies consider space system applications to the military mission.
- Electronic and ground system studies increase information on the collection of intelligence and provide adequate early warning. Special emphasis is being placed on data transfer between automatic systems.

ARDC subscribes to the program of making information available to our other team members. Our technical program planning documents, research program objectives, and systems requirements are made available to the scientific community and industry in accordance with established security procedures.

Since the fall of 1955 we have established eight long-range planning committees to assist our headquarters plans staff: guided missiles and space vehicles, propulsion, aircraft, electronics, materials, aerosciences, intelligence, and facilities.

Our committee on intelligence was not established until July 1957, due to the security ramifications involved. It was given the following mission: To look into every scientific discipline as to its application to the intelligence problem without limitation to preconceived ideas and allowing the potentialities of science to be explored; to determine initial estimates of facilities, manpower, financial, and management requirements; and to consider all phases of collection, production, or analysis, and dissemination of intelligence with emphasis on novel scientific approaches.

The report of the intelligence committee has been completed and was submitted to our commander this past summer. The intelligence area in today's arena is of critical importance and one on which a more concentrated application of the physical sciences should provide great dividends.

Upon the completion of our committees' work, ARDC requested the National Academy of Sciences to assist in producing the final technical estimate, using our original "in-house" effort as a departure point. The Academy secured the services of Dr. von Kármán.

Over the past two summers, under National Academy of Sciences and ARDC sponsorship at Woods Hole, Mass., Dr. von Kármán has assembled an outstanding group of scientists as an advisory panel to assist us in our final integrated forecast. The Academy has promised a final report of the two years' work by December of this year. We expect, from this effort, to have an integrated technical estimate outlining in general order of priority and properly time-phased, a course of action that will give us the basis for our planning for the next twenty-year time period.

Our committee on facilities was established in August 1957, and this past summer the National Academy of Sciences Summer Study Group also had a facilities committee to assist us in our planning. Actually, the facilities area has caused us some of our greatest headaches in the past and present. Appropriate facilities never seem to be ready at the time and place they are needed. Naturally, the proper phasing of these R&D facilities is most important to us since they are the tools required to carry out the technical estimate of the plan.

As you know, research and development problems usually are not solved by single decisions. They require a series of consistent actions in proper sequence, made over a relatively long period of time. In reviewing this process with respect to facilities, we find that our decisions generally have ranged in the time cycle of one to ten years. But with the ever-surprising forecast of technological advances to come, and with the accompanying complexity of facilities indicated, if we continue our present exponential rate of advancement, R&D facilities' useful life-span may well be ten years or less as compared to our present fifteen to twenty-five years.

Additionally, trends indicate that some major R&D facilities will be used for transition into the initial operational capability. Our problem becomes one of determining the need for research and development facilities in the period ten to twenty years in the future and in keeping with the technical forecast for the same time span.

Turning to the manpower portion of our long-range plan, our objective is to determine the command's manpower requirements from ten to twenty years in the future. We are concerned with the qualifications of the individuals to fill our required spaces. Primary attention will be focused on an attempt to forecast scientific skills or disciplines required and the approximate number of these skills involved. We will also attempt to identify new and unique requirements. As an example, perhaps we may determine that we will need an "astrocartographer," and none is available. It is estimated, let us say, that five years would be required to cross-train from another skill, or seven years to produce from scratch.

Obviously we cannot approach this problem as one merely of numbers and quality. Some of the underlying factors are such things as attractiveness of the job, civil service laws, competition, and management requirements.

Management must be dynamic and must change as the other parameters of our plans vary. Management of research and development on a short-time basis is difficult enough, and is subject to continual change. In any event, our long-range management plan will identify significant factors of long-range management implications, such as location and grouping of facilities, for the best use of our talents and resources. Also, we will consider using communication in its broadest aspect, such as reporting systems, means of transmitting data, and so forth.

Because of the progress we make from year to year and the personnel involved, we predict that for the next twenty-year time period, organization in Air Force research and development likely will remain fluid.

The financial estimate aims to ensure that we have necessary funds available in a timely manner, at a reasonably stable level, all factors of economies considered. Since we are not at all sure what the value of our dollar may be in 1978, details of how much we will need in the next twenty-year time period become difficult to estimate.

The idea that the Air Research and Development Command would ever complete a long-range plan for the next twenty-year period, place it, morocco-bound, on a shelf, and try to live by it is the thing furthest from our minds. The entire plan is dynamic—a continuing process in which we use feedback from every level of the government, industry, and the scientific community to maintain it in the most up-to-date terms possible.—END

A graduate of the US Military Academy, class of 1939, General Carpenter is a native of Mississippi. Previous assignments he has held include: Commander, Fifth Reconnaissance Group; Vice Commander, Thirteenth Air Force; Deputy for Operations, ARDC; Chief of Staff, ARDC; Vice Commander, Arnold Engineering Development Center. The General is also Vice Commander, ARDC, stationed at Andrews AFB, Md.

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PROGRESS REPORT ON THE RESERVE FORCES

Hon. David S. Smith

ASSISTANT SECRETARY OF THE AIR FORCE,
MANPOWER, PERSONNEL, AND RESERVE FORCES

I RECENTLY ran across this paragraph in an article about Reservists:

"The citizen-soldier has brought to the military establishment a drive, a resilience, and a toughness born of the market place, and an understanding of civilian thought. . . . Those virtues, combined with the more advanced technical skill and more extensive experience of the Regular, have formed an unbeatable combination. . . ."

In this statement, the author captured a thought I would like to reemphasize: *"The virtues and skills of Reservists coupled with the skill and experience of the Regular form an unbeatable team."* If the Air Force did not believe this, it would not today support a Reserve Force of more than half a million people at a cost of nearly half a billion dollars a year.

The Reserve program is an integral part of any long-range plans made by the Air Force. Reserve units and individual Reservists will be counted on to accomplish specific missions in line with our readiness concepts or to augment the Regular structure. For if this nation is forced into war, either local or global, we will use our best equipment and most competent specialists to bring the conflict to a decisive, successful conclusion.

To emphasize this, let's examine the defense environment in which Reserve activities should take place, underscore the importance of Reserves to the Regular force, and point out the efforts now being made to enhance Reserve capabilities.

The defense environment in which we find ourselves today is one of comprehensive capability, characterized by vigorous efforts to reduce reaction time. It is axiomatic that the closer we can be, timewise, to the source of potential aggression and to the potential aggressor forces, the more effectively our defending and retaliating combatants can accomplish their assigned missions. In other words, national survival may well hinge on this time proximity factor.

Such proximity can be developed or assured in three ways: through streamlined direction of combatant forces; through high-speed air and aerospace weapon delivery systems; and through a continuously alert force in being. The task facing the Defense Department in general and the Air Force in particular is to blend these three approaches into one integrated *course of action*.

As to the first of these—through the new Defense Reorganization Act, steps are being taken to streamline direction of the unified and specified commands. These units of all military services are now under the direct control of the Secretary of Defense. His orders to them are put into motion by the Joint Chiefs of Staff.

While the other services are integral parts of these combatant commands, it is implicit that primary reliance for effective counteraction to aggression will be on air and aerospace weapon systems. This is true because these systems can reach trouble spots more quickly and with less interference from enemy forces.

The Air Force has the primary task of assuring rapid technological progress with these weapon systems and their support equipment. This task is being thoroughly carried out through the Air Force-industry team approach. A definite pattern of progress is firmly established in all hardware categories.

For instance, in the piloted bomber field, this pattern extends from the B-47 and B-52 through the supersonic B-58 to the 2,000-mph B-70. In the fighter-interceptor field the pattern stretches from those on hand today through the F-101s, F-102s, F-104s, and F-106s to the long-range interceptor F-108.

With regard to missiles: we now have the Matador and Snark; within a few months Thor IRBMs and the Bomarc air defense missiles will be in place; shortly thereafter the Atlas ICBM will augment the SAC bomber force. And the solid-propellant Minuteman should be available to operating units in a few years.

Comparable advances are being made with air-to-air and air-to-surface missiles; with detection, warning, and communication networks; and with ground-support equipment. For the time period beyond these systems the Air Force is moving on a broad front toward development of true space weapon systems. Although specific types have not yet been made definite, it is feasible to expect that beyond the B-70, the F-108, and the Minuteman, both piloted and unmanned space vehicles will be available for performing defense missions.

Inherent in this pattern of weapon system progress is reliance on a professional force of Air Force personnel. Without dedicated, highly skilled operators and maintenance experts, all the marvels of science and industry combined cannot preserve our national well-being.

Professional Reservists are absolutely essential to this total force in being. The Air Force is relying heavily on Reserve units to accomplish specific missions, on mobilization assignees to fill vital spot vacancies in case of emergency or war, and on backup Reservists to serve as attrition replacements.

Advisory panel at the well-attended Reserve Forces Seminar included, left, Lt. Gen. William E. Hall, Commander, Continental Air Command; Maj. Gen. R. A. Grussendorf, Assistant Chief of Staff for Reserve Forces; and Maj. Gen. Winston P. Wilson, Deputy Chief, National Guard Bureau.

To prove that Reserves serve as an integrated part of the active force today, I would like to talk about a couple of recent incidents in which Reserves were involved along with the active force in matters of greatest interest to the Air Force. During the recent crisis in the Middle East, one of our Reserve units was of great service in helping to move Regular personnel and supplies from one part of the country to another, and we were very glad to make use of their well-organized airlift capacity. Another example is the active assistance that was given by transport aircraft in retrieving the nose cone of one of our recently fired ballistic missiles from the waters down range from Cape Canaveral. Increasingly, we are able to cite examples like these where participating Reservists are closely integrated in their active-duty periods with units of the active Air Force.

This reliance on Reservists is due primarily to their skill and experience level. The experience level of certain Guard fighter units actually exceeds that of same active-duty forces. Further, many senior Reservists have filled responsible administrative and technical positions with the active forces as well as with their current units. We mean to make the fullest use of this skill. Increasingly we are putting emphasis on quality rather than just quantity in our Reserve personnel requirements.

In addition to the military contributions expected of Reservists, there is another all-important role which only they can fill. As a special body of American citizens working in both military and civilian capacities, they form a bridge of understanding between the active defense forces and the civil population. Their thoroughness in carrying out this portion of their responsibility will *directly* affect the kind and amount of support the citizens of this nation give the Air Force.

In recognition of the over-all responsibilities of Reservists, efforts are constantly being made to improve the whole program. Right now, these are primarily centered around the Air Reserve Technician plan, the reorganization of training centers, and proposed amendments to the Reserve Officer Personnel Act—ROPA. In addition, we are looking ahead into the many fields in which Reservists can be used. As an example, use of Reservists in the civil defense structure is currently under consideration. It appears that the Standby Reservist could use his background of military training and experience in making a tremendous contribution to the national interest in this area.

Concerning the Air Reserve Technician program—it has been my conviction from the outset that this was an excellent method of maintaining Reserve effectiveness and giving full-time continuity to a part-time activity. We are making progress in implementing this improvement program.

As another action aimed at improving the Reserve program, the training center structure has been reorganized. Now, the ninety-three nonflying training centers will be under sixteen wing headquarters instead of the four numbered air forces. These new headquarters are not to be merely administrative offices. Their primary function is to supervise the training programs so that personnel assigned to the centers will receive better training than has been the case previously. By limiting the span of control of these headquarters, CONAC has greatly improved training administration.

Finally, a few words about ROPA.

The Air Force has been working for several years to develop a legislative package to amend this 1954 act. Because ROPA has such a profound effect on all of its Reserve officers, the Air Force has applied one cardinal principle in developing these amendments. This is that the provisions of law pertaining to Reserve officers should, as much as possible, parallel the provisions governing Regular officers. So, in addition to correcting deficiencies in what was a too hastily written law, we have slanted all amendment proposals toward that cardinal principle.

In these amendments are those aimed at correcting the most commonly recognized deficiencies—elimination of the "pusher" clause, and stopping the losses our units might have to suffer in younger officers, among others. We have included provisions to assure an uninterrupted career for those employed in our Air National Guard and recently established Air Force Reserve Technician program.

But most important are those provisions that establish one promotion list for all Reserve officers regardless of their category: active-duty, Air National Guard, or the Ready or Standby segments of the Air Force Reserve. This promotion list looks like and works just like the Regular promotion list. Yet, we have preserved the opportunity for an accelerated advancement for those on active duty and those in the Ready Reserve.

Admittedly, the job of developing amendments to ROPA has taken a long time and seems to have been inordinately delayed. However, at present, there seems to be every reason to expect its enactment by the first session of the next Congress—we hope early in 1959.

I am convinced that the bill that is now being readied for submission to the Congress will prove to be of great benefit to the Air Force, its Reserve Forces, and to our Reserve officers, individually and collectively.

The stage is set for streamlining our combatant forces. The Air Force-industry team is making rapid strides in developing and producing progressively higher performing weapons, weapon systems, and support equipment. Within the environment of these factors, it is up to the Regulars and Reserves to join forces in the all-out drive of building and maintaining an efficient force in being.

I am positive this can be done. With full cooperation from all Reservists, and with continued support from Congress and the Department of Defense, there is no doubt that the Air Force can and will fulfill its assigned missions.—END

David S. Smith is Assistant Secretary of the Air Force for Manpower, Personnel, and Reserve Forces. Named to his post in 1954, Mr. Smith is a lawyer and native of Omaha, Neb., who received degrees from Dartmouth and Columbia Law School. A naval veteran of World War II, he was wounded in the Pacific. His assignment includes responsibility for manpower and personnel policies in the Air Force, and he represents USAF in those areas in the Defense Department.

LEGISLATIVE ANALYSIS

Hon. Overton Brooks
CHAIRMAN, SUBCOMMITTEE FOR RESERVE AFFAIRS,
HOUSE ARMED SERVICES COMMITTEE

WE HAVE a lot of legislation in Congress affecting the Reserve program of the Air Force. We have a lot of legislation on the books that we have put there in the past, and I think in discussing this subject, it is well to keep in mind the fact that the Reserve program is vital to the security of the nation.

An indication of how vital the knowledge and skill of the Reservist is may be gained from one fact: that more than 196,000 officers now serve on active duty with the Regular establishment. It is obviously true that the knowledge and skill of those being returned to civilian life must at the same time be maintained through new participants in the Reserve program.

Many who have studied our defense program believe that Congress, recognizing the importance to the active forces, has dealt generously with the Reserve. Through legislation since World War II, the status of the members of the Reserve has in a large measure been brought up to the approximate equal of the active forces. At present there is equality in treatment, in pay, in promotion, and in nearly all benefits. One exception remains. This exception is the tenure of Reserve officers serving on active duty.

Before discussing the legislation which Congress has passed, it is well to remember that when we speak of equality, we mean only equality between the Regulars and the Reserves performing the same type of duty. It, of course, is not equitable to compare a Reservist on inactive duty with a member of the Regular establishment, or for that matter to compare a Regular on active duty with a Reservist serving on active duty. Nearly everyone will agree that a person who is making a full-time career of the military service should, in most instances, receive different benefits and more repeated promotions than a person who is only a part-time soldier. Retirement is a very good example of what I have in mind. Surely Reserves would not expect, after twenty or even thirty years of inactive Reserve service, to receive the same retirement benefits in dollars and cents as a Regular who has served full time for the same period.

On the other hand, Reserves on active duty are and should be considered as Regulars for all general intents and purposes. Reserves on inactive duty compete among themselves for promotion and for their own type of benefits. In the past few years Congress has enacted legislation establishing benefits for the Reserves which are almost unparalleled with any other single group, either civilian or military. This does not mean in any sense that we have come to the end of Reserve legislation. It does mean that the Reserve program has moved forward with a stride and a confidence which has amazed the nation.

In 1948 the first important piece of legislation for the Reserves was enacted into law. This was the Reserve Retirement Act which permits Reserves to retire after twenty years of active service. This act also authorizes retirement after twenty years of combined active and inactive service. In the latter case, of course, the benefits may not be received until the Reservist reaches the age of sixty.

I worked for eleven years on the Reserve Retirement Bill. I first introduced it as a resolution in the 1939 session of Congress, and each year thereafter I built up a more detailed and more acceptable bill until its final enactment.

The last provision of this law constitutes one of the finest retirement systems one can imagine. The Reservist must only have served as little as one day of active duty during World War I, World War II, or during Korea. Conceivably, all other satisfactory service can be earned by the Reservist in the Inactive Reserve at the rate of fifty or more points per year. Reservists are urged also to attend weekly drills and annual periods of active duty for training. It is also conceivable (but not recommended), that he can earn all of his points in order to qualify for retirement by merely taking correspondence courses. He cannot, however, draw benefits under the Retirement Act until he reaches age sixty.

On the other hand, it is to be assumed that this type of Reservist is participating in another type of retirement plan or plans with his civilian employment. As a result, the Reservist is able to draw checks from two pension systems—one being the Reserve Retirement Program, which has cost the Reservist nothing whatsoever, and the other being a civilian program.

The next important statutory benefit for the Reserves was the Armed Forces Reserve Act of 1952. This has been commonly referred to as a Magna Charta of the Reserves. It establishes the Reserve in statutory entities. It prescribes methods by which the Reserves could be called to active duty and provides authorization for the Reserves to work off their vulnerability so that they can in regular course be transferred to the Standby Reserve and thus not be called to active duty except in time of war or national emergency declared by Congress.

In 1954 the Reserve Officer Personnel Act was enacted. This provides a statutory system of promotion for the Reserves. Under this law, the Reserves must be considered for selection for promotion at various stages in their careers.

The National Defense Reserve Facilities Act was enacted, and today almost $600 million has been appropriated under the terms of its benign provisions. These sums can be used for construction of armories and other Reserve facilities throughout the nation. In this connection, Congress continues to appropriate more money for Reserve facilities and will undoubtedly continue to do this for four or five more years until the Reserve facilities program has been completed. I believe that I have introduced every

bill providing authorizations for construction of Reserve armories and Reserve facilities generally.

In the Eighty-fourth Congress, the Survivors Benefit Act was passed. This act sets up a new system of providing benefits to the survivors of servicemen, including Reservists. In addition active-duty service or active duty for training is accepted as qualifying service under the Social Security system, and for the first time, persons in the military establishment who have not heretofore been able to qualify for Social Security benefits may now be entitled to do so. Not only will this act benefit their survivors in case of their death, but they will be entitled to draw Social Security benefits themselves in addition to their military retirement benefits.

Another long-sought objective for the Reserve establishment was enacted in the Eighty-fourth Congress. This act provides for a lump sum financial settlement for Reservists who are involuntarily released from active duty after more than five years of continuous service. This law provides that Reservists who are involuntarily released will be entitled to a half month's base pay multiplied by the years of active duty. In the Eighth-fifth Congress, just adjourned, the House unanimously passed legislation increasing the readjustment pay for involuntarily released Reservists from one-half month to two months' basic pay, multiplied by the number of years served. Unfortunately, however, the Senate did not pass this bill before adjournment and thus the measure died. Of course, it will have to be reintroduced in the next Congress. I have already introduced a measure which I will reintroduce in January for this purpose.

During the Eighth-fourth Congress, an Officers Augmentation Act was passed. This action initiates the move to absorb thousands of Reserve officers into the permanent military establishment. As a consequence of this new legislation, Reservists who desire a career in the Regular service may now have the opportunity to qualify under this law and move from a Reserve status into a Regular officer's status.

Probably the most important piece of Reserve legislation enacted in recent years was approved by the President in 1955. I introduced this bill, held hearings on it before my subcommittee on Reserves, and assisted by other friends, pushed it through to enactment into law. Under this new law, for the first time, young men have been able to enlist in the Reserves and spend only six months on active duty for training and then finish their Reserve service obligation as members of Reserve units in their own home towns and cities all over the nation. One of the difficulties with Reserves in the past has been the lack of enlisted men. This act will go far to supply the necessary enlisted personnel to the Reserve units.

In addition to this, this Reserve Act of 1955, for the first time, provides authority under law to compel the attendance of Reservists at unit drills and annual field encampments. Of course, this is only used for those Reservists who have uncompleted Reserve obligation. This applies largely to the so-called "Ready Reservists." You will hear a great deal more about the provisions which definitely require Reservists to complete their Reserve obligation.

There are many other acts of Congress, too numerous to mention, which have been of benefit to the Reserves. Some of these are the authority from the Army and from the Air Force to retire officers in the highest grade attained. We passed a law providing the protection of the courts to job rights of men returning from Reserve training duty. Congress passed an authorization for a tax credit permitting retired military personnel under the age of sixty-five to earn over $1,200 annually without the loss of retirement credits on income tax. Legislation was also enacted affording leaves of absence with pay for substitute postal employees attending Reserve active training duty. Thus the Congress took care of the last group of government employees at that time entitled to a military leave of absence with pay.

