

MARCH 1959 / 50c

AIR FORCE

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

TITAN

USAF's

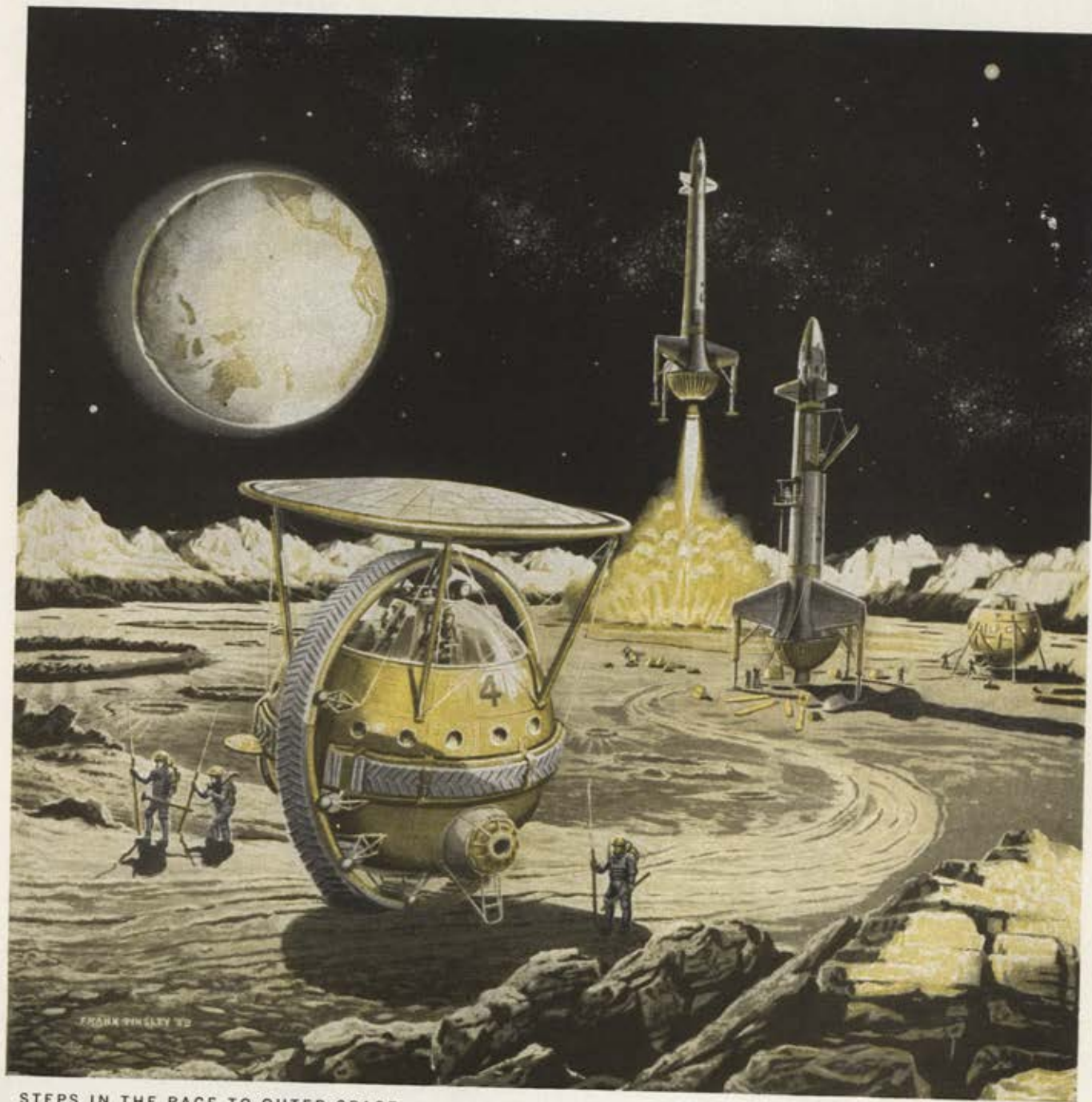
LATEST

SPACE

WEAPON

March • 1959
SPACE
DIGEST
THE SPACE AGE IN PERSPECTIVE





STEPS IN THE RACE TO OUTER SPACE

Lunar Unicycle

This 30-foot high Unicycle is designed for preliminary exploration of the Moon, once a base camp has been established. It's entirely constructed of inflated, rubberized fabric, with the exception of strengthening members, hatches and a few other items of equipment. Gyros stabilize and steer the vehicle; electric motors furnish the driving power.

Electricity for the motors and instrumentation comes from solar batteries mounted in the "parasol". The cleated, rotating wheel upon which the Unicycle travels is made of inflated tubes. A spare

wheel, carried around the body, acts as a bumper in traversing narrow defiles. Built in two sections, these wheels are assembled by belt-lacing type fasteners.

The upper level, the navigating and communications deck, is ringed with recording and surveying instruments. Living quarters make up a middle deck and below is the hold with supplies, spacesuits, oxygen equipment and spare apparatus, needed for survival.

In the background, two of the expedition's ferry ships are seen; one landing, one unloading in the bright Earthlight.

Inertial navigation systems will play an increasing role in the exploration of outer space. **ARMA**, now providing such systems for the Air Force ATLAS and TITAN ICBM's, will be in the vanguard of the race to outer space. **ARMA** . . . Garden City, New York. A Division of American Bosch Arma Corporation.

6110-A

AMERICAN BOSCH ARMA CORPORATION

The man:



A U. S. Air Force Airlift Task Force Commander charged with transporting by air everything to support U. S. diplomatic and military policies throughout the world.

This officer is a logistics expert . . . *and* a top-flight airman. He has played a prominent part in the joint Douglas-Air Force study that resulted in the design and production of the Douglas C-133.

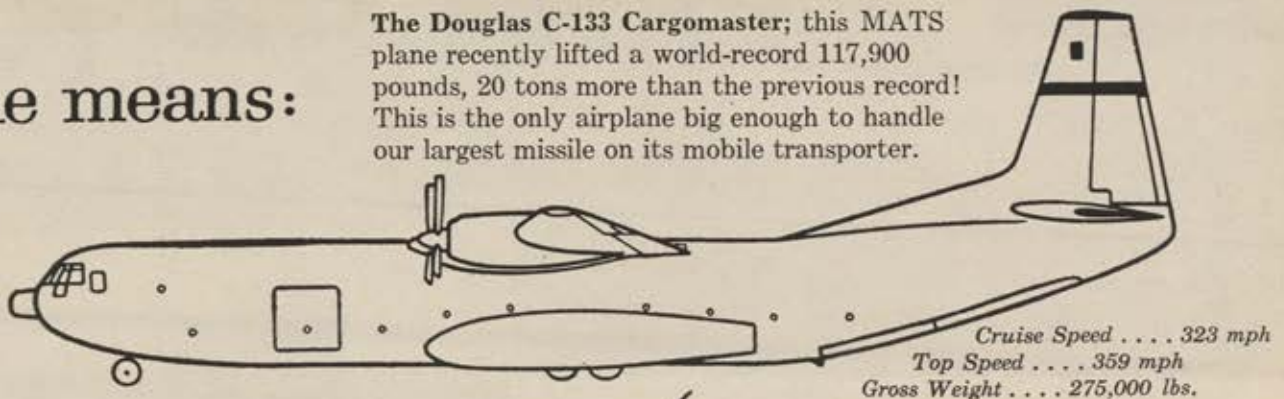
The mission:

Logistics support; now the Armed Forces can rely on an airlift system that can compete dollar for dollar with the most efficient surface carriers . . . and get there many times faster!



The means:

The Douglas C-133 Cargomaster; this MATS plane recently lifted a world-record 117,900 pounds, 20 tons more than the previous record! This is the only airplane big enough to handle our largest missile on its mobile transporter.



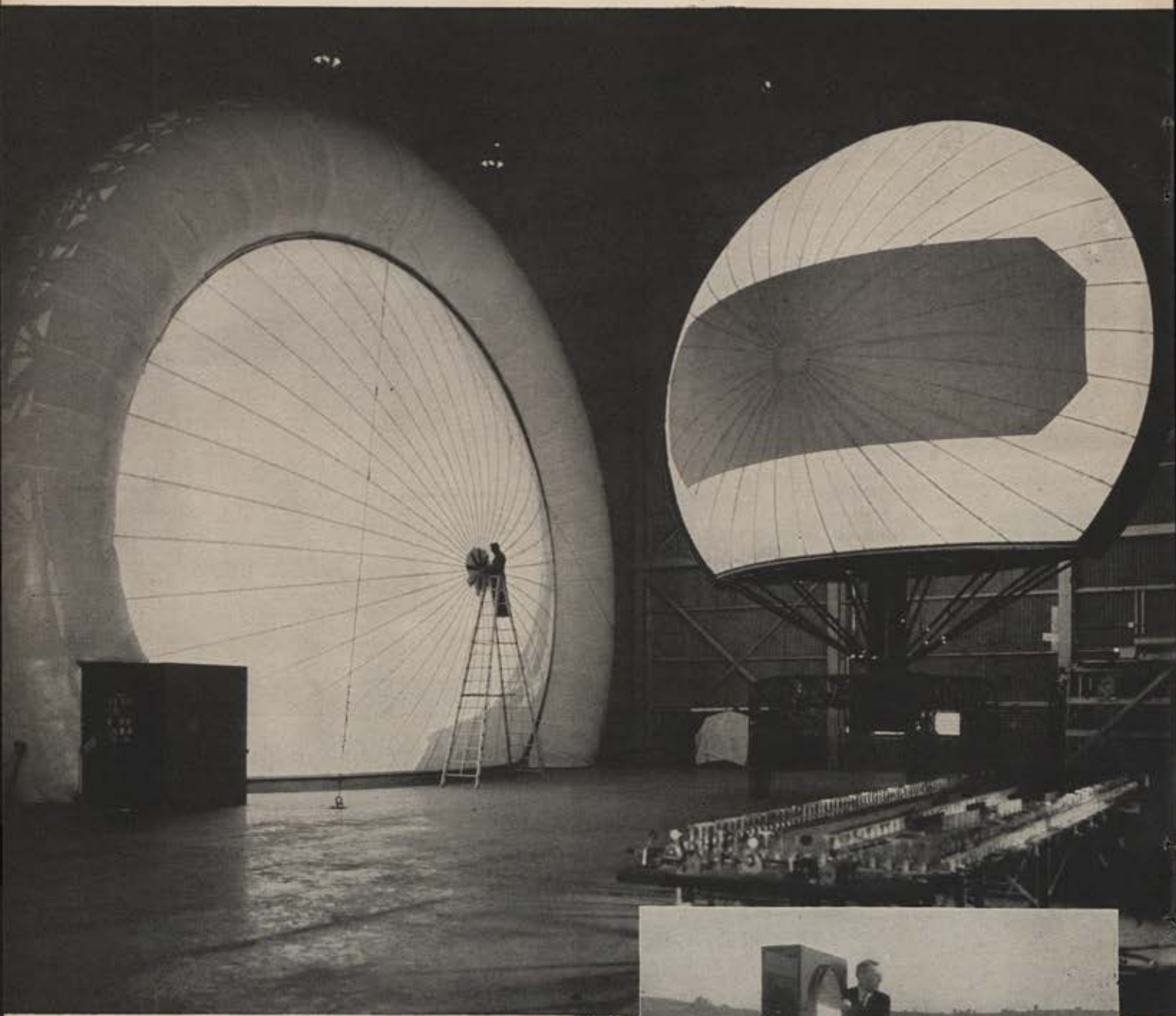
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DOUGLAS



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Westinghouse With 25 Years Of Leadership Is Meeting Today's Detection Problems

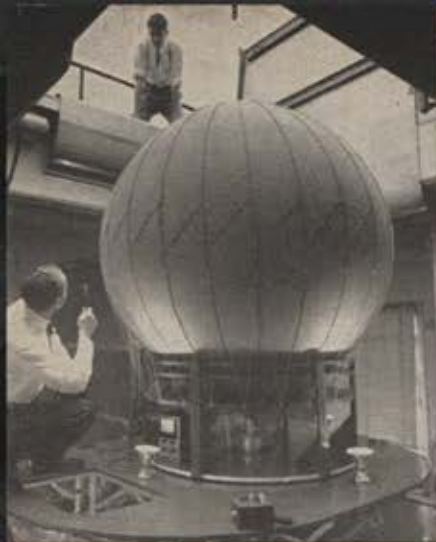


Westinghouse has been in the radar field since 1933. In that year, Westinghouse engineers, pioneering in radar techniques, detected automobiles on a highway by beaming ultra short radio waves experimentally off a rooftop of the Westinghouse East Pittsburgh Plant (illustrated at right).

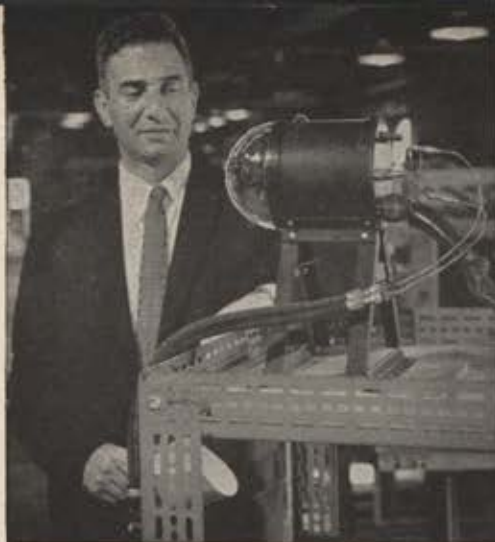
Westinghouse has delivered over 35,000 radar sets . . . and continues its role today in ground and shipboard radar for air defense and tactical missions, airborne radar for reconnaissance, AEW, mapping, ASW and missiles, and such specialized areas as pulse-doppler, infra-red, ECCM, and 3-D radar techniques.

Shown is one of the most significant advances in the field of tactical military equipment—the lightweight, highly mobile Paraballoon® Antenna, developed at the Electronics Division.





NON-ROTATING ANTENNA. A new kind of radar antenna, the Helisphere is considered a possible forerunner of those to be used for powerful antimissile radars of the future. The antenna, pictured at the Westinghouse Research Laboratories, produces a rotating radar beam without rotation of the antenna structure itself.



INFRA-RED. Westinghouse has been actively at work in infra-red research, design and development since World War II. Extensive programs are now being conducted for applications of infra-red techniques to present and future military requirements as well as the space age. Pictured is an infra-red seeker, newly designed at Westinghouse Air Arm Division.