Perhaps the legislation of greatest interest passed during the past session of Congress was the Military Pay Bill. This bill raised the rate of pay of Reservists and retained their pay on the same basis as that of Regulars. When the Department of Defense sent this bill to Congress with its recommendations, it did not contain the recommendation that Reserves would be entitled to the same rate of pay as Regulars when serving on active duty for training or when performing drills. Our Committee on Armed Services, however, quickly caught this omission and amended the bill so as to continue the equality of treatment as between Regulars and Reserves.

It is a little early to predict what legislation concerning the Reserves will be considered in the Eighty-sixth Congress. I believe that the Armed Services Committee will consider a term contract retention bill. I have already introduced such a bill, and I propose to introduce it again in January. This pertains to the tenure of Reserve officers serving on active duty. After repeated requests made by the Reserve Subcommittee, of which I am chairman, and by the House Armed Services Committee, the Department of Defense has been persuaded to go along with legislation providing term retention contracts for Reserves serving on active duty. We will give high priority to this bill, and it will be taken up early in the first session of the next Congress.

Under its provisions, a Reserve serving on active duty will be given a contract which may be renewed periodically, and by virtue of this contract he will always know how long he is entitled to remain on active duty. If he should be released involuntarily, he will in this event be paid two months' severance pay for each year served on active duty. Furthermore, after a long service, he will be guaranteed continued tenure until he is able to qualify for twenty-year retirement benefits.

In addition to this bill, the House Armed Services Committee plans a complete restudy of the Reserve Officer Personnel Act. We have found a number of instances where the act, instead of helping, is curtailing promotions for Reserve officers. The Air Force Reserve and the Air National Guard officers are being hurt because of the mandatory provisions of the act which require their selection for promotion even though no vacancies in units exist. As a consequence of this fact, many fine officers are being promoted completely out of a billet.

Furthermore, under ROPA we find that many Reserve officers serving on active duty will be released to an inactive status before they are able to qualify for retirement because of the provisions of the act which require that they be transferred to an inactive status after they have completed twenty-eight years of commissioned service. We have many Reserve officers who held Reserve commissions before World War II, but have not served on active duty. They have remained as Reserve commissioned officers, and perhaps have twenty-eight or more years of commissioned service, but may have only sixteen years of active-duty service. I am sure the committee will want to correct this inequity by permitting these officers to remain on active duty until they have completed the necessary years for retirement.

Another matter which has come to our attention regarding Reserve promotions is the case of the Naval Reserve officer not on active duty who is being passed over because of limiting percentages which were written into the Reserve Officer Personnel Act. This act permits a certain

(Continued on following page)

percentage of Reserve officers in each rank. Because of the limitations in numbers, many fine Reserve officers are being passed over, because to promote them would exceed limitations in the law. Of course, we cannot open the flood gates, but I am sure that on the other hand, the committee will want to review these percentages with the thought of liberalizing them.

There is considerable discussion around Washington concerning a separate budget for the Reserves. This probably would be an excellent idea because the Reserve appropriations then could not be diverted from Reserve purposes by those in authority in the Pentagon.

I am certain such an idea will meet considerable opposition. It occurs to me that the Reserve may be fully protected by handling this matter in another way. We should in the future ensure that the provisions of all appropriations bills which pertain to the Reserves carry in themselves suitable language which would prevent Reserve appropriations from being transferred to the Regular services. These provisions would ensure that in the future when Congress stipulates that money shall be given to the Reserves, this money may be referred to its proper designation without being diverted.

New programs are undoubtedly going to be needed in the future. We do not have static organizations in our Reserve components. They must be changed and modified and revamped in accordance with the progress of our times. With the further development of the atomic bomb and the guided missile, legislation will undoubtedly be needed to modify the Reserve program accordingly. I see no reason why the Reserves of the future should not be so trained and adapted as to meet the needs of future warfare. Of course, the guided missile program lends itself especially to the missions of our Reserve components. As these weapons develop the need for defensive programs within the continental United States, training will be intensified and efficiency of defensive organizations must and will be increased. The Reserve fits into such a program admirably. Fighter planes with terrific speeds are now handled by our Regular establishment, but accelerated training of Reserve pilots to back these men up is certainly to be expected.

QUESTIONS

GENERAL ZUCKERMAN: Mr. Brooks, the Air Force Association is on record as having passed a resolution that has not yet come to your attention, calling for the AFA president to appear before you and your subcommittee and to request you to initiate legislation for a separate budget for the Air Reserve.

Air Reservists throughout the country have felt and expressed the opinion many times that this separate budget would be the only way they could obtain the flexibility they felt is required in order to keep a combat-ready Air Reserve. You have mentioned that this would meet considerable opposition in Congress. We know of the fight you have put up for all Reserve matters in the past.

I think my fellow Reservists agree that if you and your committee decide that this separate budget would be a good thing for the defense effort, then the request for such legislation would be valid in spite of the other missions. May I ask your opinion on that?

CONGRESSMAN BROOKS: I don't think we differ in objective. The procedure might arouse some differences between us. I can say this. The Reserve Subcommittee has always been anxious to have the advice of this great organization, and we will welcome a representative from the organization to meet with us, and give testimony as to the resolution of the Air Force Association.

The objective is to actually tie down Reserve funds for Reserve purposes. In that, you and I see eye to eye.

One of the most recent subjects was that of the Reserve installations. We have provided the funds for Reserve installations. We were told that in certain categories no additional funds were needed, that there was ample money and that some of it couldn't even be spent. Yet the witnesses who appeared before our committee—almost all of them, without exception—asked for additional funds over and above that which we had authorized. As a result of this, as you know, there was no recommendation for spending in certain categories so as to provide the facilities for Reserve training, in armories and so forth; and in actual landing strips and those things. We modified and amended the bill so as to place therein authorization for funds not required, and not needed, according to those representations.

I think the money is needed. I think it should be provided, and when it comes up at the end of the year, we find money left over from the Reserve program. This creates a rather awkward situation, to find money left over apparently not needed for the program just mentioned.

Does that cover your idea?

GENERAL ZUCKERMAN: That covers a great part of it, except that we still feel that the only way we can get the flexibility required is by a separate budget.

CONGRESSMAN BROOKS: Of course, whether a stipulation for a separate budget is placed in the Appropriation Bill, or in a separate bill, coming out of the Armed Forces Committee, won't make a great deal of difference, provided it is one or the other. You will still have your separate budget.

GENERAL SPRUANCE: Congressman Brooks, I would like to say on behalf of the Air Force Association that we certainly appreciate what you did in introducing the bill to correct the inadequacies and discrepancies of ROPA in the last session. This bill contained the major points of the resolutions approved by the Air Force Association Board, and the Reserve and Guard Council.

The bill, as you know, died through the action, or no action, of the Defense Department.

I would like to ask if you plan to reintroduce this bill, and if you do plan to, whether you plan to have early hearings on it regardless of the actions of the Defense Department?

CONGRESSMAN BROOKS: We plan at this time to have hearings on modifications of ROPA. We certainly do.

I was very happy to hear the Secretary say that the Pentagon is working on that. So it seems to me that we are working together on that program. When the recommendations come, we will look them over with the view of a bill to amend ROPA at an early date. I think we can do that.

GENERAL SPRUANCE: But the matter of the hearings—it could be delayed to death again by the Defense Department.

CONGRESSMAN BROOKS: Well, now, Congress is independent. They have got a mind of their own, and sometimes we find Congress has got a will of its own, too.—END

Hon. Overton Brooks, a member of Congress from Louisiana, is Chairman of the Subcommittee for Reserve Affairs of the House Armed Services Committee. Now serving his eleventh term, he is a native of East Baton Rouge, La., who served in the US Army in France in World War I. He is known as "Mr. Reserve" in congressional circles for the role he has played in sponsoring Reserve legislation.

CIVIL DEFENSE REQUIREMENTS

Lt. Gen. Clarence R. Huebner, USA (Ret.)

DIRECTOR OF CIVIL DEFENSE, NEW YORK STATE

THE primary responsibility for the defense of the continental United States lies with the Air Force. And in carrying this responsibility out, the duty has been assigned to the Continental Air Defense Command, backed up by other great organizations. I would like to think of civil defense as a partner on the team, and its responsibility as the nonmilitary defense of our country in wartime. So, working with the Air Force as a partner, maybe we can manage in some way to win this war—certainly get through the emergency period, pick up our pieces, and go to work then, and finally finish it off.

To get at this problem, I think it is probably well to show how a plan has been developed for this situation and is now in the process of implementation. In New York State it has the force and effect of law, and applies to each and every citizen in the state.

The New York State Civil Defense plan takes into consideration the fact that we have about one-tenth of the population of the United States and about twenty-two percent of the potential industry. Our state is vulnerable to attack both by air and sea and we have twelve targets that would be prime, referred to as target-support areas.

In an emergency these target-support areas are under the command of Deputy State Director with each of the supporting counties headed by a director. The support counties have three missions:

First, to come to the aid of the target city if that city receives an attack. No city can recover from a nuclear attack without outside assistance.

Second, if time permits, the support counties are prepared to receive the evacuees from the target city and,

Third, if the bomb that was destined for the target city should happen to fall on one of the support counties, the county is prepared to carry out post-bomb rescue and relief operations.

We are greatly concerned in the development of a shelter program. A thorough knowledge of the destructive elements of nuclear weapons is necessary to understand the problem of providing shelter for the protection of life. There are four major elements we must provide protection against—light, heat, blast, and radiation.

In the expanded energy of a nuclear blast, fifty percent is blast, thirty-five percent is heat, and the remainder is radiation. The light given off by the bomb is sufficiently intense that, within a radius of several miles, it will cause blindness. However, a simple shielding of the eyes can afford protection.

The heat is so intense that, for example, a car, located over a mile from ground zero, will burn when the upholstery and tires become ignited. While heat is intense, a venetian blind will provide protection.

Of all the destructive elements, blast is the one most difficult to provide protection against. Strong shelter that can withstand many pounds of over-pressure per square inch, are needed. A brick house, one mile from ground zero, will be completely demolished by a nominal bomb, the type of bomb dropped over Hiroshima. This same bomb will cause a blast effect of 800 miles per hour at ground zero extending out to 100 miles per hour, a mile and a half away.

There is an initial radiation that lasts only a minute, that if the person is fully exposed will cause death. Residual radiation is the big problem.

You will recall the Bikini blast, when the Japanese fishermen were the recipients of radiation although they were many miles away. We simulated the dropping of the same type bomb on the city of Buffalo and found that radiation would have been carried as far east as Utica, 220 miles away. At a distance of 140 miles the radiation would have been so intense that all exposed to it for thirty-six hours would die. The terrible thing is that it takes days to die, and there is nothing the doctors can do.

There are two types of burst—one a surface burst, and the other an air burst. From an air burst we get practically no residual radiation whereas in a ground burst, where the fireball comes in contact with the ground, the concrete, steel, brick, and other material on the ground, becomes ionized and these particles are sucked up into the air and we get a heavier fallout.

Through the cooperation of the Weather Bureau, twice daily we receive a teletype report on wind conditions. This report is transmitted by our headquarters to all target cities. This report indicates the locality of the report, the direction of the wind at 10,000, 20,000, 40,000, 60,000, and 80,000 feet, and the horizontal distance in miles where the fallout will be in three hours.

The direction of the wind will vary at the different heights thus resulting in a widening area of coverage from the point of the report.

It follows that there is not a city, town, or hamlet that will not be subject to this fallout, depending upon wind direction, not only from bombs dropped in our own state but from hits outside the state. In Operation Alert 1958,

(Continued on following page)

our state was well covered with fallout from hits as far away as Minnesota and Michigan. This means but one thing: We have to provide means to detect the presence of radiation.

We are establishing, within each of our 952 townships, two fixed monitors. This will give us 1,900 stations, well dispersed throughout the state. The personnel of these stations will record periodically the radiation intensity present. This will be transmitted to the County Control Center for evaluation by the radiological service. This evaluation will be forwarded to the State Control Center.

Each of our townships will have a mobile survey monitor team composed of five or six trained people who have the mission of searching out the intense radiation spots in the township and, during the post-bomb relief operations, are responsible for the mobile surveys needed in the area of destruction. Then we have the spot monitors, trained individuals who determine the intensity present in specific locations, of food and water, the injured, etc.

From the information determined by these teams, an isointensity map is prepared on acetate, indicating the degrees of radiation. This, in turn, is placed over a map of the city and the director can quickly see the "hot" areas and caution his civil defense workers accordingly.

There is much work to be done to protect our people from the effects of nuclear explosions. As the air battle will be fought in the skies over the nation, there is urgent need for shelter whether one lives in the city or country. We believe that with a proper shelter program we can save practically all of our people from radiation, and about seventy to eighty percent from blast. A blast shelter that can withstand thirty pounds per square inch over-pressure, will protect against winds up to 700 miles per hour. This will carry you well into the area of heavy damage. Whether or not this is done is up to the federal government. Somebody in a high place must decide if the American people are worth saving. None of the states can, or will, go into such a large and expensive program without the leadership of the federal government.

We have a shelter program under development. This is based on three assumptions:

- There are at present no shelters available which can afford full protection against individual or combined efforts of blasts, heat, and radiation resulting from a thermonuclear attack.
- Attacks will occur most likely in the areas designated as target areas because of their concentration of population, industry, and resources.
- Proposed shelters will be used for pre-attack, during attack, and post-attack situations.

Shelters are classified according to two major categories: Blast and fallout shelters, with the latter category subdivided into "basement shelters" and "family" and "fallout" shelters.

If we are attacked without any warning, when the first thing we know of the attack is the blinding flash from the burst, there is only one thing to do—"duck and cover." Our schools have had this training, and it has saved lives already in cases of explosions near schools.

If we have more time, say thirty minutes, our people are warned to take the first cover available.

If there is still more time available, say a matter of an hour, then people are told to go home. If sufficient time is available to move the majority of the people into previously prepared reception areas, outside of the great cities, then the evacuation of these people will take place. We will not approve of an evacuation plan unless such a plan ensures that every resident knows where he is to go and that the reception area knows where he is to be billeted.

Serving on the Civil Defense Workshop panel, which covered some of the problems attending nuclear attack, were, left, Col. James M. Trail, AFA's new Board Chairman; Brig. Gen. Philip E. Tukey, Jr., ANG; and Col. Donald P. Carney, AF Reserve. The Moderator was John P. Henebry.

When a bomb has exploded we must initiate rescue and relief action. Measures must be taken to put out the fires, rescue and treat the injured, care for the homeless, and restore essential services so that the people can continue to live. Our first step is to determine where the bomb dropped, or "ground zero." This is not always easy, and civil defense workers must be trained for this purpose. The size of the bomb, and whether it was a ground or surface burst, is determined by reconnaissance units reporting on the degree and extent of damage to certain types of structures, the presence of radiation, etc.

Prior to the entry of civil defense personnel it is essential that steps be taken to determine the presence of radiation. This is done by the fixed monitors, service monitors, and the area survey teams of the townships. Their reports go to the control center of the area hit and, if conditions permit, civil defense personnel and services enter the area and start rescue operation.

The director, responsible for rescue operation, then divides up the real estate and assigns certain leaders to control these areas, such as zone and sector control commanders.

These areas are known as zones and consist of a zone control center and mobile operating forces. These operating forces are of two kinds, those that operate as groups near the area of destruction, known as sector groups, and those that operate on a zone basis, such as medical, welfare, and warden services. The zone headquarters are located well back from the perimeter of destruction so as to have better control over the entire area.

Aid check points are established, for control purposes, on the main routes leading into the damaged area at which point all incoming aid from surrounding counties report in and are directed where to proceed.

Our cities, which are probable targets of an enemy attack, have been organized on a more permanent basis. The control center is usually located well beyond the city limits so it would not be destroyed by the blast. The zone control centers are located in permanent buildings such as fire houses, schools, etc., both the city and zone control centers having alternate preselected positions. Mobile groups i.e., sector groups, are predesignated to be sent into the area to carry out such rescue work as is needed. The aid check points are located well outside the city and organized on a permanent basis.

When the air battle is over we must face the problems of recovery, and eventual return as far as possible to pre-war conditions. This means the resumption of transportation and communications, the restoration of channels of distribution, and the reestablishment of business and industry. This will require the combined efforts of local, state, and federal civil defense organizations, as well as other governmental agencies. There is still much to be done in connection with this recovery phase.

Civil defense planning has many facets. It is not a matter of either shelter, or post-bomb operations, or evacuation. We must have complete plans at each level—federal, state, and local—for each aspect of the program.

QUESTIONS

GENERAL TUKEY: The first obvious thing that comes to mind insofar as the Ready Reserve Forces are concerned is the recovery phase and the requirements for evacuation-type airlift that you indicated would be required in any such disaster. Would you care to comment on that a little more? How you visualize the reaction time required?

GENERAL HUEBNER: On a post-bombing evacuation there will have to be an organization, a ground transportation job, which comes under the responsibilities of the Transportation Service. Also, the reception area where they are prepared to receive them. Now, if it comes to radiation evacuation, there will have to be airlift involved in that, because there could be areas so hot that you couldn't live there for seventeen years. In getting out of those areas, time is of the essence. The people are perfectly safe in their shelters, if they are in shelters. They may run out of food. So the problem will be to get them out of the shelters quickly and get them off the ground, and, of course, the Air Force will come in for that. I am sure that everything will be devoted to the quick movement of these people.

However, this is not a hurry-up movement. There will be time for it, but it must be planned in peacetime.

COLONEL CARNEY: General Huebner, you have made some statements here about the use of the Reserve in the civil defense program. Obviously you have a fine plan in New York, one which is already well implemented. Some of the other parts of the United States, of course, are not quite so fortunate.

Do you have any idea how many Reservists are active in the civil defense program in New York?

GENERAL HUEBNER: We have a few. We have some. Some of our very topflight people are Reservists, or National Guardsmen. But on the whole, very few. My Assistant Chief of Staff for Operations is General Hamilton, who maintains the antiaircraft defenses of the New York National Guard. My Chief Engineer, a colonel, is a Reservist. Of course, we understand that on M-Day, we will lose the services of both of them, because they are civilians just like the rest of us and they will go to their duty. However, in the meantime, they are preparing people to carry on their services in civil defense.

On the whole, not many Reservists are included. They are not particularly discouraged. We do have some of them. And the retired people—we have so many brains in this country now, great military leaders. There has never been anything like it in this country's history. They are busy in industry, they have got big jobs and little jobs. And, of course, many of them are service people who retired at the age of fifty. We should make great use of this leadership potential. You just can't calculate the value of it.

COLONEL CARNEY: Do you find that the Civil Air Patrol is of any help to you, and would it be possible to intergrate a program of the Reservists and of the Civil Air Patrol to come actively into the civil defense picture?

GENERAL HUEBNER: We have given the CAP office space in our building. They are considered one of our services, and we have a Deputy Chief of Staff, on a volunteer basis, from the Civil Air Patrol. They are quite strong in the state within their capabilities. The cadets are marvelous in the control center operation. They are uniformed, disciplined, and they work out very well. But I do not think the Civil Air Patrol and the Reservist should be combined.

I think they have an entirely different purpose. I think the Reservist should reinforce and help out the civil element. He can assist in the operation of the staff, and especially in the training of the people. He can speed up the decisions. Then, once operations do start, there is a reasonable chance of their being successful.

The retired Reservists, the people who are retired, are very important.

For the active Reservist, his main purpose, his main problem, is getting to his post of duty. Of course, there is a very close relationship there. These questions must be worked out in civil defense. The Defense Department is going to have to help. Otherwise, we are just going to lose. It is just that simple. If you impose too much of a load on us, we are still going to lose. We know we can't save them all, but we have got to save most of them.

COLONEL TRAIL: General, did the state of New York take advanced federal funds made available for the participation in civil defense plans?

GENERAL HUEBNER: Very much so. It has been this money that has probably been the most valuable money we have had in civil defense, because it allowed us not only to draw up the plans, but to promulgate the plans and implement the plans, and get them printed.

COLONEL TRAIL: I would like to ask, should there be different plans in the forty-eight states? Plans might not work too well in one area that worked well in another area, especially when it comes to this evacuation business.