BIGGEST RADAR TUBE. Heart of the longest range ship-borne radar ever put in service, a magnetron tube nicknamed "Big Maggie" was developed at the Westinghouse Electronic Tube Plant at Elmira. "Big Maggie" delivers over 10 million watts of peak power, enough to search out enemy planes over 400 miles away.



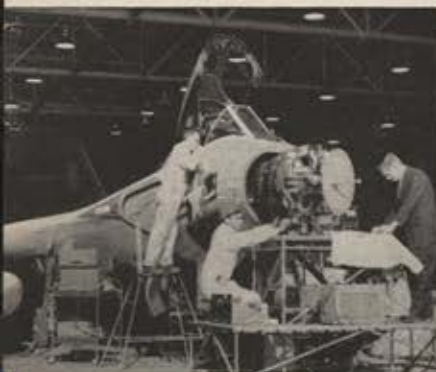
MOLECULAR SYSTEMS. A new, low-noise amplifier developed by scientists at Westinghouse Research Laboratories for Air Arm Division application. This two level solid-state maser is one aspect of a broad Westinghouse program of molecular engineering for radar and other electronic systems of the future.



WORLDWIDE SERVICE. Wherever Westinghouse radar is in operation . . . land, sea and air . . . field engineers of the Electronics Service Department assist and instruct in the operation and servicing of radar manufactured by the Air Arm and Electronics Divisions. Graduate engineers provide this Westinghouse service the world over.



COMPLETE TEST FACILITIES. Radar undergoes composite test at Electronics Division. A complete computer facility is available here and at Air Arm Division. Included are IBM 704 and large REAC, together with all environmental, shock, vibration and other test equipment necessary for the development of present and contemplated land, sea, air and space-borne systems.



200-MAN FLIGHT TEST FACILITY. Engineers at Air Arm Division install Aero 13-F radar and computer, latest and most advanced radar built by Westinghouse. Flight test facility includes over 200 people and all facilities necessary to completely service, instrument and test avionic equipment in Westinghouse owned and bailed aircraft.

For additional information on detection systems and applications at Westinghouse, write to:

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YOU CAN BE SURE... IF IT'S Westinghouse



LET'S COUNT BACK FROM THE COUNTDOWN

This is the "moment of truth." This is the countdown. A satellite will soar into the stratosphere. A rocket will hit or encircle the moon.

But let's count back from the countdown.

Let's count the grueling tests, the check-outs. Let's count the months of manufacturing, the skill, precision and care that went into each of the thousands of parts.

Let's count the brain-power, the engineering talents of the brilliant men at work... the modifications and refinements in design... the "break-throughs" that had to be made.

Let's count all the way back to the first gleam of concept in a scientist's probing, inventive mind.

And let's not forget to count the administrative control, the guidance, the coordination and planning that go into these complex projects.

There's a new name for it

Such involved systems of engineering and automation demand an entirely

new concept of planning, research, specialized administration and technical coordination. It is called "system management." It places complete responsibility for every phase of a giant project in the hands of one company or group of companies.

It takes tremendous resources. In manpower. In administrative capacity. In facilities. And that is why ITT has been selected for projects of the highest importance. The ITT System operates and maintains the DEW Line, and is managing the production of a new world-wide electronic control system ingeniously conceived by the Strategic Air Command for its operations.

And ITT is deep in many other vital projects.

In industry, too, there are "countdowns"

Large industrial projects, too, need system management. Vast communication networks, for instance... linking continents through "over-the-horizon" microwave... world-wide air navigation systems... the development

of automation in industrial processes.

System management has great potential. And ITT is equipped to put it to work... to assume full responsibility for complete system management projects anywhere in the free world. This includes not only basic concept, engineering and manufacture... but also installation, testing, operation and maintenance.

You can count on ITT... from concept to countdown.



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20 FREE-WORLD COUNTRIES



AIR FORCE

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FEATURES

<i>Editorial</i>	
JOHN F. LOOSBROCK	6
<i>Views & Comments</i>	30
<i>Housing... One of USAF's Unsolved Problems</i>	
JOHN F. LOOSBROCK	38
<i>Quality Control—For the Men as Well as the Machines</i>	
CLAUDE WITZE	41
<i>Where We Stand</i>	
BRIG. GEN. BONNER FELLERS, USA (RET.)	44
<i>The World Congress of Flight</i>	49
<i>How Much Calculation—How Much Risk?</i>	
JOHN F. LOOSBROCK	51
<i>Do We Need Unlimited Forces for Limited War?</i>	
COL. ROBERT C. RICHARDSON, III, USAF	53

SPACE DIGEST

Starts on page 57

<i>The Meaning of the Taiwan Strait Crisis</i>	
GEN. LAURENCE S. KUTER, USAF	103
<i>The Impact of Air Power—A Book Review</i>	
STEFAN T. POSSONY	116
<i>Wanted: Old Airplanes</i>	
LT. COL. CARROLL V. GLINES, USAF	128

DEPARTMENTS

<i>Air Mail</i>	10
<i>Airpower in the News</i>	16
<i>Flight Lines</i>	22
<i>What's New With Red Airpower</i>	29
<i>Shooting the Breeze</i>	34
<i>The Ready Room</i>	114
<i>Airman's Bookshelf</i>	119
<i>AFA News</i>	123
<i>Index to Advertisers</i>	133
<i>This Is AFA</i>	134

No One Gets Mad Any More

John F. Loosbrock, Editor

LAST month, while high government officials stood with bowed heads, the mournful notes of Taps rang through Arlington National Cemetery. The Air Force was burying two of its own, men who had met death doing their simple duty. Unidentified victims of the cold war, they were every bit as dead as any hero of Schweinfurt, Ploesti, or MIG Alley.

The day before the Arlington ceremony the State Department had released a tape recording of a radio conversation among five Soviet pilots. In translation, the tape told the grim story of an Air Force C-130 reportedly lured off course by Soviet navigational beams. The aircraft, known by the Soviets to be an unarmed transport, was gunned to earth in Red Armenia, just over the Turkish border.

That was last fall, on September 2. On September 24 the Soviets turned over the remains of six of the crewmen to United States authorities. The unidentified two went to rest in Arlington; the others were sent to their families for burial.

Since the incident the Soviet government has professed no knowledge of the eleven others known to have been aboard but still unaccounted for. Mikoyan, on his recent visit to the US, passed off the incident with an air of injured innocence. But the damning evidence of excited Soviet voices, as the Red fighter pilots closed for the kill, gives the lie to the Communist disclaimers.

The State Department release got a big play from all news media. But it was a brief flurry and set off no visible wave of indignation. The nation read and watched, clucked in dismay, then went about its business. Even in our own editorial offices, the typewriters skipped not a beat in their clacking, copy continued to flow in and out, commas were inserted, headlines made to fit. As a friend put it, "No one gets mad any more." Nor even sad, it might be added. Even the Korean War, with its 34,000 American dead, was a far-off, mysterious, almost casual little conflict for the majority of Americans. We took it pretty much in stride, almost as Britons of the Victorian Empire days took the Siege of Mafeking.

The point is this. In these times of megaton bombs and megabuck budgets it is quite easy to grow impersonal about wars and weapons, death and destruc-

tion. We speak of "losses" as "acceptable" or "unacceptable," of "casualties" that will have to be "evacuated." We talk of "personnel" who will be "survivors" of future wars which, in our hearts, we do not really believe will ever happen. Not happen to us, at any rate. It's just too terrible even to think about. So we don't.