GENERAL HUEBNER: In 1951, it was decided that this was probably a local responsibility. But, now, with the advent of the big bomb and the guided missiles and the shortening of the evasive action time, this last Congress passed a bill giving joint responsibility to the federal government and the states to prepare themselves for war. Also, Congress allowed the merger of the Office of Defense Mobilization and the Office of Civilian Mobilization. The national plan should be in the hands of the governors by the first of October. This plan sets forth the framework of the nonmilitary defense of the nation. And it will be required that all states, and all federal agencies, will have to work within this framework of this national plan.

There is a part of it that is military and part nonmilitary. It sets forth what the military will do, and the assistance they will render. We also hope, although it isn't in the plan at the moment that the military will set forth what they expect of civil defense to help them implement their mobilization plan, to get their Reservists into action, and if necessary, even to maintain them during the period of the emergency.—END

Lt. Gen. Clarence R. Huebner, USA (Ret.), Director of Civil Defense for New York State, is a veteran of World War I and World War II in which he commanded the first US unit to meet the Russians. General Huebner retired from active service in 1950. He is a recognized authority on the many problems of civil defense in nuclear attacks.

LOGISTICS REQUIREMENTS

Dr. Allen Ferguson
DIRECTOR OF RESEARCH TRANSPORTATION CENTER, NORTHWESTERN UNIVERSITY

LOGISTICS requirements in wartime are uncertain. More bluntly, we do not know what they will be. I would argue that no one can know and that no one should hesitate to admit that fact.

Obviously, the greatest of the uncertainties is to what extent the Air Force should prepare for a central, nuclear war as compared with a limited war. There is a serious conflict here: The logistics posture suitable for one is not ideal for the other. For example, in the central war, individual combat units should, at least early in the conflict, be able to rely entirely upon logistics support at hand; off-base support may be most difficult and unreliable. After the very first actions the confusion may be so extensive that planning would be exceedingly difficult. At the same time, it appears that forces in the earliest phases may not be critical, and they may not even play any important role until the issue is decided, largely by the strategic and supporting air forces of the major powers.

In a limited or local or peripheral war or emergency, quite the opposite is true. The great weapons held in readiness to wage or, better, to deter World War III may stand down during the limited conflicts, while the tactical air forces, the Army, and the naval surface forces will be committed as early as possible in various degrees, perhaps fully. These will be the forces requiring logistics support. Specifically, they will require airlift for at least some of their deployment and resupply.

There are other elements of uncertainty. When and where will the next emergency arise? What weapons, what forces will be employed? With these major uncertainties about the kind of combat to be supported, computation of the tons of POL [petroleum, oil, and lubricants] or of numbers of aircraft engines becomes rather complex. So, too, does the computation of airlift requirements. It is quite unrealistic to suppose that the Air Force or the Department of Defense can develop a single wartime airlift requirement. This is a fact of life with which the military and the public must learn to live.

The second major characteristic: Uncertain as the requirement is, there is some reason to think that the most likely war need is for support in limited conflicts. In recent months we have seen the Quemoy crisis and a major crisis in the Near East. Before then, Suez, Hungary, Indochina, and Korea. Half a dozen major crises with actual or potential local fighting since World War II. In local emergencies the Army, naval, and Marine forces, as well as tactical air, are, of course, expected to play the dominant roles. Is there in being the airlift capability to provide the cargo lift needed for fast response in local war?

Unless we are to run considerable risk of losing to the Reds in the end by being unable to fight effectively in limited wars, the Air Force must be able to support its own forces and those of the Army in local conflicts.

Let me hasten to add two things: One, it seems clear that it is largely because of the deterrent effect of SAC that local wars are more likely than general war. Two, consequently, the Air Force logistics system must as first priority provide adequate logistics support for the deterrent forces.

So far I have said only two things: Namely, that logistics requirements can never be even approximately accurate (and we must learn to live with that fact) and secondly, that, while retaining the deterrence capability, the Air Force should be able to provide in limited conflicts complete logistics support for tactical air and airlift support for the Army and Navy.

What are the implications of these rather obvious statements for airlift in peacetime? One way of coping with the uncertainties of war is to retain the asset control and the transport capability (certainly in large part airlift) to permit rapid response to emergencies. A second is to plan on a contingency basis with each unit having alternative plans and procedures. Then, of course, there are all the usual things such as having a high state of readiness with exercised forces, but I would like to concentrate for the rest of these remarks upon the air logistics fleet itself.

There appears to be good reason to believe that the quantity of airlift available for the wartime job is inadequate. For example, in hearings last spring before a Congressional committee, [Assistant] Secretary [of the Air Force for Materiel, Dudley C.] Sharp stated in part: "Recent JCS estimates of emergency airlift requirements show a steadily rising trend. The deficits . . . are primarily in cargo airlift. . . . Today's emergency airlift requirements must be met with today's resources, and the combined military and civilian cargo flights fall short of the mark."

Further, it seems clear that there is a great need to modernize the Military Air Transport fleet. There are at present only two turbine-powered aircraft in logistics use—the C-130 and the C-133. The great preponderance of the MATS fleet consists of piston-powered aircraft from the C-54 vintage on. There appears to be wide agreement that modernizing the fleet is desirable both for reasons of military effectiveness and for economy. A few months ago, during the MATS hearings, Senator [Stuart] Symington [D.-Mo.] stated that, ". . . We are building only 1¼ C-133s a month. That is the total of modern strategic airlift airplanes in the United States, despite our commitments all over the world. We

Panel members serving during the Logistics Workshop of the Reserve Forces Seminar included, left, Brig. Gen. John R. Alison, AF Reserve; Brig. Gen. Ramsay D. Potts, Jr., AF Reserve; Col. Robert D. Campbell, Air National Guard.

have only sixteen modern airlift airplanes for military purposes. . . ."

In recent years I have taken some considerable personal interest in the modernization of the military airlift fleet. To be able to handle the tonnages required for wars around the Communist perimeter, piston aircraft simply are not efficient. I am convinced that the cost per year in money and manpower of maintaining any high level of ready airlift capability can be reduced through modernization.

Further, so far as I know, there is little or no argument against this proposition, either in the logistics elements of Air Staff or of the Offices of the Secretaries of Air Force and Defense. Why then is not the modernization carried out and the economies realized?

It appears that there are two main reasons: First, that it is difficult to dispose of the existing fleet of piston aircraft; and, second, that to achieve the savings in operating costs in future years requires very large investment now. The remainder of my remarks will deal with the second problem.

Here is the problem: The MATS operation—providing continuous wartime readiness to perform large-scale airlift—can be performed more economically in new turbine-powered equipment of the right kind than it can be with the present fleet. However, these economies require that new investments in aircraft (and facilities) be made now, or in the near future, to achieve savings in the more distant future. This situation poses very practical problems:

- To achieve a future economy, the present over-all budget must be increased.
- That increase, being in Series 100 money [money for aircraft and related procurement and maintenance], competes directly with the procurement of weapons.
- To some Congressmen as well as some military officials, the need for transports is less obvious than the need for bombers.
- It involves asking Congress and the Executive to appropriate funds whose benefits (reduced budgets) will be reaped by their successors.

There has been strong feeling in the Air Staff that this appropriations hurdle has been one of the really significant barriers to modernization.

One reason why the problem is severe is that modernization will take a period of years. During these years the economies of operation will be building up, but the investment in new equipment will more than offset them so that the total airlift budget will at first increase.

If some method could be found to permit net economies to appear in the first year or two of the modernization program and especially if this could be done without requiring that the procurement of transports be at the expense of the procurement of weapons, a major obstacle to badly needed modernization could be overcome.

I would like to throw out one tentative proposal for achieving this.

The proposal is simply that the Air Force lease rather than buy transports. It is reasonably common practice to do the opposite, namely, for the Air Force to lease to operators Air Force-owned transports. This proposal would involve the Air Force's entering into a contract for a private company to purchase modern transports and to rent them to the Air Force under agreed conditions and at agreed rates. It would be the responsibility of the lessor to raise the necessary funds, say in the capital market, to finance the initial investment.

Such a contractual arrangement could take many forms. In the recent House Appropriations hearings, Riddle Airlines proposed one form. It could, for example, require only that the lessor furnish complete aircraft, deliver it to the Air Force at the beginning of its life, and recover it some years in the future. At the other extreme, a lessor could enter into a contract to furnish the Air Force with some specified number of good flying hours, with the lessor providing all maintenance and other logistics support including, perhaps, servicing at the home station. Intermediate types of agreements, such as one which calls for the contractor to perform major maintenance but for the Air Force to provide line maintenance and all servicing, might be considered. The purpose here is not to spell out the details of the contractual arrangements, but simply to explore the idea briefly.

Now let us consider briefly the practicality of such a concept. I shall ignore the "politics" of the idea and concentrate on three substantive points. In order for the scheme to be practical, at least these conditions must be fulfilled: (1) a mutually advantageous rental charge must be devised and agreed upon; (2) the lessor must have sufficient security over the life of the aircraft to make it worth his while to invest in the equipment; and (3) the contractual arrangements must be sufficiently flexible to cope with changes through the life of the aircraft.

Without going into detail, let us consider each condition in turn. First, a mutually advantageous rental must be agreed upon. Since modernization will presumably decrease the cost of operating a high level of war-ready airlift capacity, it should be possible to compute a rental which would be less than the cost of operating the existing piston fleet and still be enough to provide an adequate return to the lessor.

Second, adequate security for the lessor: Even with an adequate annual return, the contractor must have some assurance that the government will continue the lease long enough for him to recover at least a substantial portion of his investment and a return on his capital. Unless he has this or equivalent security, it is unrealistic to expect him to be able to finance the investment in a fleet of modern transports. The simplest arrangement would be for the government to enter into an agreement to lease the equipment at a specific rental for a period of several years. Under present law, or at least under present practice, this may not be feasible. However, the government does lease buildings and other facilities for long periods. Also if the advantages of such lease arrangements are great enough, there is at least a possibility of getting the necessary legislative or policy changes made.

Third, the need for flexibility: At the beginning of this discussion I pointed out the need for some kinds of flexibility in logistics planning. In these leases, too, it would be desirable for the Air Force to be in a position to adjust to technological and military change. Clearly it should be possible to expand the fleet, to adjust the kinds of services rendered by the lessors and to terminate or reduce the scope of contracts. Providing for expansion seems to be simple. Adjustments in contracts would obviously have to be made by new negotiations. Reduction in or termination

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of contracts could—although I am no attorney—I believe, be covered by adequation liquidated damages clauses in the original contracts.

Undoubtedly, in attempting to put such a policy actually into effect, administrative problems would be encountered, but a superficial check does not indicate that there are any major hurdles. What then would be the advantages of such a policy?

If it is practical, the leasing arrangement would appear to make the expansion as well as the modernization of the transport fleet easier in terms of legislative and budget barriers. First, during a program of modernizing and/or expanding airlift capability, fewer funds would be needed for transports than would be the case under the present procurement policies. Furthermore, as soon as the economies of modernization begin to be realized, the total airlift budget would tend to be reduced. That is, the savings would show up as reduced annual budget requirements much earlier than under the present system. Thus Congress and the Executive would not be asked to make large investments whose benefits would accrue to distant successors. Third, because the annual cost of modernization would be less in the early years of a program, there would be less competition between transports and weapons for Series 100 funds.

In addition to these administrative and budgetary advantages within the government, there may be some important advantages to industry in such a policy. To the extent that it would in fact result in some additional procurement of transport aircraft, it would tend to lessen those pressures on the aircraft manufacturers to which Dr. Paul Cherington refers in his recent report of the financial problems of the airlines. Such considerations might make a policy of this sort particularly timely. However, the passenger-type transports now in production for the airlines may not be appropriate as logistics aircraft.

Lastly, the further development by the military of efficient cargo aircraft and experience in their operation promises to benefit the aviation industry as a whole. In this context, it may be well to mention that there may be some considerable advantage in having military transports certificatable as civil aircraft.

QUESTIONS

GENERAL ALISON: Would it be wise to have a lease plan whereby some obsolescent equipment, which may have no further value to the civilian airlines, but which could be converted to the specialized needs of the military, could be leased by the government and put in the Reserve components so this valuable national capital would not be lost?

DR. FERGUSON: It seems to me that what you are suggesting is that if in fact we are able to modernize the regular fleet, then some aircraft, DC-6s, for example, might well become available for use by the Reserve organizations.

GENERAL ALISON: The airlines are going to be modernized. What will happen to the DC-6s and DC-7s? The airlines have no reserve they can put them into.

DR. FERGUSON: I have a very simple answer for that—I don't know. I have no really useful comment to make. It is thoughtful of you to raise that question, because we have a study under way now, which is only halfway done.

GENERAL HENEBRY: Are the Reserve Forces included?

DR. FERGUSON: No, not yet.

GENERAL POTTS: I think the Reserves have just about as much obsolescent equipment as they deserve. They take the obsolete equipment from the Air Force, and I don't think they ought to be asked to take the obsolete equipment from the regular airlines also.

The shortage of equipment is primarily in cargo, or convertible type equipment. Everybody seems to agree on that. The discussion is all in terms of shortage in cargo equipment and not in terms of passenger equipment.

I think we need to find a way to finance and develop more modern and efficient cargo, or convertible type equipment, a plan, which, as you said, has been proposed to Congress by several witnesses in one form or another—a plan that has been used in the maritime industry, whereby the government has given assistance.

Some people in the shipbuilding and in the tanker fields have said that they would be glad to build modern tankers, provided the government would give them a contract for five years to carry government cargo at certain rates. They worked out a tentative deal with the government and took this agreement to the bankers, and the bankers, in effect, said, "If you get a contract like that, we will give you money to build the tankers." So, they got the money from the bank on the basis of the contract, and, on the basis of the deal with the bank to make the loan, they made a contract with the shipbuilders to build the tankers and then they just sat back and enjoyed the profit.

This is a fine plan for avoiding the expenditure of government capital funds, and I think it could be well carried out. I would heartily endorse your proposal, though there would be some major problems, such as maintaining the crew capabilities and the maintenance capabilities. But if we got serious endorsement of this idea within the Defense Department, I am sure all of these details could be worked out; and I think that what we should do is develop this modern cargo or convertible capability and not worry too much about what is going to happen to obsolescent passenger-carrying equipment that is being sloughed off. It seems to me what we need in the MATS fleet, or available to MATS, is this one kind of equipment.

DR. FERGUSON: It seems to me that we are in complete accord. The requirement is for cargo equipment. I am not prepared to say anything about the disposal problem, but the need for modern cargo equipment available to MATS, or in MATS, is very important.

COLONEL CAMPBELL: In facing both a local or limited and an all-out war, in order to have a realistic force in being in the Reserve which is tailored to the nuclear age, do you think that the additional requirement is for both airlift and air tanker capability? Would you care to comment on that, as to how the Reserve and Air National Guard might help meet the requirement?

DR. FERGUSON: I am not prepared to make much comment about that. I think I could say one thing with reasonable assurance. The point is that the requirement is largely for cargo capabilities. This is particularly true in view of the fact that we do have available, and will have available, a continuously growing amount of support from the Civil Reserve Air Fleet, with modern capacity for passengers.

On the split between dry cargo and tanker capabilities, I can find nothing to say at the moment except that it seems to me to be a matter that requires further study.

All I can say about the role that the Reservist is concerned with is that it depends to a large part on the degree of modernization that the Reserve fleet has. I mean the fleet in the military Reserve organization. If, as General Alison suggested, they move toward modern, four-engine, piston equipment, then this obviously imposes training requirements on the organization.—END

Dr. Allen Ferguson, an Air Force veteran of World War II, is now Transportation Center Research Director at Northwestern University, Ill. A native of Rhode Island, he received his doctorate in economics from Harvard. He has taught at Harvard and has served in Washington with CIA.

AIR DEFENSE REQUIREMENTS

Dr. Richard C. Raymond
MANAGER, TEMPO, GENERAL ELECTRIC COMPANY

THE ROLES of air defense, in the total defense of the continental United States, are twofold.

First of all, air defense contributes to the deterrent military posture in the sense that we are trying to keep the big war from starting at all. We get a contribution to that effort by maintaining a clearly discernible offense and by maintaining a defense. The defense can contribute to the offense. It can also contribute to our freedom to maneuver in the cold war operations.

Beyond its contribution to the deterrent picture, however, air defense has a very real role in case the deterrence fails. Deterrence can fail for many reasons. One, it can fail because the force itself is insufficient. Second, it can fail because some enemy leader, we will say, switches from vodka to marijuana, or some situation like that leads him to take an irrational move. Deterrent military posture depends on the enemy's being a rational enemy. And when you say "rational," you obviously mean a guy who thinks as you do. If he thinks some other way, he is not rational. Deterrence is dependent on rationality, but it might fail for the same reason.

If it fails, air defense must be based on how it contributes to the politically free survival and recovery of the maximum number of citizens. I insert "political freedom" here because I don't think any of us would want to recover or survive under any other conditions than freedom. But I think we have to go through the whole problem, both recovery and survival, in order to see the thing in complete form.

The missions of air defense, I think, are three. I am not going to distinguish between defense against missiles and aircraft. I divide air defense into three missions. There is the mission of warning; there is the mission of active defense; and there is the mission of passive defense. You can call passive defense "nonmilitary" if it applies to you, as far as the population and the economy are concerned, but I think we will also have military passive defense as it applies to the protection of our own military forces; and here I include both offensive and defensive forces. Because I think the airpower battle may *not* be settled during the first two hours of the war, as some people think. It may take several days, and if it does take several days, the survivability of all of the elements that contribute to the winning of that battle are going to be very important.

A warning mission, I think, is fairly obvious. We have spent an awful lot of money on it. In fact, some of my friends have said that maybe the Air Force has become the Paul Revere of the space age. We spend a lot of money on warning and have a lot of people freezing every day on the north edge of the North American continent. And we have many others flying many, many hours in large complicated airplanes; and a lot of others sitting around on ships and Texas Towers and one thing and another, carrying out the warning problem—the first aspect of it, anyway.

In looking now at warning against air threats, that is, aircraft, we say we can see probably at least two hours of tactical warning. This is far less than the fifty hours required to evacuate New York City, but it is enough to do a lot of things.

As we proceed into the future, we find that our warning expenditures are going to increase because the number of possible threats are increasing, and the maximum warning time will diminish because of the threat of the new vehicles. The intercontinental ballistic missile, for instance, doesn't have to fly two hours getting here, so we talk about fifteen minutes. It is quite conceivable that we will be given less time than this, even if we detect ICBMs at the instant of launching.

Warning times then are going to diminish and expenditures are going to increase. But the importance of the function is not going to diminish.

We in California have under study a cost benefit analysis relating to the warning problem. And we have come up with the figure of $1 billion a minute, as a reasonable price to pay for warning, beyond fifteen minutes. In other words, if you have fifteen minutes' warning and by spending $1 billion you can get another minute of warning, it is worth it to go ahead and pay. That is a kind of a shocking figure, yet it is a minimum number. Because in thinking about it, we did not include savings to civilian economy by an additional minute of warning.

All we considered was protection and deployment of military forces, and the additional use we could get out of our forces is worth $1 billion a minute.

Warning is absolutely essential, therefore, in the air defense business, and probably is the only one we know how to do with real assurance at the moment. We will have, I believe, warning on out into the distant future, but it will be a rather short warning, something like fifteen minutes.

But, defense, I think, is probably in two parts—that is, the active defense of the forces we are trying to protect, and the active defense of the civilian economy. These may be the same in case we are able to invoke the distant air battle concept and start fighting the air battle so far away from the target that you can't really tell what the target is, but as we proceed into the ballistic missile area, it will be evident what the target is, and we can't have a very long distant air battle, because we don't have time to fight that sort of battle. So we may find we have to expand this function, and maybe take a military establishment and erect a defense around it that will do some good.

We must continue to work on active defense for the whole country, but right now the tactical problems involved seem to indicate that it is going to be a little easier to defend something like a military establishment, something quite hard and fairly small, than it will be to defend the civilian economy, particularly when you consider the effects

(Continued on following page)

of fallout. This doesn't need to stop us from working on active defense of the large-scale area type against all possible threats. But right now the tactical problems involved seem to be more difficult than they are on the short-range defense of a hard target.

The third role of active defense is being picked up now by the military to some extent. You hear a great deal of talk about "hardening." And the people up in Colorado Springs begin to shiver and shake when they think about hardness of Air Defense Command, because SAC is moving right in with them, and somebody may want to kill off SAC and may kill them off accidentally in the process.

In any case, I think this is a question that we can quite safely leave in the hands of the professional military people, because they are actively doing something about it.

With regard to the passive or nonmilitary defense of the civilian economy, we need to get into action. As we look toward future air defense problems and talk about use of nuclear warheads in defense weapons—and we have looked at a lot of possible kinds of defense systems, some of which involve quite large nuclear warheads—we find ourselves a little bit in the position of trying to run a police force with no weapon but an electric chair. And it is wired up so that it kills the executioner as well as the victim. So we have a serious problem. If we use nuclear warhead weapons to the extent contemplated by some, we could easily kill ourselves with our own fallout, unless we had some kind of hole to crawl into to avoid those effects. And I don't see the general world situation getting any better in the distant future.

The United States in 1955, with six percent of the world's population, used fifty percent of the world's production. We have ninety-four percent of the world's population in various stages of disagreement with us, and a lot of them are probably going to be shooting at us during the next 500 years. I expect to see the Chinese Communists win out over the Russians within twenty-five years, and if we think the Russians are hard to deal with, we should try the Chinese some time.

All I wanted to say by introducing those apparently unrelated remarks is that this is a long-term problem. I think to convince yourself of it, you should think about how we thought about the air defense problem a couple of years ago, and you will find that it hasn't changed much today.

We are moving into the area where ballistic missiles will be important. But this does not, unfortunately, cancel the manned aircraft threat. A defense system, as we are finding out from our experience with SAGE, takes perhaps ten years to be designed, engineered, manufactured and put together, and made operative. An offense system takes maybe five years, if you work real hard at it. So an enemy can wait until you are five years down the road on your defense system, and have committed yourself to that system, before he needs to decide what offense system to use. And if you put all of your defense eggs in one basket, then all he has to do is move on to develop a different offensive system, and you are through, because he can be ready and you can't. The point I wish to make here is that we cannot afford to let the new-fangled threats come in and take over all of our consideration. We have to worry about defense as a total problem. And just about the time we get our organization for defense against ballistic missiles organized we will find, probably, that somebody has invented an airplane that will fly around the world at fifty feet, or something like that, and we will be back in the old, low-altitude problem.

Summarizing, I think these threats fall into four categories—the air-breathing aircraft, or missile, that comes in at low altitude, is still a serious problem, although we are making headway; the aircraft or missile that comes in at high altitude; missiles which may be launched from ships, probably submarines, probably of the missile type, although they may be air-breathing; and the intercontinental ballistic missile.

Members of the panel aiding at the Air Defense Workshop included, left, Brig. Gen. Donald J. Strait, Air National Guard; Chief Warrant Officer Dale Hendry, ANG; and Lt. Col. Frank Ward, Commander of an AF Reserve unit.

It may be possible to cover all of these threats within one large system, but it may be necessary, on the other hand, to design separate systems for them.

In designing a system, you run into the principle that I discovered ten or fifteen years ago. I call it the principle of "dynamic obsolescence." If you make a system large enough, complicated enough, comprehensive enough, it will be obsolete before you get it finished. I think this is a worry that we are facing in many areas.

The concept of air defense has been developed to a high degree by people working in this area professionally, but I would like to mention a few facts about it. I think weapon defense in depth with a mixture of weapons is extremely desirable. Start fighting out as far as you can, and fight right up to the threshold, if necessary.

I think the concept of unity in air defense is an important one. We need a unified command. We need a unified engineering structure in air defense. I have already mentioned flexibility. We have got to have the ability to meet many threats, some of which might be very well defined at the beginning, and we must develop equipment to meet them. Nonetheless, we must do our best on our forward plans. We must design our systems and our organization so that they permit the greatest use of all the technical marvels. And if the system is going to work after the chips have been put on the table, we have to have a degree of hardness that we haven't seen or talked about much yet. Not only in the physical sense must we be hard but we must be hard in communications, and we must be able to put the whole system into immediate action.

It is possible in military planning to plan an offensive system which is more or less overdone. That is, when you have planned to kill every Russian once, it doesn't help much to try to kill him twice. I admit there is a strategic uncertainty on our ability to penetrate their defense. But it does not seem realistic to me to drop so very many bombs on them. What I am getting at is that you *can plan enough offense*, but on the other hand, I *don't think* you can plan *enough defense*. The only time you stop working on defense is when you are exhausted. Because no matter how deep you have dug your holes or how well constructed your shelters are, no matter how much work is done on a defense system, you can never be completely sure that the other guy is not going to invent some new wrinkle with which to get at you. He has the choice of weapons; you

have got to meet him on his own terms when you are working on defense.

I would like to suggest that we have three ways to split up the bone, if you want to look at it that way. I don't mean the Army, Navy, and Air Force. I mean we have the general war offensive, general war defense, and of course, the limited war.

Limited wars are much more probable than general war. Of course, the way to keep it that way is to have the deterrent posture. So these things are not independent of each other. I do say that once we have provided for an adequate offense, and once we have developed to the best of our ability our limited war strength, we ought to spend everything else we can rake up on defense, and I believe if the American economy were put to it, we could rake up a lot more than we have been.

We have never had enough expenditure on defense. We have never solved all of the major technical problems. I will not go into detail, but we can stand a lot of effort on them. We have a major systems problem. We have a major political problem. And we have some policy problems. I would like to mention one. I think it is interesting. For many years, we have been a maritime nation, and we have adhered steadfastly to the policy of freedom of the seas. We have heard of the three-mile limit. On the other hand, when we talk about air defense, we say, "We expect the Navy to establish seaward control. We expect air defense identification zones to extend one hundred miles out to sea." So although we are for freedom of the seas, we are not so vigorously for freedom of the air. I realize this is a policy problem. At least I regard it as a policy problem. In defense against missile-launching submarines, you might want to go out, say, one hundred miles, or one thousand miles and establish a submarine defense area, and establish a few rules such as all submarines must be on the surface, or display a certain flag.

QUESTIONS

General Strait: I would like to hear whether or not you feel the main threat seems to be from the missile area, or whether or not you think there is still a threat from the surface-launched, long-range bomber in order for us to justify the continued expenditures we have put into fighter defense forces.

Dr. Raymond: That is an interesting question. I think I tried to say that even though we see new threats sometimes such as the intercontinental ballistic missile coming in, we haven't seen any of the old ones going out yet.

The warning problem is one I am sure you will appreciate. If you were actually in on the kickoff of the ICBM, you would have twenty or thirty minutes' warning. If you have to wait until the missile comes up over the horizon, our northernmost outpost would then have fifteen minutes. If you consider submarine-launched vehicles, the warning time is even shorter.

To guard against an offensive system of that kind, it seems to me that you almost have to have a defensive system in which the personnel involved are certainly no farther away than the mess hall or the PX, and they have got to be pretty close to their operating post.

We must have a plan to operate against that kind of offense. What would we do? There is a variety of things you can do and a variety of risks you take with each and every offense. It looks to me now as though a coordinated operation in which the ballistic missile is used to precede and to cover the aircraft attack, more or less the way artillery used to cover the infantry attack, is the kind of thing you have to worry about now. I think that in dealing with this kind of threat you think about, first of all, something to keep you alive through the missile part of the business, and second, something to go up and deal with the aircraft.

Mr. Hendry: It was mentioned that the Inactive Reservist definitely had a role to play in civil defense. Which of your three roles do you feel is best for the Ready Reservist to participate in?

Dr. Raymond: I have to duck on that question. I am not a professional military man, and I know very little about the management of the military Reserve program or its problems. It seems to me that you would have cases where the Ready Reservist can be properly trained and available within a fairly short time. He could be useful in any kind of mission for which he is trained. But he has got to be pretty much on deck if you are talking about missiles. I don't know to what extent that would throw a burden or strain on the Reserve system. I do know there is a host of civil defense problems, or, let me say nonmilitary defense. It is possible the Reservist may very well find himself a more useful occupation than in the actual defense on fifteen minutes' notice.

General Henebry: I think it is important to observe that there are some twenty sites where the Air National Guard is actually setting air defense alerts, and on five-minute notice. If this is successful for manned aircraft, I think it could be employed for defense against missiles as well.

Colonel Ward: Doctor, your discussion brought out three points I thought were particularly interesting. First, that new concepts must not be allowed to completely displace the old, and along that same line, the organization for defense in depth. I am sure that you don't mean the men in hardware alone, a war capability or a defense or a retaliatory capability, a force in being, not backed up by Reservists. I think you meant to enlarge on that a little in the area of personnel and manpower as well as in the hardware.

And then, with regard to the limited war forces, my feeling is the Reserve could back this up tremendously more than is being done in the war planning, so that the utilization of the Tactical Air Command would not necessarily decrease the retaliatory strength.

Would you comment on that?

Dr. Ferguson: I do think depth is important in more than one dimension, as you point out. Depth in geography, in weapons, and in the capabilities and in personnel is extremely important. I deliberately excluded no situation from talk about defense problems. It is undeniable that limited war is one of the probable situations all three of the armed services have been thinking about for the last several years.

Strictly from the standpoint of a taxpayer, it seems to me that the Army and Air Force, for example, have been running a pretty hard race for control of the air defense of the country, and that the Navy and Air Force are about to be running a pretty hard race for the control of the astronautics mission. I don't know what the Army and Navy are racing over, but they should be racing over the ability to fight a limited war. Yet, neither one of them seems to be moving very fast, in my opinion.

Dr. Raymond: I could make one more comment. You will recall that approximately fifty-one weeks ago Saturday, the Soviet Union carried out a feat of technology which took us quite a while to duplicate—in fact, we still haven't quite duplicated it. If you will go back in time and try to recapture the national hysteria that struck America almost immediately after Sputnik I, you will find that the air defense hasn't changed very much in this year, but that the public awareness of it changed remarkably for a short time.

Being in a position to view the effect of Sputnik on industry problems, I find that the reaction period of the federal government, when given a sharp jab, is forty-eight

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days. It took forty-eight days for them to relax overtime restrictions on important projects then going on. These were high-priority projects. I find that the relaxation time is about one year, because it looks as though they are about to put the overtime restrictions back on.

So we really ought to have one of these jabs about every six months in order to keep the public properly informed on the seriousness of the international situation.

GENERAL HENEBRY: Without violating any security restrictions, are there means of observation of enemy attack beyond the so-called conventional radar system now in use? I am thinking of the vast amount of money spent on DEW Lines. Or is our radar operation going to become obsolete in the relatively near future?

DR. RAYMOND: The answer to the two questions are "Yes" and "No." Yes, there are other techniques for going out and getting information and observing what is going on in an enemy country. I refer to a satellite system carrying infrared detectors which can "see" enemy planes and missiles.

The answer to the other question is "No," however, because these same things, which can work only over the enemy country and see his missiles actually being launched, can't see aircraft flying around at all. And even the colossal radar system that you are going to have to build, and the outer space system, are both no good against manned aircraft because they don't do anything at extremely low altitudes. They are not close enough together.

GENERAL HENEBRY: Another question that occurs to me is the art of defense weapons. Is this art maintaining pace with the art of observation?

DR. RAYMOND: What you mean is: What good does it do to see them, if you can't do anything about them?

GENERAL HENEBRY: That's right.

DR. RAYMOND: Or "How do you change the DEW Line into a 'DON'T' Line?"

GENERAL HENEBRY: That's right.

DR. RAYMOND: Our art in weapons is a little behind our art in observation. But actually you have to think about these things in terms of complete systems. It doesn't do any good to build long-range weapons unless you have long-range fire control and guidance. It does a little good to see a long way because warning is nice, whether you back it up or not. It would be nice to have the DEW Line armed so that it wouldn't only see the threat coming but could actually go out and do something about it.

GENERAL STRAIT: We have the Air Force, the Army, and the Navy each with their own missiles. From the standpoint of organization, do you feel that our defense capabilities have suffered by not having a defensive role assigned to a small force?

DR. RAYMOND: I think the missiles system should be planned into a single defense concept and be under the same control. Whether this means they are to be manned by people wearing the same type of uniform or not, I cannot say.—END

Dr. R. C. Raymond is Manager of General Electric's Technical Military Planning Operation (TEMPO). He is a veteran researcher and received his doctorate in physics from the University of California in 1941. During World War II, he served with the Massachusetts Institute of Technology Radiation Laboratory. He joined GE in 1956.

RESERVE FORCES SEMINAR

SPACEFLIGHT REQUIREMENTS

Col. Benjamin P. Blasingame

HEAD, DEPARTMENT OF ASTRONAUTICS, AIR FORCE ACADEMY

The increasingly significant matter of spaceflight and the USAF's role in it was covered in the Seminar's Spaceflight Workshop, following the address by Col. Benjamin P. Blasingame, head of the Air Force Academy's new Department of Astronautics. Panelists included Col. Edward J. Perkin, representing the Air Force Reserve; Maj. A. J. Latham, also from the Air Force Reserve; and Maj. Gen. Clarence A. Shoop, Chief of Staff of the California ANG.

OUR supersonic surroundings and our man-from-Mars flying suits do not assure progress; we must make a constant effort to achieve that goal. It is out of recognition of this fact that the course in astronautics was created at the Air Force Academy.

This new course, astronautics, has, first of all, the inspirational objective to which I have been alluding. It is a glimpse at the future; it aspires to instill an attitude of inquisitiveness in the young Air Force officer, an attitude which will make him forever ask: Is this the best way to do this job?

The material for this new course is drawn from current Air Force experience in research and development. Its textbooks are even now being written. They will be kept loose-leaf fashion and thus kept abreast of current technology.

Aside from the larger inspirational objective, this new course has several specific educational objectives.

The first of these is to develop an appreciation of the engineering and military compromises which must be

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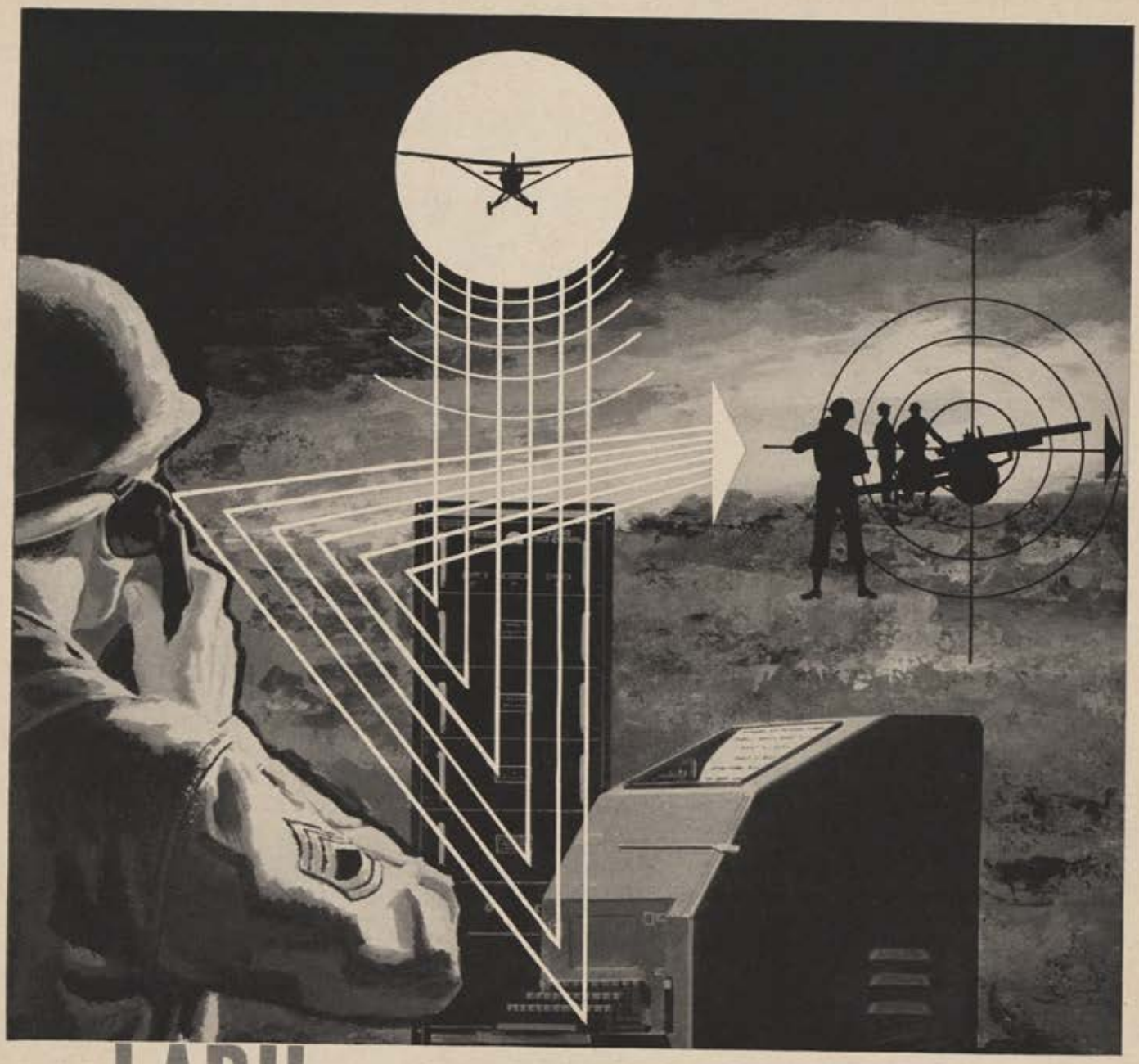

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made in the creation of a new weapon system. That is, to gain recognition that one never gets the theoretical best of anything and that a modern weapon system is a compromise between operational convenience and technological convenience.

Our other educational objective is to develop an understanding of the fundamental physics of astronautics.

When some people hear this last phrase, they are elated, presuming that our new officer will arrive in their commands knowing all the design details of the Atlas, Titan, and the Thor. But they won't; actually they will have only limited exposure to these missiles. Our course will teach the fundamental physics of spaceflight—not the specialized design of some early examples of a new art.

To make this clear, consider the time of the Wright brothers' early airplane. Of what lasting value would education in the details of how this airplane was put together be to today's Air Force officer? The answer is none. On the other hand, the fundamental principles which determined the performance of the Wright brothers' airplane are the same today and tomorrow. The total unrefueled range of that airplane was determined by the same factors that determine the range of the F-104 today. Therefore, understanding the range equation—the so-called Breguet formula—gives one extraordinary insight into what must be done to improve this range. It tells one where technological effort must be focused.

In a similar vein our objective is to teach what can be done with long-range rockets, to point out what must be known about the performance of a rocket before it can be used effectively, to call attention to fundamental limitations, to focus thought into areas which need to be pushed to permit more ambitious spaceflight, and to equip the individual to make his own feasibility studies to explore new ideas.

To accomplish this, the course begins where Johannes Kepler and Sir Isaac Newton began some 300 years ago in the study of celestial mechanics. Using the same laws of motion which determine the planetary orbits, the cadets learn to compute the trajectories of ballistic missiles and satellites in the first weeks of the astronautics course. Thus this course has its roots in the earliest development of mankind's understanding of theoretical physics.

Just as the pilot must learn to conserve his fuel and use it efficiently to get the full range of his airplane, the missileman must learn the most efficient way to use his missile. This is the second subject covered: What is the optimum powered trajectory of a spacecraft and how is its unbelievable velocity (twenty to thirty times the speed of sound on earth) attained?

This early part of the course gives real meaning to the cadet's earlier study of physics and mathematics. He sees the laws of conservation of mechanical energy and momentum assume reality; he sees differential calculus specify the accuracy of control of velocity which must be attained; he sees his study of integral calculus being used in calculating trajectories and determining rocket performance.

In the next several weeks, rocket powerplants are studied. Here the cadet applies his studies of physics, chemistry, and thermodynamics to an understanding of the best choice of fuels for rocket engines. He learns the fundamentals of rocket engine design.

After this, the course turns to the reentry phase of spacecraft. Attention centers on reentry into the earth's atmosphere. The cadet's earlier training in aerodynamics will be fully exercised as he computes the forces acting and the heat generated by the reentry body.

As though this were not enough, the course turns next to the subject of guidance and control of large rockets. Here the cadet will find himself reviewing his electrical engineering theory as he studies simplified automatic control systems. Here also he will brush up his training in mechanics as he copes with the problem of avoiding over-stressing in the rocket structures.

This extensive theoretical treatment is followed by a case history of at least one actual modern long-range rocket. The effort here is to demonstrate how the theoretical requirements are met in actual practice. This part of the course serves both to salt down the theory and to teach the fact that, "one can't have the theoretical best of everything." The cadet is exposed to the realities of compromise in engineering. He learns also that the military user must understand the designers' limitation, lest he compromise the end product by overemphasis on operational niceties.