We forget that the war of tomorrow, like all wars since Cain slew Abel, must be a war of flesh and blood, of muscle and bone. It will be a war of widows and orphans, of shattered bodies and devastated countryside. It will be impersonal only in means, not in results. And we will quite probably not be able to participate vicariously through the eyewitness accounts of correspondents or the newsreel picture on our television sets.

This hot war is what the cold war is being waged to prevent. It is awesome in its implications, frightening to contemplate. But in the meantime, the cold war continues to take its toll despite the lower temperature of the conflict. Human beings have died and will die, on both sides of the Iron Curtain, in pursuit of patriotic impulses or merely because a combination of fateful factors places them in the wrong place at the wrong time.

The Hungarian rebels had no Arlington to accept their remains. They went to what their Soviet masters would term a traitor's grave. The Soviet military forces assuredly bear their quota of "training accidents," leaving fatherless families behind to mourn. The free world has no monopoly on grief and sorrow.

Such is the price the world is paying for the continuance of an uneasy peace. In comparison with the alternatives, the price is small. The least we can add to it is our attention, our sympathy, our gratitude. Let us restore personality to the faceless statistics we send out prepared to fight, and to die if need be, to protect the view from our picture windows.

Perhaps we have forgotten what all good country editors know. "People make news," they say—and people make wars, and fight wars, and suffer through them, or die in them. And it is debatable whether the quick or the dead will be the more fortunate should the victims of the cold war turn out to have sacrificed in vain.—END

AN ASW SYSTEM... DISPLAY/AIRBORNE RECEIVER/SONOBUOYS

Anti-submarine warfare equipment designed, developed and produced by *The Magnavox Company*, in conjunction with the Navy Department, provides patrol aircraft with eyes that see underwater by day and by night. The AN/ASA-16 Display System, together with SONOBUOYS, AN/ARR-26 Receiver systems and other associated equipment provide aircraft with a clear picture of the ocean-depths below them. They are part of the continuing contributions of *The Magnavox Company* in aiding the U.S. Navy to combat the growing submarine menace.

MAGNAVOX capabilities are in The Fields Of Airborne Radar, ASW, Communications, Navigation Equipments, Fusing and Data Handling . . . your inquiries are invited.

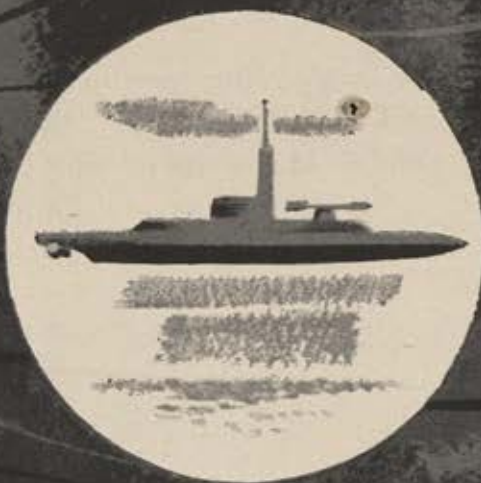


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COMMUNICATIONS



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Spray plane approaches Lake George hyacinth bed low and slow.

Florida's Winged Watchdogs

by HERB FISHER

International aviation authority, veteran test pilot, author

An inside report on the Aviation Section of the Florida Game and Fresh Water Fish Commission... another in a series on why business and private aircraft, like the world's major airlines, use Champion Spark Plugs



Airboat eradicates waterway-clogging hyacinths with spray-hose.

National publicity resulted recently (LIFE, etc.) when Wildlife Officers successfully restocked forest with wild turkeys via airlift.



Ever fly the Everglades—five feet off the water?

Pluck shipwreck victims from choppy seas? Hedge-hop the "green side of hell" by night? Spray low in a fixed-wing with flaps down? Airlift wild turkeys? Fly "queen-bee" for patrol boats converging on fish and game law violators—or fleeing criminals? Flush ducks—count and identify them—on a low pass? Strafe "rough fish" with poisonous chemicals?

Or wade armpit-deep in a pit-of-terrors—alligators, quicksand, leeches, venomous moccasins and mosquitoes using your head for a GCA? Maintain, singly and as a unit, your own aircraft or airboat—major engine and airframe

overhaul to simply finding "the bug"? Lecture, do reams of reports?

Flying Wildlife Officers of the Florida Game and Fresh Water Fish Commission's Aviation Section do some of it all of the time and all of it some of the time.

They're picked men: No margin for error in this diverse precision work. Takes intense concentration, unusual skill . . .

Picked machines—aircraft, parts and equipment; "swamp-buggy" airboats, "kicker" motorboats—backed by a remarkable maintenance operation. For



Mr. Fisher

there's no place for breakdown . . .

Chief of Aviation, Chief Pilot and Chief A & E Mechanic is William S. Durkee, an old pro with single- or multi-engines, land or sea—commercial, military and barnstorm.

Immediate responsibility of Durkee's crack outfit is the security and progress of four million acres of Florida wildland, peppered by 30,000 named lakes laced by stream and marsh. But assisting federal, military and other state agencies is routine:

Like when fire menaces life and property in a national forest. Or in Civil Defense emergencies. Or when lawmen are after somebody or something in the back-country. Or when migratory waterfowl need a federal census. Or, jurisdictionless, when human life hangs by a hair in swamp, forest or Gulf . . .

Seven pilots, four A & E mechanics, eight planes do it. All are on 24-hour call—and, sometimes, duty. Headquarters, centrally located: Ocala Airport.

There, in a well-equipped hangar *pilots and mechanics built*, beyond call of duty, the Aviation Section not only gives major engine and airframe overhauls to all its planes, but also to airboat engines, majored at 600 hours! The Commission operates 62 airboats.

A typical three-month period, from the pilot log: Day patrol, 607 hours; night patrol, 52 hours; hyacinth spraying, 27 hours; aerial photography and survey, 62 hours. For this same period, the *pilot log* shows 9,000 miles' ground patrol, 425 hours for special office duties, 550 hours assisting other departments—900 hours on *maintenance*.

"In addition to maintenance and flying qualifications that many pilots just don't have, our pilots must have—and they do have—a genuine interest in game and fish conservation," Durkee stressed. "Top pilots, top mechanics, heroes of rescue that we insist remain anonymous—yes, they're all these and more. But first and foremost, they're Wildlife Officers."

Flying Wildlife Officers, whose two-

A 70-mph airboat on patrol in hazardous Everglades. Airboats run 600 hours on Champions used in aircraft for 300 hours!—a unique and grueling "double-life" for spark plugs.



way radio communication with all units—air, land, water—makes possible a highly coordinated operation—vital, in fact, to enforcement and rescue phases.

Despite constant hazard, the Aviation Section has flown 10,000 hours without major accident. It was founded 3½ years ago as an outgrowth of a one-plane operation begun in 1948. Patrol and spray flights now exceed 5,000 hours and 115,000 square miles annually.

Firing this air-water-land force to life day and night are spark plugs indicative of the Commission's uncompromising policy on men and equipment: Typical of procedure, the Aviation Section tried several types to determine for themselves the most dependable for the vital heartbeat of the engine—ended up with Champion Spark Plugs exclusively. In plane, airboat, motorboat, truck, jeep,

patrol car, shop equipment.

And herein lies a "double-life" saga unique in performance annals: Despite these severe operating conditions, the Commission runs Champions 300 hours in its aircraft—four Pipers, three Cessnas and a pontooned Stinson—then "bumps them down" and runs them another 600 hours in airboats! And when these airboats come in for a 600-hour major, their aircraft engines are worn out!

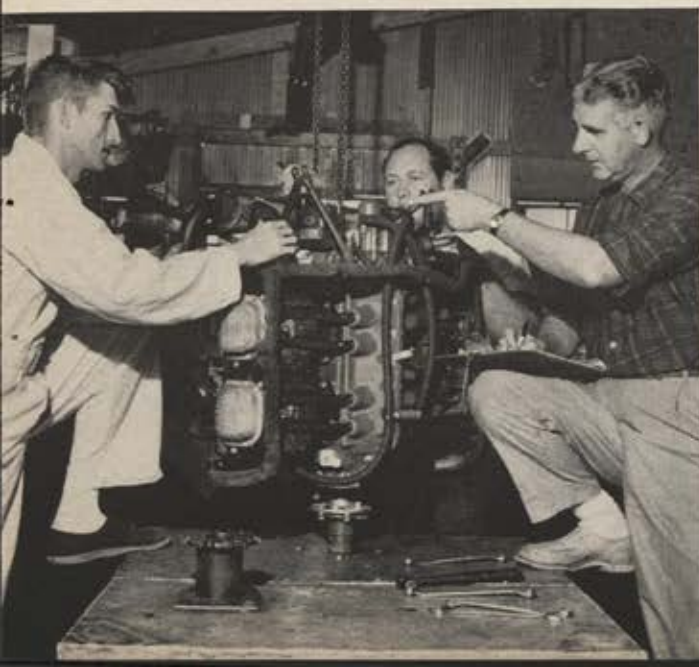
"Frankly, I don't see how these airboats give peak performance for 600 hours—you should see some of them in for overhaul," Durkee said. "And the beating the spark plugs take for 300 hours in low, slow flying, with high cylinder-head temperatures, then full throttle—then to run another 600 hours in poorly cooled airboat engines! Patrol airboats sometimes run 70 mph—and hyacinth-control airboats often turn up 3,200 rpm's blasting and rocking off mud flats. Add hot weather and salt-air humidity to that cylinder temperature, too!

"Here's a 900-hour 'double-life' on heavy engine-load both ways—plane and airboat—and, often we remove plugs before we really need to!"

They take no chances. Airboat engine failure can be almost as perilous as an aircraft forced-landing, especially in the Everglades. Took an airboat officer 30 hours to slog seven miles once . . .

Its peak performance has made the Aviation Section an important integral part of Florida's nationally acclaimed conservation and enforcement program.

Those responsible are the winged watchdogs of a wilderness wonderland.



Pilots and mechanics work together to maintain own planes plus 62 airboats—from airframe to major engine overhaul! Pilot-mechanic William S. Durkee (R), Chief of the Commission's Aviation Section, supervises and pitches in.



air mail

Conventional Pulse Radar

Gentlemen: We were interested in the article entitled "Space Age Developments in Long-Range Radar," by Dr. Robert I. Bernstein, in the December 1958 issue of *SPACE DIGEST*.

It was surprising to us to read on page 81, in paragraph two of the introductory note: "In fact, it would be impossible to obtain the many thousand miles of range needed for these new operating conditions with any reasonable amount of radar transmitter power using pulse-radar techniques. Such power levels in 'conventional' pulse radars would not only be extremely difficult to produce but would call for heavy and expensive equipment."

The facts are that this has already been done quite successfully some time ago by the MIT Lincoln Laboratories using a very-high-power pulsed radar transmitter developed and built by Continental Electronics under an Air Force research and development contract. We refer to the "Millstone Hill" project that has been publicized to some extent.

The super-power pulsed radar transmitter technique is reasonable because it is an accomplished fact. Transmitter costs are justified on the basis of the results obtained, as with any item or project.

We have no quarrel with new techniques. Quite to the contrary, we welcome new challenges. Our company has been built around research and development projects. Super-power transmitters of all types and frequency ranges are our specialty.

Thomas B. Moseley, Dir. of Sales
Continental Electronics Mfg. Co.
Dallas, Tex.

Gentlemen: I read Mr. Moseley's letter with great interest, but unfortunately cannot agree with his criticism of my contention that satisfactory operation of very-long-range radars cannot be accomplished merely by brute force increases in transmitted power within the limitations that today are accepted as practical during the foreseeable future.

It is generally accepted that the detectability of a radar echo is deter-

mined by the total collected echo energy. To increase radar range by a factor of ten over World War II accomplishments requires that the transmitted energy be increased by a factor of 10,000 because of the fourth-power law governing radar propagation. While there have been improvements in antenna gain and receiver noise figures in the past thirteen years, these are more than offset by the smaller radar reflectivity of missile nose cones as compared to the propeller-driven aircraft which served as targets during the war.

Furthermore, noise of solar, galactic, and auroral origin, not to mention transhorizon tropospheric scatter jamming, vitiate the improvement that an increase in antenna collecting area would otherwise produce and submerge the benefits of a low-noise receiver.

An optimistic specimen of World War II radar would radiate a one-megawatt pulse with a few microseconds pulse duration. It might reliably achieve a range of 200 miles on a very large propeller-driven airplane and would yield a range resolution of about 500 yards.

If we accept Continental Electronics' estimate that one can reliably produce ten megawatts of radiated power, and ignore the relative smallness of the radar reflectivity of a missile nose cone, it would require a pulse width of a few thousand microseconds in order to produce a radar range of 2,000 miles. If conventional radar techniques are merely extended by brute force, the range resolution that would result would be several hundred miles, and this is clearly unsatisfactory for either impact prediction or interception in the case of enemy missile warheads, and is also extremely inadequate for trajectory measurement in the case of satellites or other space vehicles.

A "conventional" pulse radar of great power of the type that Mr. Moseley refers to as the "Millstone Hill" project would succeed in the detection of large targets, but could reveal nothing precise about the trajectory unless some more refined "unconventional" techniques are employed.

In order to achieve precise results

at long range, a few of us in the field of radar research and development have for several years been advocating the use of FM/CW (frequency modulation/continuous wave). This advocacy has been rewarded with some success, since a very effective FM/CW radar (the ORDIR system) was demonstrated in my laboratory several years ago and several other systems for producing FM within a long-duration radar transmission have been developed by other research groups.

The use of frequency modulation permits very fine range resolution even though a long duration radar transmission is employed. Once the means of employing FM is accomplished it becomes possible to use transmissions that are much longer than the figure of a few thousand microseconds referred to above, and this permits the power level of the transmitter to be reduced.

The additional advantage accrues that the precision in measuring Doppler velocity increases in direct proportion to the duration of the transmission. When the transmission duration exceeds 1,000 microseconds by a substantial amount we call the technique FM/CW because it possesses the characteristics of continuous-wave operation in comparison to "conventional" microsecond pulse radar.

I would not like to leave the impression that very-high-power transmitters of the type Mr. Moseley's company is developing are in any way rendered superfluous by the use of FM/CW. The improvement they afford can be cascaded with the advantages obtained by FM/CW, and the range and reliability of radar certainly are improved thereby. However, it is important that these new high-power transmitters possess sufficient bandwidth and stability to make them compatible with FM/CW.