I hope it is clear that the astronautics course serves an auxiliary role: It is a sort of windup or capstone which gives practical meaning to all the cadets' earlier training in the basic and applied sciences. It is in the nature of a systems engineering course. While remaining a course in fundamental science, it has about it an air of utility.

That, briefly, is what the astronautics course at the United States Air Force Academy is today. Its text and its lessons are kept in loose-leaf fashion because they will be different each year, discarding what has become obsolete, and adding frontier knowledge. Above all, it aspires to instill a lasting willingness to consider thoughtfully new ways to do things and new things to do.

QUESTIONS

General Shoop: The little experience I have had with the current weapon systems, the F-102s and F-106s, and the planning for use of some of the future weapon systems, long-range interceptors, convinces me that the Air Guard and Reserve have a greater potential than ever in defense work. I wonder if anything in the space travel requirements will change this picture seriously? In other words, do you think spaceflight will be as adaptable to the Air Guard as the current and proposed weapon systems?

Colonel Blasingame: Yes. It seems to me that our requirement for people is expanding and not contracting. I can only generalize from that that there is more than a job for every person to do.

General Henebry: Would it be fair to ask if the weapons of the future are going to be of such complexity that the part-time soldier, or weekend warrior, can't utilize the employment of them?

Colonel Blasingame: Tremendous effort has been made in the direction of attempting to relieve some of the stresses in the operation of new weapon systems. These are efforts to lower the training level required of the operator. We must do this whether the forces be Regular or Reserve.

General Henebry: Therefore, I believe it would follow that if the Reserve organizations—the National Guard and organized Reserve—are capable of employing some of the present-day weapons, even though your ultimate weapon is becoming more complex, the employment of it would become simpler and the Reservist could be utilized.

Colonel Blasingame: I don't think that technology is what is holding up this part of the program. It is organizational planning, timing, and so forth.

Colonel Perkin: Don't you think there should be at this time parallel training of the Air National Guard and

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the Air Force Reserve in both the missile and space age?

COLONEL BLASINGAME: Well, I am an educator by profession and choice, and I am an educator at heart, and I couldn't do anything but endorse your statement. I think all of us have a whole lot to learn.

COLONEL PERKIN: Do you think we should back up and come to the middle of the road between aircraft and guided missiles, at least in the next five years?

COLONEL BLASINGAME: Well, I would like to call to your mind a statement by General White. We are going to use whichever system is appropriate for the task. I am sure you know that our program includes a great deal of development of manned aircraft as well as missiles, and I think that we are in a period of transition. There are areas in which the missile seems unlikely to substitute for manned aircraft. On the other hand, I think the present emphasis we have put on the long-range rocket is not too big. I think it could stand to be larger.

COLONEL PERKIN: Since the Air Force Academy is training your men and the courses given are of a general nature, do you contemplate some program, from a practical standpoint, to introduce space engineering courses of a more "practical" nature at the Academy?

COLONEL BLASINGAME: Our course in astronautics does treat of the fundamental physics of spaceflight itself. Because we are military people, we concentrate heavily upon those aspects of space vehicles that are likely to be important to the military man. We spend a great deal of our time on ballistic missiles, satellites, and the like. And certainly, we expose the cadet to the spaceflight picture. We expose him to a very realistic and practical study of experiments now planned and now being accomplished in space exploration.

There is, in addition to the academic training the cadet receives, a series of direct orientation courses given by the commandant of cadets. This introduces cadets to the weapon systems in use today, and those systems now in development. This course includes not just textbook instruction but visits to operating commands in the missile fields, and it includes time at the Atlas base in Cheyenne. It includes time in the operational environment of missiles. It also includes a tour of the Martin plant, where cadets will see the missile in development. Here, I think, the young officer will get a direct feel of the task ahead.

GENERAL SHOOP: Is it accurate to say that, in addition to the courses you have mentioned and the experience the cadet will be exposed to at the Academy, there are other engineering and scientific courses that relate to missiles?

COLONEL BLASINGAME: I should make it clear that what I have presented to you is a small fraction of the program. The young man in the Academy has a large program. He is occupied every minute, and I have given you a little view of only a small fraction of his time.

He has the normal university training in all of the humanities. As a matter of fact, speaking solely of the academic program, that is sufficient to occupy fully as much time as the subjects dealing with science and technology over and above what would be the normal load at a university. In other words, the cadet has additional training in the military sciences and in innumerable exercises. We have a program in athletics, as you know, and we expect each man to participate in athletics.

GENERAL HENEBRY: In addition to the training obtained at the Academy doesn't the Air Force sometimes send officers—and of course these gentlemen will be officers some day—to civilian educational institutions?

COLONEL BLASINGAME: That is correct. We aspire to have maybe ten percent, maybe twenty, of our people go on to advanced training in civilian institutions. From this group will come the new workers in research and development activities of the Air Force. But the Academy's is an undergraduate program. It doesn't do anything but help us support the very fine graduate training that the Air Force has had over the years.

MAJOR LATHAM: I happen to know that the Department of Psychology at the Academy was recently disbanded. I wonder if you have taken over in your department any of their function in the area of study that we sometimes call "human engineering"?

COLONEL BLASINGAME: We are not including in the astronautics courses at present any of the aeromedical aspects of spaceflight. When the reorganization you spoke of was accomplished, courses in human biology were added. This was taught by the Flight Surgeon. Much of the material in the course in psychology was combined into a course in management and leadership. They teach here the principles of psychology and its application to leadership.

GENERAL SHOOP: Could you give us a little additional information on the actual handling of these weapons, whether they will be adaptable to National Guard and Reserve Forces. One side of the argument has been that no civilian component would ever be capable of handling atomic weapons, that the AEC would not let them into their hands, that they were beyond the capabilities of Reserve Forces. On the other side there are people who say just the reverse is true, that with their technician program they can handle any kind of missiles or weapons. Although they might not be the one to press the button to fire them, there was no reason why they couldn't be maintained and perhaps operated by them. Do you have any comment?

COLONEL BLASINGAME: Speaking now of offensive missiles, with which I am best acquainted, we will have to considerably simplify the operation of them. We have, in connection with that, a tremendous task of backing up the astronautical supply system. In the total system of getting that missile off and keeping it ready to go there is a job for a lot of people.

GENERAL GRUSSENDORF: I would like to comment, because you can be sure I follow your desires. It is primarily a matter of getting the facts together properly and presenting them properly in order to achieve an understanding of the capabilities of the Reserve components. I think we are getting closer to that every day. The recent trip that a number of the Air Staff made to both troop carrier wings and Air Guard units at summer camp has gone a long way toward correcting a lot of misunderstanding.

The answer previously given by the Air Staff as the results of a resolution passed here by the Guard Council or the combined Reserve Council of AFA has since been modified, and I am sure will be out shortly. I think you will all be reassured that the problem is not just "Can you do it?" but rather, "How much can be done by the Reserve components?"—END

Col. Benjamin P. Blasingame was USAF project officer on the Titan ICBM, before becoming head of the Air Force Academy's new Department of Astronautics. A native of Pennsylvania, he joined the Air Force in 1941. He served in early radar development programs and holds a doctorate in aeronautical engineering, received from MIT.

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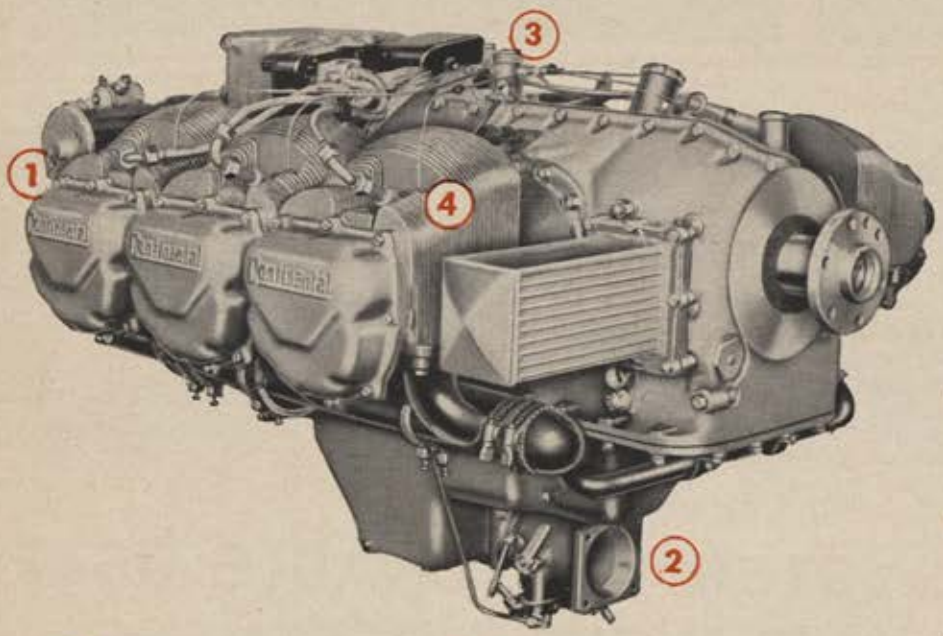

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Continental Motors Corporation

AIRCRAFT ENGINE DIVISION

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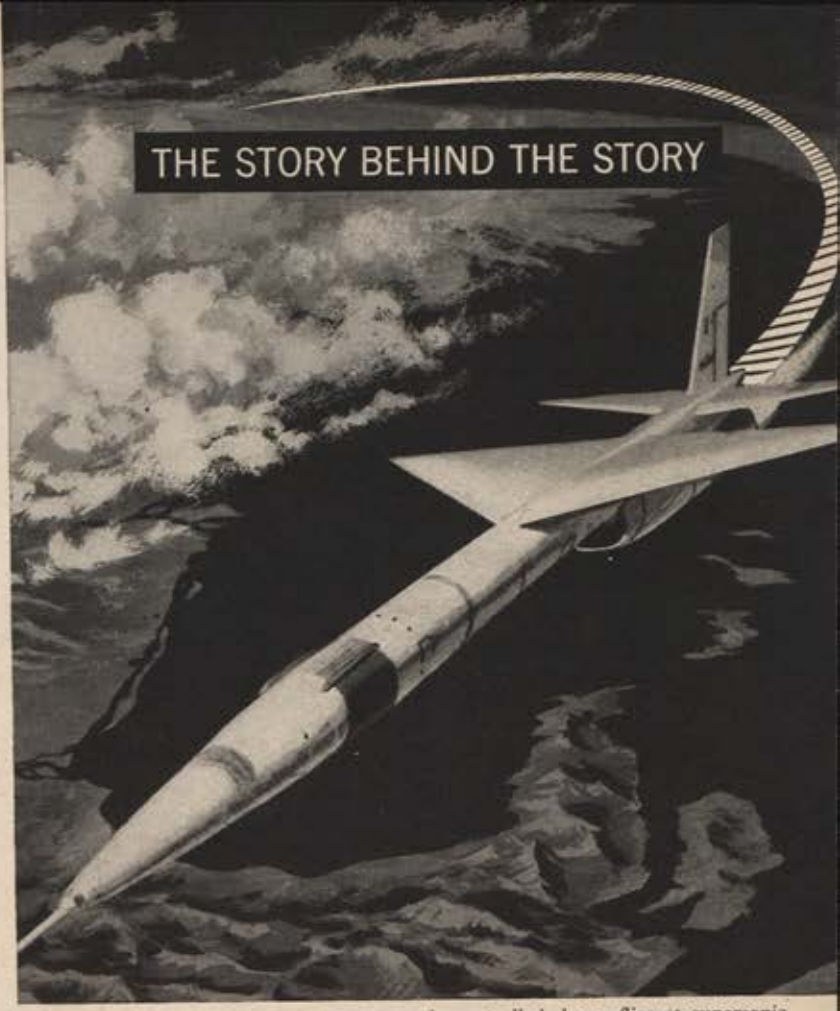
GROUND CONTROL of target drone centers in air-portable van. Men at console maintain control through flight instruments. Path of drone is traced automatically on plotting board at right.

AIR CONTROL relays commands from ground station to drone where distance or terrain block direct beam. Air director may also originate control since it has complete microwave system.



PROBING ANTI-MISSILE DEFENSES, remotely-controlled drone flies at supersonic speed toward target area. Test measures alertness of defense system and speed in launching ground-to-air missile.

GREAT RANGE of Sperry microwave command guidance system is shown in diagram. Ground station (1) controls target drone (2) either directly or through air director (3). Drone draws fire of defense system which launches ground-to-air interceptor missile (4).

RADAR SYSTEM WILL ENABLE USAF TO TEST ANTI-MISSILE DEFENSES

Can guide "attacking" drones 400 miles at supersonic speeds

How good are our anti-missile defenses? A new Sperry Microwave Command Guidance System recently demonstrated for the Air Force will help military officials find the answer. Applied to supersonic target drones used to simulate a missile attack, the system will aid in testing the readiness of air defense units and ground-to-air missile defenses.

With a range of 400 miles, the Sperry system can guide a drone along a preset course with precise accuracy from a mobile ground control station. It displays a drone's path automatically on a plotting board, receives information continuously from the drone on its speed and other flight conditions, and commands the drone's engine and flight controls. When the earth's curvature or obstructions block the ground signal, the system operates through a director aircraft which is a flying duplicate of the master ground control station.

In working with the Air Force to develop the new system, Sperry made use of its broad experience in gyroscopics and electronics as well as its mastery of microwave radar for guidance and control of missiles and aircraft. Since 1946 Sperry has been designing and producing complete long-range control systems for drones and unmanned aircraft—including the first to fly directly through an atomic cloud.

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CIVIC RESPONSIBILITIES

Gen. Curtis E. LeMay
VICE CHIEF OF STAFF, USAF

WHEN a man in a military job has duties in addition to his primary assignment, people usually say that he wears two hats.

Most of us, I think, are perfectly satisfied and, in fact, would prefer to be one-hat operators. However, in this day and age we soon learn that wearing two hats is not only the style, but quite necessary. I have become particularly aware of this over the years as I have been called upon to wear my second hat more and more often.

In both categories of hats, members of the Air Reserve Forces are important members of the Air Force family. First, they are expected to be ready on a moment's notice to join with Regular Air Force units in responding to any threat to our security. Second, they are also expected—and encouraged—to serve as Air Force spokesmen in their communities.

As far as the first hat is concerned, we of the Regular Air Force depend on Air National Guard and Air Reserve combat units and individuals to support accomplishment of the Air Force mission. Many Air Guard and Reserve units are on duty right now as integral elements of our defense network. In fact, the entire Reserve Forces unit structure is now geared to instant readiness.

Today, we have an Air National Guard composed primarily of interceptor fighters and AC&W units which are integrated into our air defense network. Air Force Reserve units, on the other hand, are charged with providing an airlift capability that can be used in support of airlift requirements for all services. Our Air Reserve Forces comprise thirty-nine combat wings, considerable support type units, and augmentation individuals. When one compares this total force with an over-all active force structure of 105 wings planned for the end of this fiscal year, it is obvious that our Reserve Forces constitute a considerable part of the Air Force capability.

It is up to the Guard and Reserve commanders to make certain that their units are just as ready as they can be made. Every problem of mobilization must be anticipated and resolved *now*. I realize that there may be some problems of facilities and equipment which are difficult to overcome, but we must keep after them and work together to settle them. If units or individuals cannot be made ready for immediate useful service in an emergency, we are wasting time and money and we should scrub them. We cannot squander our resources.

In turn, the Air Force will offer all possible support to those units and individuals who readily accept a share of responsibility for carrying out the Air Force mission. We need and are glad to have them as equal partners.

When it comes to wearing the second hat, Air Reservists can play another important role—by informing the people about airpower. By this I mean that Reservists must use their experience and knowledge to interpret airpower accurately through individual contacts with the public. In this way Reservists can help others to make decisions about the Air Force on the basis of facts. . . .

If the Air Force and the other services are to have what they need to attain their optimum effectiveness as instruments supporting the government's policies, they must be backed up by the understanding, will, and determination of the American people. This means that the people must be constantly informed on the progress of the national defense efforts. And since airpower is an important part of the total national defense strength, the people must receive a steady flow of information about the Air Force.

I see Air Force public information objectives this way:

First, we want the American people to be accurately informed about the airpower threat to our security, and we want them to know what the Air Force is doing to counter the threat.

Second, we want the people to know what the Air Force needs, now and in the future, to do its job.

And last, we want the people to have confidence in the Air Force—confidence based on our continuing high standards of performance.

Modern airpower has compressed time and space into a small package. Technological advancement in thrust, structures, and electronics foreshadows an even greater incompetence of time and space as allies. That is why the most dangerous threat facing this nation and the free world is expanding Soviet airpower. Fortunately, our own airpower is of excellent quality and growing. The point is, however, it has to keep improving—keep increasing in quality and strength, and it can only do this if the public understands the urgent necessity for the United States to have airpower second to none.

Our public information agencies are trying hard to keep the public informed. At various times in recent months,

(Continued on following page)

for example, the Air Force has informed the public that we are actively concerned with fifteen missile systems, some of them operational, some testing, and some in development. We have also released information concerning the location of twenty sites for missile operation in different parts of the country—as well as the existence of a dozen missile units, either in operational or training status. The public has also been informed about some of our other projects, such as the X-15 which man will soon take into the near area of space. We have also told the public about a subsequent spacecraft designed to put a pilot into orbital flight and return him to earth.

At the same time that all of this has been going on, we have tried to keep the public informed concerning the improvements in all categories of our manned aircraft forces. The public has also been told about the measures being taken to better our forces' alert posture and reaction time—a most important counter to the threat. However, such a vast and complicated process is difficult to present to the public in such a manner that they can keep the whole picture of airpower in perspective.

Dissemination of information concerning the threat and the counter to this threat is more than a question of mass media communication. As effective as these outlets are, and as much as they help, they cannot do the whole job. A lot of hard work by individuals, who understand airpower and can talk intelligibly about it, still has to be done at the community level.

In making the progress of airpower crystal clear to men and women throughout the country, the direct contacts Air Reservists have in towns and cities everywhere are invaluable. Their friends and fellow citizens want up-to-date information about the Air Force, and they respect the knowledge and opinions of these Reservists. Where precise understanding is concerned (and it certainly is concerned in the case of modern airpower) there is nothing to equal person-to-person communication.

If the public is to have confidence in their airpower, we in the Air Force must make clear to the public our own concepts. It is essential that the public know and understand what the Air Force is doing to maintain its capabilities to counter today's threat while bringing along the strength that must be ready tomorrow. In this respect, several fables have cropped up persistently as a result of recent technological developments. For example, you have undoubtedly heard it stated or implied that the progress of automatic devices spells the doom of the flying Air Force. We have some excellent automatic devices now and will undoubtedly have even more remarkable ones in the future—but mechanical marvels will not be able to do all the jobs. They never will be completely free of reliance on human functions. Whatever they are, whatever they do, wherever they operate, the so-called unmanned devices will still be carrying out decisions that men make and instructions that men prepare for them—often as onboard flying crews. One thing is certain—automatic devices never will be able to anticipate every condition.

One of the things that we must make clear in presenting our facts to the public is that forces employing mixtures of the most modern systems—manned and unmanned—will be capable of a wider variety of tasks. They will be able to get the job done better and more economically. Since man will continue to be an important element of Air Force strength, one of the most serious tasks facing us is to find men with the necessary skills to handle the flying and support functions in the years ahead. Here again, you can help by using your knowledge and influence to encourage a general understanding of the opportunities that young men and women can find in the Air Force.

Another fable—talk of the "ultimate" weapon—started last October with the launching of the first Sputnik. True, the development of any radically new weapon or technique is generally spectacular and always important. But the strength and quality of our airpower doesn't rest on any single weapon or technique. Its foundation is a system of integrated and mutually supporting forces. And our superiority can be extended into the future only if this system moves forward into the space age as an entity. Personally, I doubt that there ever will be an ultimate weapon although I agree that at a given moment in history, a weapon could be decisive.

There is a constant need for people who are familiar with airpower to keep the record straight by sorting fiction from fact about airpower and its future. To help, our public information people operate an internal information program, the purpose of which is to keep the Reserve Forces supplied with current facts so that Reservists can be of real service to the people of their communities. I trust they will make use of it.

There is one last thought I would like to leave—this thing called public relations is not a manipulation of minds. It is not, as some of the short-lived, light-headed popular books have implied, something immoral, evil, or contrived. It is not press agentry. Rather, public relations is first deserving, and then earning, public understanding. In that context, public relations, and education as well, are tools of an enlightened policy toward the public. In America today, one must be understood if he wants to gain support. We all must contribute if we want to sustain that support.

Today, the Air Force is a vast and complex operation much larger than most people realize. Its annual budget, for example, is approximately four times as great as the total annual net sales of United States Steel—one of the world's largest industrial corporations. It is not surprising, therefore, that nonmilitary individuals who are busy with their own affairs find it difficult to keep up with everything we are doing. We owe it to them—as fellow citizens and taxpayers—to keep them informed.

No institution can survive in a democracy if the public is of a contrary opinion. Although the Air Force may enjoy a history of accomplishment and the current support of the President, Congress, and the public, we cannot sit back and assume that we will retain their support. The challenge then is: Are we going to leave our public relations to chance or are we going to do something constructive about it?

The public relations and educational job of achieving public understanding and support cannot be done by commanders and staff officers alone because the attitudes and actions of every individual associated with the military all speak louder than any command echelon. The commander or staff officer can act in the best interests of his country and wear his second hat well, but others can undo—knowingly or unknowingly—faster than he can achieve. That is why all of us in the active military service and all Air Reservists as well, have to lend a hand in the matter of public relations.—END

Gen. Curtis E. LeMay is Vice Chief of Staff, USAF. Prior to his assignment in Washington, General LeMay was SAC's Commander in Chief. A pioneer pilot before World War II, during the war he directed the B-29s in the air war against Japan. He took command of SAC in 1948.

THE NAVY'S DEADLY FLYING FISH

It's called TALOS . . . a name to remember.

It's the missile now installed on the Navy's newly-commissioned guided-missile cruiser, the *U. S. S. Galveston*. It's a surface-to-air weapon that can knock invading aircraft out of the skies.

Deadly accuracy

It's part of a weapon system conceived by Applied Physics Laboratory of Johns Hopkins University. Using an air-borne guidance system developed by ITT engineers, TALOS locks on its target...seeks it relentlessly, the way a compass needle seeks North...swiftly overtakes and destroys it.

The deadly accuracy of TALOS makes it one of the most important and successful weapons available for the defense of our skies.

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So keen, so accurate is its air-borne guidance system, the Army will use TALOS too. The Navy and the Army are pooling their resources—working in close, effective cooperation—to develop land-borne, mobile launching devices and modified firing controls . . . to take the fullest advantage of TALOS' remarkable "brain power" and striking power.

The big job of ITT in missile guidance

TALOS is just one of the missile tasks that have been assigned to ITT. The Army's LACROSSE is another. ITT engineers developed its complete guidance, ground, air, tracking, and computing systems. They contributed to RASCAL, for the Air Force. They developed the launching and firing controls and test equipment for BOMARC, another Air Force missile. ITT engineers developed, designed and supplied much of the vital communication systems providing telephone service and warning information at the ATLAS intercontinental missile bases.

It's a big job—requiring research, experience, skill, imagination in electronics and other fields. It's a job that ITT is proud to be a part of.

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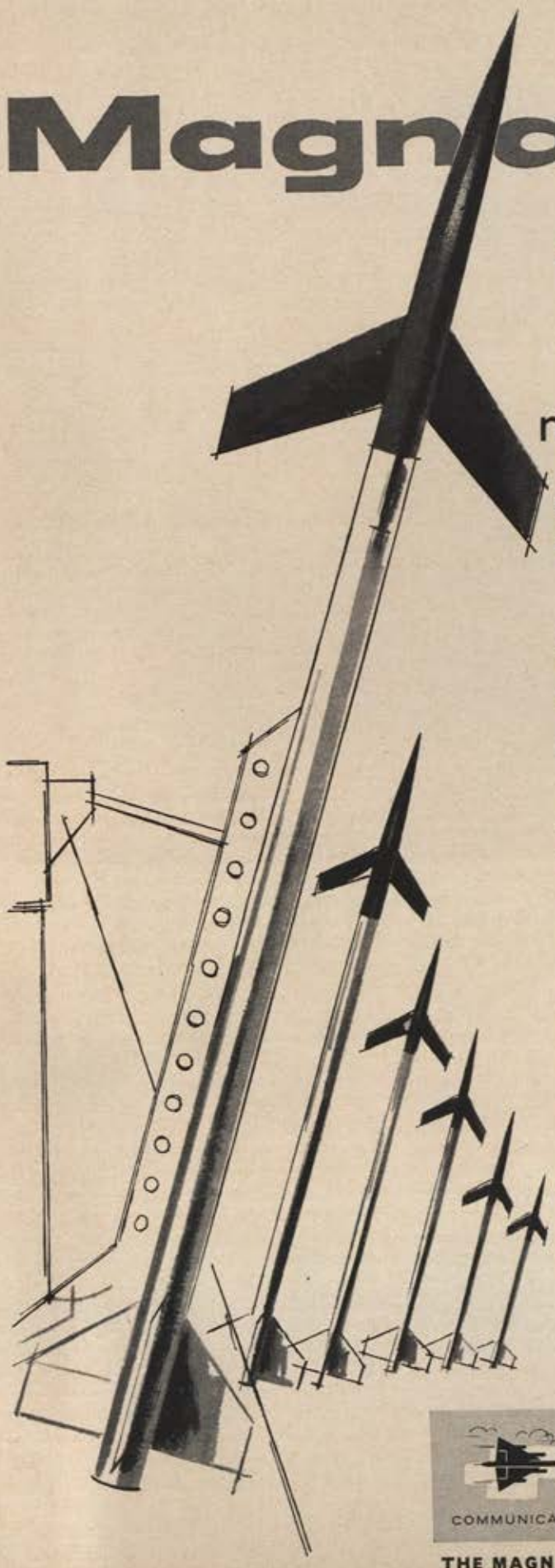

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It's a proven fact . . . that of the total work necessary to put a missile into the air, a staggering 90% is primarily logistical and involves the control of many individual maintenance parts. This figure becomes compounded as the number of inactive, but ready-to-fire missiles increases . . . and keeping track of their individual needs becomes a herculean task.

It is clear that an efficient system of organizing, filing and searching great masses of data at high speeds, and at realistic costs is necessary. The Magnavox Company answers the need for "discrete" unit data record handling with **Magnacard.**

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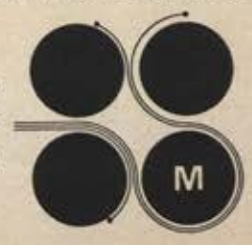

THE MAGNAVOX COMPANY · Dept.14 · FORT WAYNE, INDIANA

Arizona Senator and rated command pilot, Barry Goldwater, receives special AFA Citation from AFA President Schenk.

The 1958 winner of the Ricks event, Capt. Clarence Christensen, Jr., Nebraska ANG, accepts his trophy.

AFA RESERVE FORCES AWARDS

A SURPRISE award from the Air Force to the moderator, presentation of outstanding Guard and Reserve individual and unit awards, honoring of a flying US Senator, and awards of a trophy and plaques to the Ricks Memorial event winners climaxed the busy and event-packed all-day Reserve Forces Seminar September 25 at the Dallas Convention.

Recipient of the Air Force Award, the Exceptional Civilian Service Award, was the Reserve Seminar's moderator, John P. Henebry, former AFA President and outgoing Chairman of the Board.

His award was presented by Air Force Vice Chief of Staff, Gen. Curtis E. LeMay, in recognition of the Reserve general's outstanding contributions to airpower on the occasion of last year's Fiftieth Anniversary of the Air Force.

Senator Barry Goldwater of Arizona, who received a special AFA Citation, was recognized at the Seminar for his outstanding service as an Air Force Reservist, including studies of the problems of personnel retention, advanced aircraft, and ballistic missiles.

A colonel in the Air Force Reserve, the Arizona legislator is the only US Senator to have achieved the rating of command pilot. He has flying time in twelve different types of jet aircraft.

Announcement of the top Air National Guard and Reserve units and individuals also starred the busy day. Chosen as the outstanding Guard unit for 1958 and recipient of an AFA award was the 175th Fighter-Interceptor Squadron, of Sioux Falls, S.D.

The 175th established, as part of its excellent performance, a new record score in the Spaatz Trophy competition. Maj. John Schilt, unit commander, accepted the AFA honor on behalf of his men.

Winner of the top Air Reserve Unit AFA Award for 1958 was the 349th Troop Carrier Wing, stationed at Hamilton AFB, Calif. This unit had been redesignated from a fighter-bomber wing, and established an outstanding performance record. The award was accepted for the unit by its commander, Brig. Gen. Harold P. Little.

The honors as top individual Air National Guardsman went to M/Sgt. Harry Kilpatrick, a member of the 138th Fighter-Interceptor Squadron of the New York Air National Guard, who received a plaque in recognition of his outstanding performance.

His opposite number in the Air Reserve—1958's outstanding Air Reservist—was M/Sgt. Louis J. Rasmussen of the 2643d Air Reserve Center at San Francisco, Calif. Sergeant Rasmussen is first sergeant of the 631st USAF Hospital (Reserve). He received an AFA plaque to mark his achievement.

Both men were honored, too, at the Airpower Awards Banquet, on Saturday evening, September 27.

The winner of the AFA's 1958 Air National Guard Ricks Memorial event, Capt. Clarence Christensen, Jr., of the 173d Fighter-Interceptor Squadron, Lincoln, Neb., received the Ricks Trophy from AFA President Schenk at the Seminar. Captain Christensen completed the dash from Jacksonville, Fla., to Dallas on Sunday, September 21, prior to Convention opening, in one hour, forty-eight minutes, and twenty seconds. The proficiency event, flown in North American F-86Ds, featured radar-controlled intercepts. Of the nine Air National Guard pilots who started, eight completed.

Honored with plaques were the three runners-up in the Ricks event: Lt. Arthur R. Allen, 122d Fighter-Interceptor Squadron, New Orleans, La.; Lt. Elvin R. Ruthstein, 151st Fighter-Interceptor Squadron, Knoxville, Tenn.; Capt. Bobby W. Dodges, 111th Fighter-Interceptor Squadron, Houston, Tex.

All four winners were presented, at the close of the formal trophy and plaque ceremonies, with gift transistor radios from the General Electric Company, presented by J. B. Montgomery, of GE's Aircraft Gas Turbine Division at Cincinnati, Ohio, manufacturers of the J-47 jet engines powering the F-86Ds flown in the Ricks cross-country.—END

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Protect Your

James H. Straubel
Executive Secretary of AFA, says . . .

"We have long known of Mutual's interest in and work for the USAF. Their work on Medicare, and on the continuing MATS insurance program have won them recognition throughout the Air Force. We are delighted to have Mutual work with us in helping to protect hazardous duty pay of rated personnel."

Mr. V. J. Skutt
President, Mutual of Omaha, says . . .

"It is with great pride that we accept the responsibility of protecting this vital segment of our armed forces. We know the importance of their part in protecting our way of life. We are fortunate to be able to assist them—doubly fortunate in this opportunity to work with so respected an organization as the Air Force Association."

New

brings flyers security —

Wife?

Kids in School?

How much of your flight pay does it take right now to cover your family expenses? And what plans have you to cover those expenses if you're grounded, and your flight pay is lost for 3 months, 6 months, a year?

AFA's Flight Pay Protection Plan was designed for you—designed to help you cover expenses without going into debt, in the event that you're grounded. Details on the next page.

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Flight Pay!

low-cost protection—a non-profit service of AFA to rated personnel—

peace of mind – *and indemnity for flight pay lost*

through grounding for disease and accident.

Got a new car?

A mortgage?

Bills due?

Add up your outstanding obligations. Then figure out for yourself how you'd handle them, if you lost your flight pay through grounding.

If loss of flight pay would mean embarrassment, worry, trouble—then you're the man that AFA's Flight Pay Protection Plan was designed for. Flight Pay Protection, after a waiting period, gives you a continuous income after you're grounded—gets rid of nagging worries about bills or debts. You'll find full details on the next page.

If you're grounded

For 90 days or more as a result of disease—for 180 days or more as a result of aviation accident —then, if you're covered by AFA's Flight Pay Protection Plan, you get

a) indemnity for lost flight pay, at the rate of 80% of the pay you've lost. (Tax free — the amount is roughly equivalent to 100% of your regular taxable flight pay.)

b) A continuing income—indemnity at the same rate—for as long as 12 months in case of grounding due to disease, or 24 months, for groundings due to aviation accident.

You pay only 2% of your annual flight pay for this protection!

This protection is made possible at this rate as a non profit service of AFA *for AFA members only,* through the cooperation of Mutual of Omaha.

For details and instruction on how to become an AFA member, see the pages which follow.

Here's How the Plan Works

Basically, Flight Pay Protection is designed to protect you from loss of flight pay due to disease or accident which strikes after you have taken out this protection.

You pay 2% of your annual flight pay for this protection. In return, you may receive 80% of any flight pay you lose through groundings.

There are some cases which the Protection Plan will not cover. They're about the ones you'd expect—attempted suicide, groundings due to injuries received as a result of insanity, VD; voluntary suspension from flying; groundings due to disease or accident which preceded application for protection.

Since, basically, this plan is designed to use your own money to protect you, these exclusions are the ones you would want yourself, to protect your investment.

Chances are that they will never affect you. But you'll want to read them over before you take out the coverage—and here are the conditions and the exclusions which affect payment under the plan.

THIS IS TO CERTIFY that under and subject to the terms and conditions of Group Policy No. GMG-1776 (herein referred to as the policy) issued to the AIR FORCE ASSOCIATION, Washington, D. C. by MUTUAL BENEFIT HEALTH & ACCIDENT ASSOCIATION, Omaha, Nebraska (herein called the Association), the Member whose name appears on this certificate is insured for the insured period specified herein against loss of Incentive Pay for Hazardous Flight Duty Performed, in accordance with current Service Regulations, hereinafter called Incentive Pay, due to (1) accidental bodily injuries received while the Member is insured under the policy, or (2) disease contracted while the Member is insured under the policy and more than 30 days after the effective date of the Member's insurance thereunder. The 30 days waiting period applicable to loss of incentive pay due to disease shall not apply to coverage under Member's certificate renewed without lapse.

PART I. MONTHLY INDEMNITY

If, because of covered injuries or disease, the Member shall become disabled while insured under this policy so as to be prevented from performing duties entitling the Member to receive Incentive Pay, the Association will pay monthly indemnity periodically, based on the Incentive Pay applicable to his "Pay Grade" and "Years of Service" in accordance with current rates of "Incentive Pay for Hazardous Duty" as set forth in current Service Regulations, in an amount equal to one-twelfth of 80% of the "Amount of Annual Flight Pay" shown on the Member's Certificate of Insurance, for the period of such continuous disability as hereinafter specified:

(a) If disability is caused by covered injuries due to an Aviation Accident, no indemnity shall be paid unless the period of disability exceeds 180 consecutive days. If such disability continues beyond this waiting period, indemnity for loss of "Incentive Pay," as defined herein, will be paid retroactive to the 91st day from the first day of the month in which such disability occurred, but for not exceeding 24 months.

(b) If disability is caused by covered injuries not due to an Aviation Accident, or by disease, no indemnity shall be paid unless the period of disability exceeds 90 consecutive days. If such disability continues beyond this waiting period, indemnity for loss of "Incentive Pay," as defined herein, will be paid retroactive to the first day of the month in which such disability occurred, but for not exceeding 12 months.

A Member shall not receive more than the respective total limit of indemnity for any and all continuous or successive disabilities incurred during any single premium period.

PART II. EXCLUSIONS

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

1. Criminal act of the Member or from injuries occasioned or occurring while in a state of insanity (temporary or otherwise).
2. "Fear of flying," as officially certified by responsible authority of the Member's Service and approved by the head of the service in accordance with applicable regulations.
3. Caused by intentional self-injury, attempted suicide, criminal assault committed by the Member, or fighting, except in self-defense.
4. Directly or indirectly caused by war, whether declared or not, if act of an enemy in such war is the direct cause of loss insured hereunder, hostile action, civil war, invasion, or the resulting civil commotions or riots.
5. Failure to meet flying proficiency standards as established by the Member's Service unless caused by or aggravated by or attributed to disease or injuries.
6. Inability of a member to continue to meet physical standards for Hazardous Flight Duty because of a revision in those standards, rather than because of preceding injury or disease causing a change in the physical condition of such member.
7. Accidents caused while riding or driving in any kind of race.
8. Alcohol, drugs, venereal disease, arrest or confinement.
9. Willful violation of flying regulations resulting in suspension from flying as a punitive measure, or as adjudged by responsible authority of the Member's Service.
10. Sentence to dismissal from the service by a general court-martial, submitted resignation for the good of the service, or suspension from flying for administrative reasons not due to injuries or disease.
11. Loss of life shall not be deemed as loss for purposes of this insurance.
12. Primary duty requiring parachute jumping.
13. Voluntary suspension from flying.
14. A disease or disability pre-existing the effective date of coverage, or a recurrence of such disease or disability, whether or not a waiver has been authorized by appropriate medical authority in accordance with regulations or directives of the service concerned.

15. Mental or nervous disorders.

The following conditions will be of particular interest to you as a covered Member:

1. (a) A member is considered eligible to apply for this insurance provided he has successfully passed his last annual physical examination and is physically qualified and entitled to receive "Incentive Pay" as of the date of application, provided, that an annual physical examination shall not be deemed to have been successfully passed for the purposes of this insurance if upon review of that examination or any laboratory tests or upon re-examination the Member is suspended for physical reasons from flight status.

   (b) The Principal shall have the right to request a review by appropriate Military Medical Authorities of the medical records and other evidence submitted in connection with a claim.

2. Each Member agrees to notify the Association through the Principal of any change in "Incentive Pay" because of change in grade and years of service and to pay any additional premium thereafter due. Such change shall be effective only on the next succeeding renewal date of his coverage. In the event the Member has failed to give this notice, the Association will have the right to specify in the new certificate the amount shown on the preceding certificate.

3. (a) The insurance of any Member shall automatically terminate as of the date he ceases to be a member of the Air Force Association, leaves the Member's Service, is pensioned or retired, whichever occurs first, or as of the next premium due date succeeding his attaining the age of sixty years. No indemnity shall be due or payable hereunder for any month occurring after the Member ceases to be a Member of the Air Force Association, leaves the Member's Service, is pensioned or retired, whichever occurs first, or after the next premium due date succeeding his attaining the age of sixty years.

   (b) In the event a Member receives the limit of 24 months' indemnity for disability caused by accidental bodily injuries due to an Aviation Accident or 12 months' indemnity for disability caused by accidental bodily injuries not due to an Aviation Accident, or by disease, coverage as to such Member and premium payments not then due will automatically terminate. Thereafter the Member may reapply for coverage hereunder subject to all the terms, provisions, limitations and exclusions set forth in the policy.

4. Written notice of claim should be given to the Air Force Association within 20 days after the occurrence or commencement of any loss covered by the policy.

5. Written proof of loss must be furnished to the Air Force Association, Washington, D. C. for each month for which indemnity is claimed, within 90 days after the termination of said monthly period for which the Association is liable.

6. All indemnities of the policy will be distributed through the Air Force Association to the insured Member or, in the event of his death prior to payment of claim, to his next of kin.

7. No action at law or in equity shall be brought to recover on the policy prior to the expiration of sixty days after written proof of loss has been furnished in accordance with the requirements of the policy. No such action shall be brought after the expiration of three years after the time written proof of loss is required to be furnished, or such further time as may be required by law.

MUTUAL BENEFIT HEALTH & ACCIDENT ASSOCIATION

/s/ V. J. Skutt
President

Mutual
OF OMAHA

AIR FORCE ASSOCIATION
FLIGHT PAY PROTECTION PLAN
Underwritten by Mutual of Omaha

11-58

SEND REMITTANCE TO AIR FORCE ASSOCIATION, MILLS BLDG., WASHINGTON 6, D. C.

(Please Print) Rank Name

Serial Number Years Service for Pay Purposes

Mailing Address

Amount of Annual Flight Pay

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

Signature of Applicant Date

☐ I want to join AFA, $6 dues enclosed.

Application must be accompanied by check or money order for annual premium. The annual premium charge is two percent of ANNUAL flight pay.

THE DELEGATES AT WORK IN BIG "D"

Schenk, Trail head 1958-59 slate of leaders as business sessions chart year ahead

PETER J. Schenk of Washington, D.C., who has earned national repute as a spokesman for US aerospace power in the Technological War, was reelected President of the Air Force Association as delegates gathered at the Dallas, Tex., Convention, September 25-28 to choose their 1958-59 leadership slate. Mr. Schenk is the second man in AFA history to be honored with reelection as President. In private life, Mr. Schenk is assistant to the president of Raytheon Manufacturing Company.