Robert I. Bernstein
Associate Professor
Columbia University
New York, N. Y.

Not Second-Rate—Yet

Gentlemen: Certainly American brain power and American genius are better than any in the world.

Why, oh why, must nearly all articles published indicate that the lousy Russian Communists are better than we are? I refuse to accept such statements.

Surely you can get some *red-blooded American* who can realistically tell the American people that we are not a second-rate power.

Lt. Gen. George E. Stratemeyer
USAF (Ret.)

Winter Park, Fla.

• *It's not a case of the Soviets being better than we. But it would be less than realistic if we were to ignore the fact that Soviet technology and weapon production are progressing at a rate faster than our own. America will become a second-rate power only if Americans wish it that way. Unfortunately, this more and more appears to be the case.*—THE EDITORS

Air-minded Casey Jones

Gentlemen: As a long-time member of AFA (since 1946) I wish to lodge a strong protest to some of the ideas expressed by Claude Witze in his December '58 article "Airports and the Jet Age." I am a locomotive engineer—but am also air-minded, being a World War II pilot and currently active in the Air Reserve program in Southern California. . . .

I do not believe that we of AFA want anyone to have their hands in the "public till"—whether the till is federal or municipal. Mr. Witze very definitely leaves the impression that, in order to survive, our privately-owned airlines need the American taxpayer.

Mr. Witze is very hurt that Omaha did not pass their airport bonds. He should have applauded these conscientious taxpayers, and instead should have castigated the airlines themselves for not getting together and building their own airport! . . .

Part of the bond money for Omaha's airport would come from general funds. This means that everybody in Omaha would have to pay for the airport for the benefit of a few thousand. In comparison, the railroads serve everyone in a community, and are the largest or near largest taxpayers in many communities.

Why can't we of AFA push more strongly for a self-sufficient private air industry? The people of the United States have face-fed the private air industry for so long that they feel it is part of their "heritage" to be helped by the taxpayer. And they are so strong that they are endeavoring to get our first line of defense out of the air, or at least off the airways, which are owned and maintained by the United States! Witness the recent air

collisions between Air Force planes and commercial airliners. We of the Air Force have taken the beating!

I am as convinced as you are that a national transportation system is necessary in our economy. This would include the rails, roads, air, and water. But—of what use would a new airport at Omaha have been to the national defense? Offutt AFB is nearby for military aircraft—and built with taxpayers' money. If there were an all-out nuclear war, none of the major airports . . . would be available to either civilian or military aircraft. They would all be knocked out very early in the game. . . . But an enemy attack could not stop all of the rail and road systems. . . .

And the rails continue to be the only transportation system that can haul the most for the least in the shortest time—and haul virtually anything that is built. The car you drive, the food you eat, the coal you heat with, the clothes you wear—even the airplane you fly in, has at one time or another been on rails.

Hurray for a greater Air Force—but also a stable economy.

David W. Litsinger, Maj., AFRes.
Lynwood, Calif.

• *Senior Editor Witze's rundown on the status of the Federal Airport Aid Program concluded with the statement that it is an essential part of the nation's airpower program. This is based, of course, on the thesis that air transportation, like rail transportation, is essential to defense. And, of course, there are situations where surface carriers cannot meet the demand. We are sure Major Litsinger knows of examples.*—THE EDITORS

Desk Reference

Gentlemen: I keep a loose-leaf book of sections from AIR FORCE/SPACE DIGEST Magazine, headed by the Air Force Almanac pages. I include all the organization charts, the photo-charts, the "Guide to Air Force Bases," the "Map of Major Air Force Bases in the Continental United States," and sundry pay charts, glossaries, and other pages of semipermanent reference value. . . . This is for me a desk reference—I use it repeatedly.

This leads me to the suggestion box. Why don't you publish and sell, with or without advertising, an Air Force Almanac annually? This could be composed entirely, or largely, of pages right out of the magazine, with some updating changes.

I have an alternative suggestion. Why don't you publish your "reference use" type of pages in the magazine on removable, perforated pages.

You could make available a lettered loose-leaf binder. (I should think advertisers would prefer space on pages which would have permanent use.) This would at least make easier the job of maintaining a current loose-leaf almanac.

Col. Hamilton B. Webb
Randolph AFB, Tex.

• *Present editorial planning coincides with one of your suggestions. The Almanac is to be an annual activity—with this year's scheduled for September. It will contain all new material (which takes care of the updating changes you suggest) and will include advertising (which makes the whole operation possible). Your suggestion for perforated pages is a good one. But, while making life easier for readers who clip issues, it'd make life much more complicated for your editors and all but impossible for our already-harried printer.*—THE EDITORS

And Other Worlds

Gentlemen: I received some measure of pleasure out of your January '59 article, "Will Man Find a Hostile Universe?", but like all articles that have a question for a title, it never really says very much and certainly never gives an answer.

In passing, I would like to say I don't see how, out of all the vast reaches of space, we could possibly think ours is the only inhabited planet. I belong to the school that believes we all started at the same place and the same time, that natural laws are universally the same, and that specific creatures, except for environmental alterations, are basically the same. I am most curious to learn, and probably never will, if any inhabited planets have religions similar to any on earth.

Elmer L. Henson, Jr.
Nashville, Tenn.

GOC Editorial

Gentlemen: Attached herewith is a copy of the Nassau County Civil Defense Newsletter, with your editorial from the December issue of AIR FORCE/SPACE DIGEST Magazine as my lead story.

No one could have done a better job of paying tribute to the Ground Observer Corps.

Frank DeK. Huyler, Jr.,
Col., USAFRes.
Office of Civil Defense
East Meadow, L.I., N.Y.

Hard-Working CAP

Gentlemen: Didn't you forget something?

When you eulogized the very deserving GOC [December '58], I think
(Continued on page 15)

Lockheed's turboprop Electra: Performance-proved for 8 key military missions

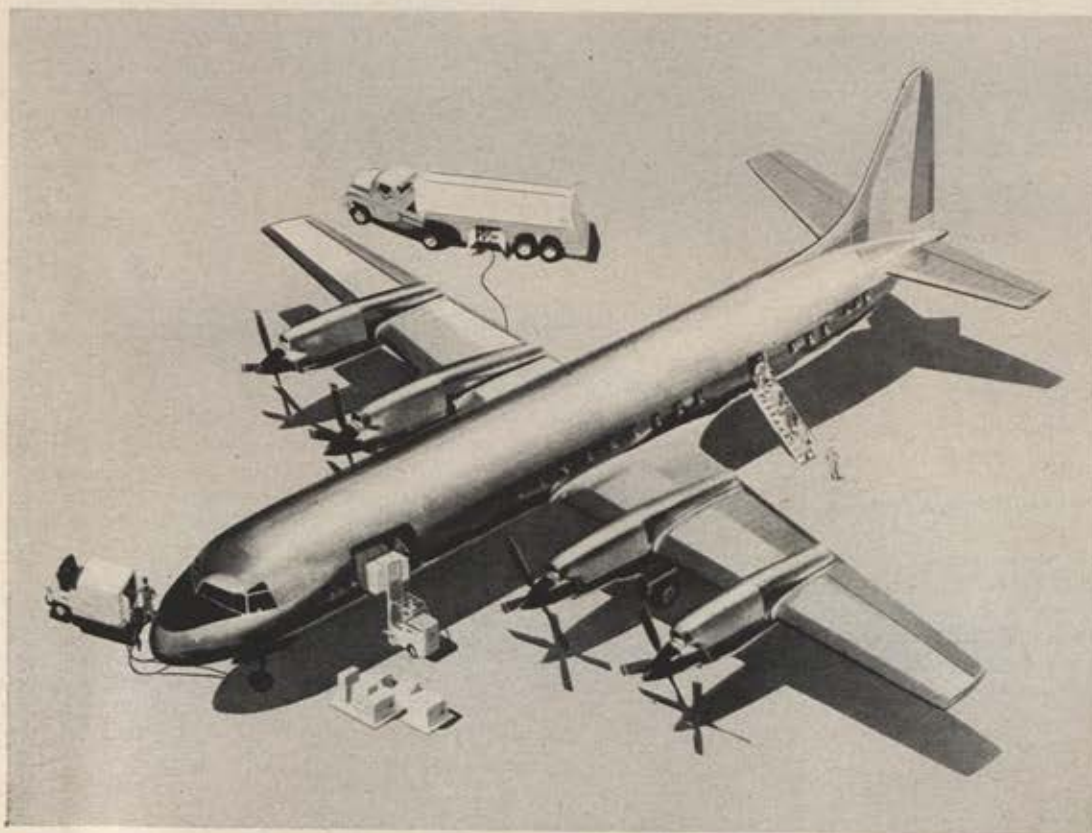
During its recent headline-making 52,000-mile tour—of the United States, Canada, Europe, Asia, and the Middle East—Lockheed's new turboprop ELECTRA airliner dramatically demonstrated its amazing performance capabilities.

Seasoned pilots were astonished by the ELECTRA's short takeoffs and landings—especially its safe, sure stops on rain-slick runways. Over the Alps, with two engines purposely cut and one prop at zero thrust, the ELECTRA cruised on only *one* engine. Taking off at 115,000 pounds gross weight, the ELECTRA flew non-stop 3220 miles

from Istanbul, Turkey to New Delhi, India—in a record breaking 7 hours, 55 minutes.

The ELECTRA's proven performance, safety, ease of maintenance, and economy of operation qualify it in every essential to fill the Armed Forces' requirements for eight new Jet Age aircraft, each performing a different key mission.

Because ELECTRA airliners will be in service for airlines throughout the world, emergency service and parts for military ELECTRAS will be readily available worldwide. Result: optimum global utilization of USAF and Navy ELECTRAS—at minimum costs for parts inventories and service.



Completely self-sufficient, the ELECTRA can land at out-of-the-way airports and remote landing strips—because it has its own engine starters and ground air-conditioning, plus built-in passenger stairs. Passenger/cargo loading, refueling, and servicing of the ELECTRA can all be done simultaneously.



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3



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6. *Long Range SAM Transport*: Intercontinental range, using existing airports.
7. *Downrange Transport*: For personnel engaged in missile range test programs.
8. *Special Air Missions Transport*: Improves hemispheric communications.



4



6



5

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**Air Force
"Sunday
Punch"**

ATLAS



Boosted into space by the fiery thrust of three huge rocket engines, the seven-story Atlas intercontinental ballistic missile roars upward from its Cape Canaveral launching pad. Quickly it sheds the frost encrusting the liquid oxygen tank and races to its predetermined destination in the far reaches of the globe. In its size and range and capability, the Air Force Atlas is a

commentary, for all the world to heed, of the necessity to maintain the peace. RCA's Missile and Surface Radar Department has been privileged to design and develop ground check-out, launch control and cabling equipment as a major subcontractor to Convair (Astronautics) Division of General Dynamics Corporation, the Atlas prime weapons systems contractor.



Tmk(s) ©

RADIO CORPORATION of AMERICA

DEFENSE ELECTRONIC PRODUCTS

CAMDEN, N. J.

you forgot to mention one group that helped them carry out their mission. Whom did they report—a jet or two and a couple of airliners? Yes—and hundreds of little CAP planes flying 'round and 'round over the spotter stations at assigned altitudes—hundreds of CAP pilots who flew thousands of hours through dozens of lost Sunday afternoons so the spotters would have something to spot. I know this is true—for I was one of those pilots.

Quietly we go about our task of helping to air-condition the thinking of our country—and grimly we join in the search when comes the need—and cheerfully we do whatever we're asked.

But we're human. We'd like to know you know.

J.E.T.
Albany, Ga.

• We haven't forgotten the CAP—it was just closing day for the GOC.
—THE EDITORS

Japanese Interest

Gentlemen: You may recall that we purchased 225 copies of the March 1958 [Space Weapons Handbook] issue of AIR FORCE Magazine, for distribution to our offices in foreign countries. Permission was granted for republication of the material (in English and in translation). . . .

You will be interested to know that a Japanese translation of an article from the issue, "The Space Frontier," written by William Leavitt, John F. Loosbrock, Richard M. Skinner, and Claude Witze, was published in the June 1958 issue of *Kagaku Gaho*. *Kagaku Gaho* is a monthly with a circulation of approximately 30,000. . . .

Garrett K. Sias, Acting Chief
News and Features Branch
Press and Publications Service
United States Information Agency
Washington, D.C.

B-47 in Danger

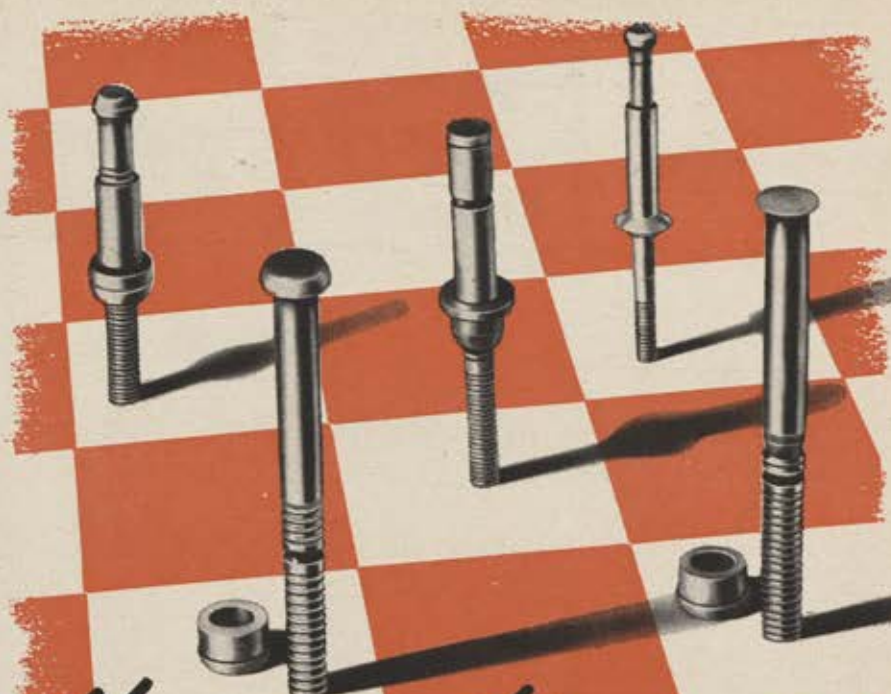
Gentlemen: Shame on you! Please note front cover of December '58 issue, AIR FORCE/SPACE DIGEST Magazine.