Serving with President Schenk, as 1958-59 Chairman of the Board, will be James M. Trail, of Idaho, Chief of Staff for Air of that state's National Guard and a veteran AFAer and former National Director. For a full rundown of new AFA officers and directors, see opposite page.

More than much had happened in the world since the delegates had gathered in Washington for the 1957 Convention and salute to the Fiftieth Anniversary of the US Air Force.

The Soviets had startled the world with their Sputniks, and responding to the challenge, the US had intensified some of its efforts to meet the increasingly menacing Russian challenge.

But to the AFA delegates, the questions—a year after Sputnik—remained: Are we doing enough to stay with and surpass the Communists? And equally important, are the American people getting the full story of the US position *vis à vis* the Soviets?

The Association's 1958 Statement of Policy (*for full text, see page 36*) pointed up these questions firmly and bluntly:

"Soviet strength and striking power continue to grow at a more rapid pace than our own. Our margin of security continues to dwindle. . . .

"Our peril would be clearer to the American people if our leaders would make candid acknowledgment of their estimates of current and future Soviet forces to be posed against us—forces which daily grow more dangerous to our survival. . . ."

To meet these challenges, AFA once again called for consolidation of the three military departments into one.

Demanded, too, in the 1958 Statement was an increase in expenditures for "research and development of future forces appropriate to the changing threat."

That the US *can* afford expanded efforts in defense was strongly asserted in the AFA Statement.

In the words of the Statement:

"Our total national defense effort can be expanded without endangering the economy.

"The defense effort today represents less than twelve percent of our gross national product. Estimates of the percentage of gross national product devoted to the Soviet Union's military effort range from thirty to fifty percent. Yet the threat posed by the enemy's actual force in being today, and by the more advanced weapon systems he is rapidly developing and producing, places a far greater requirement upon our defense effort now and over the next decade than was the case ten years ago.

"We believe the people of the United States should be frankly informed of the grave danger in which they live. . . . We believe the American people are currently being asked to take this risk without their full knowledge and understanding."

AFA's 1958-59 leaders, chosen at Dallas, are Peter J. Schenk, reelected as President, and James M. Trail, elected Chairman of the Board. He succeeds John P. Henebry in that AFA office.

Opening the first business session at Dallas' Hotel Adolphus was the invocation by Msgr. William F. Mullally, AFA Chaplain, following the formal call to order by President Schenk. Chairman of the sessions was Howard T. Markey, Chicago, Great Lakes Regional Vice President.

Addresses of welcome were given by Convention Chairman Al Harting, Mayor R. L. Thornton of Dallas, and Maj. Gen. Harry Crutcher, Jr., Texas Air National Guard, who was military host.

To mark the admittance of Alaska as the forty-ninth and now largest state of the Union, a report on the significance of Alaska in the aerospace power picture was given the delegates by Lt. Gen. Frank A. Armstrong, Jr., Commander of the Alaskan Command, who was on hand to represent the Governor of Alaska and military forces in that vital area. In the audience, as the General spoke,

was a delegation from the newly chartered AFA squadron in the newest state. The group, represented by Dan Plotnick, received its charter at the session from President Schenk.

Keynote address at the session was given by former Chairman of the Board Gill Robb Wilson (*see page 60*). Mr. Wilson praised Alaska as the first US state carved out by airpower and went on to discuss what he described as the new formula for survival in an age of mass destruction potential. He called for increasingly greater stress on aviation as an instrument of national policy and demanded that scientists fulfill "their duty in giving meaningful explanations of the implications of [their advances] to society and to the economics of life."

The famed speaker earned a standing ovation.

Following Mr. Wilson's address, the annual report to the delegates was given by James H. Straubel, AFA Executive Director, who described the intensified activities of the staff and organization during the hectic twelve months just passed, announcing to delegates the addition of "a magazine within a magazine," the new SPACE DIGEST, beginning on page 67 of this issue.

Reelected to serve with President Schenk and Chairman of the Board Trail were Julian B. Rosenthal of New York City, National Secretary, and Jack B. Gross of Harrisburg, Pa., National Treasurer. Both are Air Force World War II veterans. Mr. Rosenthal is an attorney and has served as AFA's legal counsel, and Mr. Gross is a beverage jobber and automobile dealer.

The Convention chose six new AFA Regional Vice Presidents and reelected six others. Nine new National Directors were elected and nine others were retained. A full rundown appears below. The Rev. William Laird, Haddon Heights, N. J., was chosen as new National Chaplain.

Other highlights:

- Honored specially were recipients of AFA's 1958 "Family Awards," given in recognition of contributions to airpower, and announced at the closing Airpower Brunch, held Sunday morning, September 28, at the Statler Hilton Hotel. Chosen as AFA's "Man of the Year" was Treasurer Gross, while the "Unit of the Year" was the San Diego, Calif., Squadron. For full rundown of family awards, see box on following page.
- Miami Beach, Fla., was approved as the site of the 1959 Convention and Aerospace Panorama, while

(Continued on following page)

Left to right, high spots of the business sessions and Awards Banquet: Julian B. Rosenthal, reelected National Secretary, makes report to delegates; Jack B. Gross, reelected National Treasurer, receives congratulations, after his designation as AFA's Man of the Year, from outgoing Board Chairman John P. Henebry; San Diego Squadron commander, Frank W. Davis, acknowledges honor to his unit as AFA's Unit of the Year; Convention Chairman, Dallas' Al Harting, welcomes delegates; Alaskan Command commander, Lt. Gen. Frank Armstrong, addresses delegates on new state's strategic role.

AIR FORCE ASSOCIATION'S NEW LEADERS

Elected for the Year 1958-59 at Dallas, Tex.

SECRETARY

***Julian B. Rosenthal**
New York, N. Y.

PRESIDENT

***Peter J. Schenk**
Washington, D. C.

TREASURER

***Jack B. Gross**
Harrisburg, Pa.

REGIONAL VICE PRESIDENTS

New England Region
**Philipe F. Coury*

Northeast Region
**Leonard A. Work*

Central East Region
George D. Hardy

Southeast Region
**Alex G. Morphonios*

South Central Region
Roy T. Sessums

Midwest Region
**Kenneth H. Bitting*

Southwest Region
**Hardin W. Masters*

Rocky Mountain Region
Dale R. Erickson

Great Lakes Region
**Howard T. Markey*

North Central Region
**Merle S. Else*

Northwest Region
Robert H. Mitchell

Far West Region
Harvey J. McKay

NATIONAL DIRECTORS

Chairman of the Board—James M. Trail, Boise, Idaho

****John R. Alison**
Hawthorne, Calif.

***A. Paul Fonda**
Hagerstown, Md.

****Arthur F. Kelly**
Los Angeles, Calif.

***Charles O. Morgan, Jr.**
San Francisco, Calif.

***Arthur C. Storz**
Omaha, Neb.

Walter T. Bonney
Silver Spring, Md.

J. Wayne Fredericks
Bronxville, N. Y.

****George C. Kenney**
Scarsdale, N. Y.

Msgr. William F. Mullally
St. Louis, Mo.

****Harold C. Stuart**
Tulsa, Okla.

***J. Alan Cross**
Miami, Fla.

Albert L. Harting
Dallas, Tex.

Thomas G. Lanphier, Jr.
La Jolla, Calif.

Fred O. Rudesill
Metairie, La.

***W. Thayer Tutt**
Colorado Springs, Colo.

****Edward P. Curtis**
Rochester, N. Y.

***Samuel M. Hecht**
Baltimore, Md.

***W. Barton Leach**
Weston, Mass.

****C. R. Smith**
New York, N. Y.

Alden A. West
DeWitt, N. Y.

J. R. Dempsey
La Jolla, Calif.

****John P. Henebry**
Park Ridge, Ill.

***Carl J. Long**
Pittsburgh, Pa.

****Carl A. Spaatz**
Chevy Chase, Md.

****Gill Robb Wilson**
Huntington, L. I., N. Y.

****James A. Doolittle**
San Francisco, Calif.

****Robert S. Johnson**
Woodbury, N. Y.

John S. Montgomery
Glendale, Ohio

William W. Spruance
Wilmington, Del.

Paul S. Zuckerman
New York, N. Y.

Edward Lee Heinz, *Berkeley, Calif.*—ex officio
Rev. William Laird, *Haddon Heights, N. J.*—ex officio

* Incumbent

**Permanent members

Chicago and Las Vegas were favored for selection of the 1960 site.

The third business session on Saturday, September 27, saw delegate action on resolutions:

Passed resolutions included:

- A call for AFA to urge action by the President and Department of Defense toward a goal of a single promotion list for all ranks in all services, with the ultimate goal of a single military service.
- AFA support of revisions of current weapon systems and procurement practices for increased emphasis on competitively negotiated incentive-type contracts to reduce lead time, while providing proper safeguards for small business.
- A call for congressional action to provide increased quarters allowances for military personnel; extra hazard pay for personnel involved in development and operation of new weapon systems or at a remote station not now covered by current flight pay provisions; adoption of the career management provisions of the Cordiner Report to allow needed flexibility in promotion and retirement policies.
- A call for congressional action to improve housing for military personnel and dependents by extending the Capehart-Rains Act, programming housing at remote stations, programming housing for married, lower-grade airmen.
- Encouragement by AFA of qualified young men to enter the new Air Force Academy.
- Commendation of the Eighty-fifth Congress for its legislation of the National Aeronautics and Space Administration; the Federal Aviation Agency; increased military pay; and reorganization of the Department of Defense.
- A call for the President, the Congress, and Secretary of Defense to assess and make public the US military requirement in the face of the Soviet threat in terms of the nation's ability to bear the economic burden.
- A call for the modernization, with jets and turboprop transports, of the Military Air Transport Service, and the Air Reserve and Air National Guard.
- A call for enactment of legislation extending the Federal Air Transport Program to at least June 30, 1963, with expenditure of at least $100 million during each year of the program.

Resolutions significant to AFA organization and constitutional procedure included:

- Limitation of the office of national president to no more than two terms in succession.
- Provision for National Constitution to be amended to read: "The right to nominate and vote for thirteen (13) Regional Vice Presidents representing each of the regions specified in Article V, Section 2 of this Constitution, shall be confined to the delegates representing their respective regions."
- Provision that Airpower Councils be formed only with the consent of appropriate wing commander and concurrence of squadron or flight in area concerned.
- Recommendation that the Space Education Foundation establish a perpetual memorial suitably honoring the memory of the late Capt. Iven C. Kincheloe, Jr.
- A call for the President and Board of Directors of AFA to advise the Secretary of the Air Force of the need to take cognizance of capabilities and resources of the Air National Guard in the missile age.
- A call to the AFA President and Board to urge enactment of the All-Service Bill to amend the Reserve Officers Personnel Act to correct inequities as the act affects the Air National Guard and Reserve.
- Recommendation to USAF and the Congress that assignment of officers as Executive for Reserve Affairs and their staffs at Hq. USAF and CONAC be restricted to Reserve officers called to active duty for four-year terms for express purpose of filling such posts and that such tours be limited to one.
- Call for AFA to urge Congress in future appropriations to earmark funds for Reserve support, so that they may not be used for other purposes.
- Call for the Association to petition the Department of Defense to remove present restrictions on drill pay ceilings and that all personnel in augmentation forces, along with programmed units of the Air Reserve Forces, be paid inactive-duty training pay.—END

AFA ~~FAMILY~~ AWARDS

THE PRESIDENT'S TROPHIES

Jack B. Gross, Harrisburg, Pa., AFA's Man of the Year

San Diego, Calif., Squadron, AFA's Unit of the Year

UNIT EXCEPTIONAL SERVICE PLAQUES

California Wing, Membership

Pennsylvania Wing, Education

Lincoln Squadron, Lincoln, Neb., Community Relations

Vandenberg Squadron, Detroit, Mich., Programming

INDIVIDUAL EXCEPTIONAL SERVICE PLAQUES

Frank W. Brazda, San Diego, Calif.

William L. Dougherty, Cleveland, Ohio

Alex G. Morphonios, Miami, Fla.

O. D. Olson, Colorado Springs, Colo.

Mr. and Mrs. Robert A. Patterson, Pittsburgh, Pa.

Alden A. West, DeWitt, N. Y.

Leonard A. Work, State College, Pa.

T/Sgt. John H. Zollinger, San Diego, Calif.

MEDALS OF MERIT

John I. Bainer, Long Beach, Calif.

Ken Ellington, New York, N. Y.

R. Kenneth Hamler, Jr., Millington, N. J.

Earl McClintock, North Hollywood, Calif.

Will O. Ross, Mobile, Ala.

J. Chesley Stewart (Posthumously), St. Louis, Mo.

Mrs. Ruth Young, Pittsburgh, Pa.

SPECIAL CITATIONS

John P. Henebry, Chicago, Ill.

Julian B. Rosenthal, New York, N. Y.

Arthur C. Storz, Omaha, Neb.

NEW AiResearch steering control system

Combines Acceleration Switching Valves And Hydraulic "Printed Circuit"

More reliable and responsive... this lightweight electro-hydraulic steering control system converts low-level electronic signals from the main guidance system into hydraulic energy which actuates the mechanisms steering the missile.

Packaged as an integrated unit, the three servo valves and six control actuators are mounted on a common manifold and powered by fluid or hot gases. The simplified "printed circuit" system of integral passageways within the manifold eliminates all external plumbing and leakage.

The acceleration switching servo valves provide positive control of spool velocity, thereby achieving greater resolution, reliability and response even at extreme temperatures.

Easily installed and removed as a complete, interchangeable unit, acceptance testing of this compact system can be accomplished prior to missile installation. Suggested applications are: missile surface controls, jetavator controls, and vector and nozzle steering controls. Your inquiries are invited.

Specifications

Actuator load (range)	*90 to 150 in. lbs.*
Electrical input (nominal)	*28 volts DC—10 Milliamperes*
Pressure range	*500 to 3000 psi*
Rated flow	*½ to 2 gpm*
Mounting	*Manifold*
External leakage	*None*
Proof Pressure	*4500 psi*
Burst Pressure	*7500 psi*
Temperature operating range	
Fluid	*—65°F to 450°F*
Ambient	*—65°F to 750°F*
System filtration	*10 microns*

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The Airpower Book Club Selection for NOVEMBER

The Memoirs of Field-Marshal Montgomery

A man who battled from El Alamein to Whitehall, who took on everyone from his mother to Eisenhower, Montgomery remains something more than a great dissenter. He is a great general, certainly; but how many know that, as one reviewer points out, *"The Montgomery-Coningham-Tedder team founded in the desert the tactical air doctrine that became FM 100-20 over Marshall's signature, and FM 15-35 over Eisenhower's"?*

Dedicated to serving the men who want depth and breadth of professional knowledge—who seek stimulation in preference to placid conformity—the AIRPOWER BOOK CLUB is proud to present to members the autobiography of a soldier who has become a legend in his own time—Field Marshal Sir Bernard Montgomery, Viscount of Alamein.

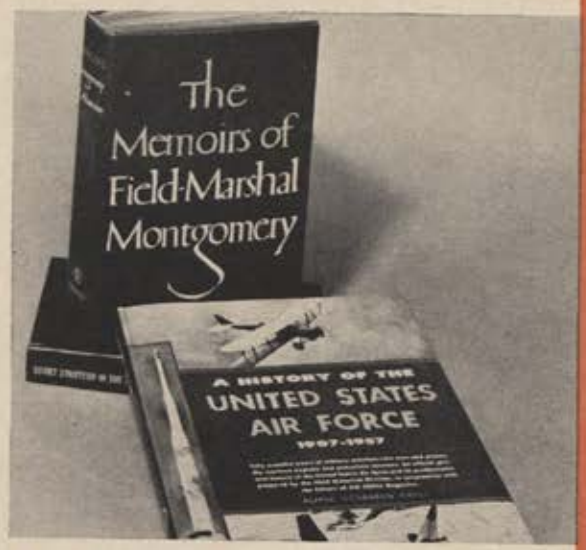
A man who deliberately set out to become the very model of a professional soldier, and a student of war, Montgomery is a controversial figure ranking with Billy Mitchell as a storm center.

"I have never" he says, "been afraid to say what I believed to be right and to stand firm in that belief. This has often got me into trouble."

The memoirs of a man who has held command at every military level from platoon to Army Group would be worth reading, even if they were dull; more especially so when his experience ranges all the way from Indian frontier duty through World War II to the early days of SHAPE.

But Montgomery is never dull. **He has mastered writing as he mastered any of the arts necessary to command.** *". . . I claim that I am clear. People may misunderstand what I am doing, but I am willing to bet that they do not misunderstand what I am saying. At least they know quite well what they are disagreeing with."*

Your Book Club Membership NOW will bring you



Soviet Strategy In The Nuclear Age

By Raymond L. Garthoff

A complete review of past and current Soviet thinking on organization, and strategic concepts for brush-fire and nuclear war; a study of the Soivet image of the US military structure; careful, detailed analysis of land power, seapower, and airpower functions in Soviet strategy. The Soviet approach to and employment of missiles.

Retail Value $4.00

The Memoirs of Field-Marshal Montgomery

Retail Value $6.00

And a FREE gift. History of the USAF 1907-1957

Nearly 400 photos, many of them collector's items . . . more than two dozen maps and charts . . . 287 pages of vivid text, including a foreword by Gen. Thomas D. White, Chief of Staff of the USAF, and a complete index and bibliography for quick reference.

Retail Value $6.75

For your $15 membership fee you get

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AIRPOWER BOOK CLUB

11-58

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☐ I enclose $15. ☐ Bill me for $6 a month for 3 months.

☐ Start my membership with The Memoirs of Field-Marshal Montgomery.

☐ Start my membership with Soviet Strategy In The Nuclear Age, so that I will get *two* selections, plus my gift book, immediately.

NAME_____

ADDRESS_____

_____

AIRPOWER BOOK CLUB

Monty's Wars—with the Enemy and Others

By W. Barton Leach

Montgomery of Alamein

FOR thirteen long years since V-E Day Montgomery of Alamein has held his tongue while others caught the publishers' market with their versions of great events. Now in his Memoirs he has his say—and what a say it is! Intensely personal, vivid with the urgency of decisions under fire, ruthless in pinpointing errors—including his own, Olympian in its judgment of men, it pulses with Monty's heartbeat.

"Sweet are the uses . . ."

The wheel of adversity in its mysterious way twirled four times for Monty. He was an undersized, skinny kid with a dominating mother—which made him aggressive. His was a poor family, incapable of supporting him in the polo-playing tradition of officers in his age group—which turned him to serious study of the profession of arms. His beloved wife of ten years died in 1938—which led him to seek solace in dedication to his career. Finally, in 1942, the commander designate of the Eighth Army was killed in an air crash—which made Monty CG of the Eighth. (By odd coincidence Tedder got his air command in the Western Desert by the crash-death of the air marshal first chosen.)

Alamein and Points West

The desert offered war to Monty's liking, never alas to be repeated. True, he had a defeated and disorganized army with low morale and lower confidence in its commanders. But he was on his own, confident in his professional competence, charged with a definite mission against a single enemy, and unworried by political considerations.

Believing that his soldier-civilians should feel a sense of his personal command, he decided to give them "not only a master but a mascot. . . . To obey an impersonal figure was not enough. They must know who I was. . . . I readily admit that the occasion to become the necessary focus of their attention was also personally enjoyable. . . . The twin badges in the beret became, if you like, my signature. It was also very comfortable." He canceled standby orders for a retreat to the Nile and convinced the Eighth it was going to drive Rommel out of Africa.

Rommel's defeat with heavy loss when he attacked at Alam Halfa on August 31, 1942, was as carefully planned as the more famous offensive victory three weeks later at Alamein. Both indeed were integral parts of the same plan: first to blunt Rommel's sword, then to send him reeling back in retreat.

Now it can be told that within very recent years the Air Force Association Policy Committee failed to nominate the Field Marshal as Airpower's Man of the Year only after being told that this might reduce his effectiveness at SHAPE. Certainly the Montgomery-Coningham-Tedder team founded in the desert the tactical air doctrine that became FM 100-20 over Gen. George Marshall's signature and FM 15-35 over General Eisenhower's. Ground and air commanders, sharing a tactical headquarters, made a joint plan to be carried out from a joint command post, predecessor of the JOC. Air superiority took first place, mounting to a crescendo of attacks on enemy airfields immediately before the ground offensive. Meanwhile interdiction of sea and land communications whittled down Rommel's staying power, especially in fuel. Finally, to pave the way for the breakout, full effort was poured into the battlefield—the precursor of the carpet bombing at St. Lô.

Concentrated Thrust v. "Partridge Drive"

The 1940 success of the Manstein Plan—Guderian's massive armored thrust through the Ardennes and across France to the Channel—as compared with the failure of the 1914 Schlieffen Plan, emasculated through not keeping the right wing strong, dominated Monty's strategic thinking. He consistently opposed what he calls the "partridge drive" (everybody attacking all along the line with all units suffering equally from the inevitable logistic shortages) and favored the one strong thrust supported by all necessary transport, reserves, and supply, other units being "grounded" in holding operations.

Sicily

Bradley/Patton and Montgomery here came together in a single operation for the first time. Monty began this beautiful friendship by asserting—and carrying the point with Ike and Alex—that the American plan to land in the Palermo area on the western angle of Sicily would produce disaster, and that the Americans should land on one side of the southeast angle while Monty landed on the other. Then, according to Bradley, Monty hogged the only road by which the Americans could go north to Messina—and Bradley's *A Soldier's Story* produced a map showing solid columns of advancing American troops being forced to turn on their tails and go off somewhere to the west. Monty's map of the same episode shows American forces skittering around aimlessly in Western Sicily with ample opportunity to go north had they wished; and his text severely criticizes the lack of a "master plan" to concentrate on Messina and thus prevent the Axis forces from escaping to fight another day in Italy.

Overlord

After a brief sojourn on the Italian boot, Monty was

The long-awaited recollections of one of the most striking figures of World War II, "Monty"—the tough-minded Briton whose daring played the key role in putting Rommel's dreaded Afrika Korps out of business, have finally reached the public prints as The Memoirs of Field Marshal Montgomery *(World Publishing Company, Cleveland, $6). The book gives the Viscount of Alamein's version of the hard, exciting days of World War II and describes his role in momentous decisions and actions.*

On these pages, W. Barton Leach, a veteran observer of the military scene and the first director of the famed Harvard Defense Studies Program, gives an incisive report on what the great soldier in the beret has to say.—THE EDITORS

ordered to London to assume command of 21 Army Group for the cross-Channel attack.

On New Year's Eve, 1943, in Marrakesh, Churchill gave Monty his first look at the invasion plan prepared by (British) Gen. Frederick Morgan as COSSAC (Chief of Staff to Supreme Allied Commander, Designate). Before breakfast the next day Monty had kicked the slats out of this laboriously prepared document and convinced Churchill that it was all wrong.

Arrived in London, Monty replaced with his own team the existing senior staff of 21 Army Group; the resulting quip that "the Gentlemen [amateurs] are out and the Players [professionals] just going to bat" did nothing to endear the CG to the Gentlemen who had been sweating out the plans at Norfolk House.

As planning progressed, disagreements appeared. Churchill, convinced that there were too many vehicles for the number of fighting troops, came down to discuss the matter with Monty's staff. The CG got him comfortably seated and then said:

"I cannot allow you to discuss [this issue] with my staff. My staff advise me and I give the final decision; they then do what I tell them. That final decision has been given. In any case, I could never allow you to harass my staff at this time and possibly shake their confidence in me. . . . You can argue with me but not with my staff."

What a man! Churchill took the rebuff in good humor.

As all will recall, D-Day was originally planned for June 5. But the weather forecast was bad. Tedder was for postponement. The Navy would not commit itself one way or the other. "I was for going. . . . Eisenhower decided to postpone." When the fifth came, "It was clear that if we had persisted with the original D-Day, we might have had a disaster."

"Failure" at Caen

After the Overlord landing the British and Canadian troops held the left of the Allied line facing Caen; Americans faced the *bocage* country on the right. By long-agreed plan Monty was to draw German strength, especially armor, to his segment of the front while Bradley/Patton broke out. It worked. Monty absorbed the opposition of 650 of Rommel's tanks as against 200 opposing the American forces.

But not until D-plus-33 did Monty take Caen, scheduled for capture on D Day. Furthermore, of course, he did not break out toward Paris or the Channel ports despite more favorable terrain. The press climbed all over Monty, with an assist from himself in an over-ebullient press conference. Ike, too, seems to have made unguarded statements in a report to the CCS and a conversation with Churchill. Monty had to grin and bear the press criticism to avoid compromising the plan; but his critics at SHAEF, who knew or should have known the plan, clearly got under his skin. It is heart warming to find that Bradley's book supports Monty fully.

Partridge Drive on Berlin

In a really blistering chapter on "Allied Strategy North of the Seine" Monty assails Ike for indecision, vacillation, delay, and, ultimately, clear strategic error in failing to push one concentrated thrust to Berlin through the Ruhr and the North German Plain. This would have required stopping Patton, transferring American divisions to the northern thrust, and throwing all logistic resources behind them. Monty offered to yield the command to Bradley, but this was hardly realistic and was quickly rejected.

Whether Monty's criticism of Ike is justified, is essentially an issue of logistics. On this Monty must sustain a heavy burden of proof, for even his able and devoted Chief of Staff, de Guingand, agrees with Ike and disagrees with him.

Arnhem, The Bulge, and Victory

Operation Market Garden, the airborne attempt to seize the bridgeheads on the lower Rhine, failed. Here Monty got one nasty surprise (the high battle worthiness of a Panzer Corps refitting in the area) and admits two mistakes: dropping the troops too far from the vital objective and underestimating the difficulties of opening the approaches to Antwerp.

The Bulge was a mess all round. Monty had proposed in early December that he be given command north of the Ardennes and Bradley south; but this had been turned down, for American forces were straddling the area. Then on December 16 the Germans attacked and Monty's proposal had to be adopted under fire.

At long last the partridge drive in overwhelming force subdued the enemy. Monty finds little to admire in the process. Senior commanders, air and ground, engaged in ceaseless rows over strategy exacerbated by personal jealousies.

In 1947 the Field Marshal succeeded Brooke as Chief of the Imperial General Staff. As to how he would fit into the Chiefs of Staff Committee under a government overwhelmed with the problems of a war-weary population in a shattered economy, apprehensions were only too well justified. Demanding a fifteen-year program for the Army based upon a politically approved strategy was really a tall order for the Labor Government in those times. "Because of my direct methods of tackling problems I made many enemies. . . . I told my colleagues that the Chiefs of Staff should write a paper on western strategy in major war, and submit it to the Prime Minister. They did not agree, pleading lack of sufficient evidence of the power of future weapons and lack of time for their staffs; I then said I would produce the paper in the War Office within a week." And he did. (It is generally accepted that no comprehensive American paper on postwar national strategy was considered at high level until NSC 68 in 1950 under the impulse of the Soviet atomic explosion in 1949.)

Though the Chiefs of Staff refused to accept Monty's paper they did agree that, if necessary, "we must fight for the Middle East." Prime Minister Attlee challenged this. (Observe that this is a political/military issue of grand strategy not unlike the question of fighting for Korea in

(Continued on following page)

1950—or Formosa in 1958. In the United States military advise would be sought and carefully considered; but the decision would be made by the President after discussion in the NSC, of which no military officer is a member.) "I asked [the Chiefs of Staff] if they were prepared, with me, to resign rather than give way over that area. I added that I would do so, with or without them. They both agreed wholeheartedly and this information was conveyed privately to Attlee. We heard no more about it." This concerted military pressure upon the civilian authority raises, in British terms, a constitutional issue and, in American terms, an issue of civilian control. It is the view of this commentator that on so crucial a matter the Chiefs of Staff were justified in this extreme step. But, if the episode has not been previously disclosed it is another question whether a military officer should disclose it.

The Minister of Defence in the Labor Government was A. V. Alexander, not to be confused with Field Marshal Sir Harold Alexander, who became Minister of Defence under Churchill at a later date. Monty asked the other Chiefs of Staff, Tedder and Coningham, "to form up with me in a combined approach to the Prime Minister and ask for [Alexander's] removal, on the plea that we had no confidence in him. To my immense astonishment they both agreed!" But, "my two colleagues declined to face the music on the day of battle. . . . They agreed that none of us had any confidence whatsoever in the Minister of Defence, but they both thought that the action I proposed was unconstitutional and would undermine the future position of the Chiefs of Staff Committee."

Well, how about it? Think of some of the characters who in living memory have been made service secretaries in this country to pay political debts. Consider also that, in the 1958 hearings on defense reorganization, the man who was Secretary of Defense for the preceding five years was so evaluated by all concerned that no one even called him as a witness. What military leaders can properly and effectively do about incompetent civilian superiors is a tough question deserving more careful treatment than can here be given. Nor are the American and British answers necessarily the same. In the two possible American parallels it is a certainty that no pressure from the JCS, including group resignation, would have caused Truman to fire Louis A. Johnson before the Korean War or Eisenhower to get rid of Charles E. Wilson before Sputnik. Johnson clearly had to go after the demonstration of US weakness in opposing a fifth-rate military power, but the pressure came from events, not from the JCS. Wilson had already been eased out before Sputnik, also without JCS pressure. The military must stay aloof from party politics if they are to remain effective through political overturns; and cabinet appointments are too strongly political for their participation.

Deputy SACEUR

Had the story stopped before SHAPE was organized history might have gone along with Bradley's 1951 evaluation of Monty as "a good, if perverse, soldier." But there were aspects of his career that did not fit in with Bradley's deprecatory adjective: his staff and subordinate commanders were devoted to him, his troops worshipped him, Bradley had nothing but praise for Monty's exercise of the Overlord Allied command, he worked well with civilians and staff in the War Office, and from 1948 to 1951 he had shown great patience in directing at Fontainebleau the multi-national military planning staff of the Western Union. Analyzing these apparent contradictions one finds a basic harmony: whatever Monty conceived it his job to do, he did. Not seeking conflict, he faced it to get on with the job. Belittling approval, he courted it where the job required.

At SHAPE the Field Marshal served under four American SACEURs—Eisenhower, Ridgway, Gruenther, and Norstad. Service under Eisenhower came naturally. But Ridgway was a mere corps commander at the Bulge; the Field Marshal opposed his appointment and found him unsuited—but still he served. Gruenther had never commanded anything when appointed; Norstad was a temporary lieutenant colonel (permanent rank: captain) when Montgomery was commanding at Alamein—but he served under both of these with mutual affection and respect.

Ike and Others

Monty considers Alan Brooke, the Great Stone Face who is currently the victim of an over-adulatory biographer, "the best soldier that any nation has produced for many years." He confers high praise upon a wide spread of his principal staff officers and subordinate commanders, especially de Guingand and Horrocks. Generally he avoids evaluating Americans; but he gives Bradley the high compliment of having stated in 1944 that, despite their disagreements, he "would willingly serve" under him. He gives accolades to Bedell Smith, Gruenther, and Norstad.

He concurs in the widespread adverse judgment on Chamberlain, Gamelin, Ironside, Gort, and Auchinlech.

To Churchill he has already paid public tribute as "the greatest Englishman of all time." But he adds: "Churchill combined within himself—within one man—almost all the qualities which we humans can possess, and, as with all humans, they were not by any means all good. Of all his remarkable traits I would put 'domination' as the most prominent."

As to Eisenhower, my notes show twenty-two points at which Monty thinks he was at fault in command organization, in firmness of decision, in strategic concept, or in insistence that his commands be obeyed. "I would not class Ike as a great soldier in the true sense of the word. . . . But he was a great Supreme Commander, a military statesman. I know of no other person who could have welded the Allied forces into such a fine fighting machine in the way he did, and kept a balance among the many conflicting and disturbing elements which threatened at times to wreck the ship. . . . His real strength lies in his human qualities. . . . He is the very incarnation of sincerity. . . . I can never adequately express what I owe to his personal kindness and forbearance."

Envoi

At age seventy Montgomery of Alamein has retired. The last photograph in his Memoirs shows him leaning on the handles of a power lawn mower at his home in Hampshire with the caption, "The author enjoying the evening of life." But the suggestion of a Cincinnatus-type bucolic withdrawal seems incongruous. Apart from everything else he ought to be kept fairly busy with the chain reactions from his book.—END

A 1924 graduate of the Harvard Law School, Mr. Leach started his career as secretary to the late Supreme Court Justice Oliver W. Holmes. In 1929, he became an instructor at the Harvard Law School and was named an assistant professor in 1930. Since 1931, he has been a full professor at Harvard. A National Director of the Air Force Association, he is a World War I veteran, a Reserve brigadier general, and consultant to the Secretary of the USAF.

airman's bookshelf

'Love at First Sight'

"She was big, and on the ground she wasn't very pretty. But every inch of her structure was power, a rugged and sturdy machine with all the mass of a tank . . . 2,000 horsepower! . . . four heavy .50-caliber guns . . . 7,200 rounds of heavy lead per minute!

"It was love at first sight."

The heat of summer 1942 lay heavily on the Bridgeport, Conn., Municipal Airport as 2d Lt. Robert S. Johnson, fresh out of flying school, warily edged around the wondrous, massive, seven-ton P-47B Thunderbolt. He kicked a tire, ran his hands lightly along the trailing edges of the wing, and wondered where it would take him.

Before World War II finished, Bob Johnson and his "Indestructible Jug" were to write air history—a deadly team responsible for splattering twenty-eight German Messerschmitts and Focke-Wulfs across the European landscape, and Johnson was to become one of the top aces of the war.

Johnson's autobiography, *Thunderbolt!*, written with Martin Caidin (Rinehart, $3.95), relives this brilliant saga graphically and should grace your bookshelf.

Bob's early life in Lawton, Okla., is covered in a short opening section. He tells how, as a boy, he watched Army pursuit pilots from Fort Sill fly aerobatics in their P-26s and P-12s, while he dreamed of a future of his own in the sky. He got his wish, and he was on his way to Kelly Field, class '42-F.

After graduation, 300 flying hours later, the new airman drew the 56th Fighter Group at Bridgeport, where the unit was designated to check out the newest entry in the air-fighter class—Republic's now legendary Thunderbolt.

The Jug, by looks, shouldn't have flown at all. But in the hands of masters like Johnson, it became universally respected by Hitler's Luftwaffe.

Johnson's story moves swiftly from one combat sequence to another in well organized fashion. He writes modestly and sparingly of his own personal accomplishments and skills, glowingly of the P-47. Its ruggedness and endurance in churning aerial combat, and the diving pursuits in which Jug pilots frequently experienced "compressibility speed" (the control surface freezing zone—known today as the leading edges of the sound barrier) are amply described.

Bob was an ace extraordinary. Most of his victories were over first-line enemy fighters. Men like Johnson, "Bud" Mahurin, Francis Gabreski, and Dave Schilling and the incomparable Mike Gladych made the 56th—"Zemke's Wolfpack"—the nemesis of the Luftwaffe. Bob's squadron was the first in all of Europe to reach the 100-destroyed mark. The book's vivid description of aerial battle, as the 56th reached deeper and deeper into the continent on "ramrod"—bomber escort missions—ranks high in air literature.

And although Bob designed his story as a tribute to his airplane, the book unavoidably reveals him as a brilliant, nerveless, and courageous young combat air leader, resolute in his faith. *(See October '58 AIR FORCE, page 113, for a stirring chapter from this new book.)*

* * *

The Military Service Publishing Company has released a handbook that should become a standard reference for Air Force families.

Air Force Bases ($3) is a directory of USAF bases and installations, domestic and foreign. It covers all stations except primary contract flying schools and some 115 isolated AC&W sites of the Air Defense Command.

Ten categories of useful information on each base are listed: Location and transportation facilities (rail, air, and bus serving the area); address; climate; transient accommodations (guest housing, VOQ, BOQ, etc.); housing (on and off base, average rental, average waiting time, including trailer courts); schools, on and off base; auto data (insurance required, amounts, etc.); environment (nearby places of historic, vacation, and sightseeing interest, recreation areas, shopping facilities); base facilities (commissary, clubs, golf courses, theaters, swimming pools); and personality of base (command responsibility, unit composition, and organizations assigned to the base).

This handy source book carries sample views of buildings and facilities at various bases. ZI installations are grouped by geographical area, overseas by country. A complete index affords easy reference.

Annual revision is planned to keep it a current, up-to-date source of answers to innumerable questions about the next transfer.

Career guidance in the air age received a valuable assist from two volumes. Harry Neal, retired civil service employee and author of numerous career guides, has written *Skyblazers: Your Career in Aviation* (Messner, $3.50) from extensive on-the-spot research at military air bases, aircraft plants, and airline industry operational centers. He describes for teen-agers a wide range of aviation careers, military and civilian, and analyzes the unique opportunities which lie ahead in the expanding business of jet rocket flight. Qualifications, educational preparation, job acquisition, and salaries are covered.

Slanted more toward military aspects of aviation, is Charles M. Daugherty's *Wider Than the Sky: Aviation as a Career* (Harcourt, Brace, $2.95). Daugherty's "call to the air" emerged subtly from an attractive, well written chronicle of aviation from the Wrights to jets and missiles.

By discussing current job types and opportunities against a background of past accomplishment, he gives an appealing picture to the teen-ager. A chapter delineating specific fields and specialities, military and civilian, concludes this worthwhile volume.

Air Books

The British take their air history seriously, and their proud record emerges in documentaries such as Owen Thetford's definitive study in *British Naval Aircraft, 1912-1958* (Putnam, London, $6). Every plane (more than 360) flown by the Royal Navy, from its beginning in 1912, is pictured with general narrative covering design, development, manufacture, and operations. Statistical data include operational units, numbers delivered, engineering specs, performance figures, armament, and three-view drawings. A short illustrated history of British naval aviation prefaces the work, and appendices describe the Royal Navy's lighter-than-air craft used between 1914-1919.

If the "Battle of Waterloo was won in the playing fields of Eton," as once suggested, claim can be made that the Battle of Britain was won above the runways of the Central Flying School (C.F.S.).

The forty-five-year history of this famous aerial institution, established simultaneously in 1912 with the Royal

(Continued on following page)

Flying Corps (predecessor of the RAF), is traced in C.F.S. *The Birthplace of Airpower*, by John W. R. Taylor (Putnam, London, $2.50). The British date their military airpower from the founding of the first organized school to train military pilots. Famous airmen like Marshals Trenchard, Slessor, Embry, Selway, Boyle, and Tuttle and more recent World War II heroes including Douglas Bader, among others, got their start here. Forty-six nations have sent pilots to C.F.S. for study and flight training—and they still do. C.F.S., relocated several times, is now at Little Rissington. Its course and purpose have undergone frequent change to keep pace with the rapid march of technology, but its high reputation has remained constant.

Related Professional Reading

The controversy over the dangers of continued nuclear testing goes on. Latest warning voice in this public debate is that of Dr. Albert Schweitzer who pleads for a workable international ban on nuclear testing. Three Schweitzer radio appeals, broadcast from Oslo, Norway, in April 1958, and subsequently appearing in *The Saturday Review*, make up *Peace or Atomic War?* (Henry Holt, $1.50). "It is not for the physicist . . . to say the decisive word on the dangers of nuclear tests," says Dr. Schweitzer. "That right belongs to the biologists and physicians," he asserts. The doctor believes continued testing will lead to atomic war, and that only in mutual renunciation is there any hope for nations to live in peace. The first requirement is an absolute, he states. The second is a risk and gamble we must take. There is no alternative if we desire to avoid the evil consequence to the children of future generations, writes the doctor.

° ° °

Newest spine-tingler out of World War II is a classic study of applied ingenuity in breaking out of an isolation cell deep in "escape-proof," Gestapo-guarded Montluc prison in Lyons, France. It is told in *A Man Escaped*, by Andre Devigny (Norton, $3.75).

Equipped only with an iron spoon, French political prisoner Devigny, under death sentence, dismembered a huge oaken cell door under the watchful German guards, snaked his way to freedom over buildings and walls with a rope hand-woven from mattress and blanket strips.

While the methods used by Devigny in his incredible escape are worth attention in Air Force Escape & Evasion schools, of greater significance is the extent to which the author probes and explores escape psychology and emphasizes the necessity for thorough planning. Devigny *had to* succeed. This book should be required reading for every Air Force combat crew member.

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The Soviet Navy, edited by Cmdr. M. G. Saunders, RN (Praeger, $7.50). Eighteen top naval experts from eleven nations, including Britain, America, France, and Germany, provide essays covering every aspect of Russian naval affairs. Topics deal with size of force, location of bases, training, and comparative strength and effectiveness of the Soviets on the seas compared with navies of the United States and of various other Western nations.

° ° °

To err is human, and last month we pegged the price of Duell, Sloan & Pearce's new Air Force adventure series lead-off volume *Kent Barstow: Special Agent*, by Rutherford Montgomery at $5. Price is $3.

—Maj. James F. Sunderman

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