You show a B-47 being taxied up to, or over, a ground power unit. Boy, will the Director of Safety of that bomb wing raise hell when he sees that. You just don't do that sort of thing.

Suggest the person responsible for your cover picture be briefed accordingly. But don't be unhappy. I still think your magazine is excellent.

Maj. William P. Riddling
Davis-Monthan AFB, Ariz.

• Briefed—too late!—THE EDITORS



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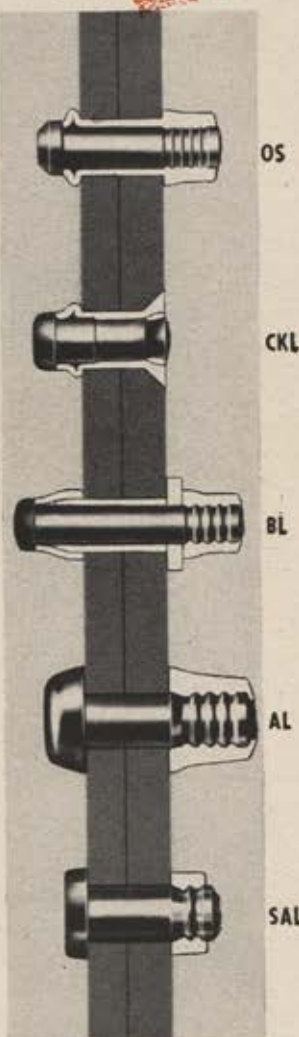
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AIRPOWER in the news



Claude Witze

SENIOR EDITOR

Questions and Answers

WASHINGTON, D. C.

At mid-February, which is where we are at the moment, both sides of the Potomac and both ends of Pennsylvania Avenue are taking part in something that the headlines call a missile debate. Actually, that is a provincial label for what is going on because there is no single topic involved in the argument.

In the past three weeks at least eight committees on Capitol Hill have turned their curiosity toward the Pentagon. It has been reliably reported that Defense Secretary Neil H. McElroy and Joint Chiefs Chairman Gen. Nathan F. Twining spent thirty-eight hours in the witness box in this period. A congressman had his picture taken trying to give an apple to a recalcitrant monkey, and a number of recalcitrant young secretaries took a dim view of an exhibit of mice placed in a Capitol corridor.

It is significant that outside of the Defense Department itself, these committees are showing the greatest initial curiosity about the Air Force. If we paint with a broad brush, they are interested in the adequacy of the defense budget, the continuation of the Strategic Air Command as America's big deterrent force and the "posture" of defense. The so-called missile argument falls in the latter category, along with management of the missile program, the anti-missile missile, and the race for space. In all of these subjects the Air Force has proven capability to the extent allowed by the state of the art but there is no evidence, so far, that the Defense Department knows this and plans to cash in on the fact. As pointed out in these columns many times, there are basic decisions that must be made in the area of roles and missions.

An excellent example of the kind of nonsense that results from this situation popped up the day when two Army generals told the House Committee on Science and Astronautics that Mr. McElroy had rejected their plea to start production of a missile that can shoot down Soviet ICBMs. They did admit there is a difference of opinion whether or not the Nike-Zeus antimissile missile development has progressed to the point where it would be smart to set up a line.

So far, there has been no USAF testimony indicating a change from last year's position that any and all anti-missile missile programs belong on paper. None is expected, and a DoD spokesman already has told another congressional quiz that "the best scientific brains in the country" have advised against putting Zeus into production.

This being the case and assuming the scientific brains are right, it would seem that Mr. McElroy should find some way to educate a couple of Army generals who are eager to get a quick slice of the fiscal 1960 pie. Not many days before the congressional probes started, Mr. McElroy said we haven't got Zeus and don't know when we will get it and indicated there may be an end to the old differen-

tiation between area (USAF) and point (Army) defense missions.

Certainly it was our understanding that the Defense Reorganization Act of 1958 made Mr. McElroy the boss. It was pointed out here last month that the Pentagon's highest command still is dodging the issue, saying it does not know who will use Zeus if it is used and, out of the other side of the mouth, that the Army will use it as a tool of the Continental Air Defense Command, if Zeus is deployed.

The Barrier Is Not in Space

The monkeys and the mice that visited Congress were brought to the House committee by the office of USAF's Director of Advanced Technology, who is Brig. Gen. Homer A. Boushey. General Boushey was introduced by Gen. Thomas D. White, Chief of Staff, who made it clear that he views air and space as a continuous operational field, now known as aerospace, and that USAF must have proficiency all the way up. Extreme caution must be taken, General White warned, to avoid damage to the military requirement by putting basic research too far away from the military program.

Then General Boushey reviewed the Air Force story, emphasizing the fact that the hottest space projects we have today come from USAF—the X-15, Dyna-Soar, Sentry, and the propulsion systems that go with them. He gave a rundown on USAF facilities and talent in the development area and added a survey of the aerospace medical effort. With all this experience, going back more than forty years, USAF today is working in large part for other people, and it would take an awfully stubborn congressman to miss the point. The programs, rooted in USAF, have been shifted to an alarming degree to the Advanced Research Projects Agency and the National Aeronautics and Space Administration.

Now ARPA is a Defense Department agency and NASA presumably is civilian. And it is not at all clear, particularly in the Pentagon, who is running the show. This is an aspect that aroused the curiosity of the Senate Committee on Aeronautical and Space Sciences, headed by the potent Lyndon B. Johnson, Texas Democrat. At their hearing, Roy Johnson, ARPA's chief, declared he controls the money. He said, in effect, that USAF can go into space only as far as he decides to let it go. It then was brought out that Dr. Herbert York, Defense Director of Research and Engineering, also feels that he has some prerogatives in this area. If there are any left for the Air Force, it was not made clear what they are.

Shortly afterward, the Defense Department issued a charter for Dr. York's office of Research and Engineering. It doesn't seem to leave much doubt about who is boss in the research and engineering area. It carried out Mr. McElroy's announced intention of having Dr. York supervise all R&E activities.



Wide World Photos, Inc.

USAF Secretary James H. Douglas and Gen. Thomas D. White, Chief of Staff (both seated) confer with Senator John Stennis (Dem., Miss.) of the Armed Services Committee.



Wide World Photos, Inc.

Pentagon space bosses are William Holaday, until recently director of guided missiles, Dr. Herbert York, new chief of research and engineering, and Roy Johnson, of ARPA.



Wide World Photos, Inc.

USAF's Maj. Gen. Bernard A. Schriever, top missileman, testified that we can build more ICBMs and that Soviet might in this area presents a dangerous threat to US.

At the same time, nothing has been done yet about ARPA. The Defense Secretary told the House Armed Services Committee he plans to continue Mr. Johnson's office as "an operating agency paralleling the Research and Engineering organizations of the military departments." This connotes no intent to reverse or curb the trend to deprive military organizations of their right to develop new weapons.

In fact, there is a contrary connotation that is receiving more and more attention. This is the suggestion that ARPA might be a fourth service, a Service of Supply in the embryo, ready, willing, and able to spring out full blown. Mr. Johnson, according to Mr. McElroy, will report to him "administratively." On the other hand, "his research programs will be subject to the supervision and coordination of Dr. York's office just as there are those of the military departments."

The significance of this passeth our understanding. We note that William Holaday, former Director of Guided Missiles, is not leaving Mr. McElroy's family. His original job has been abolished, and Mr. Holaday is the announced

chairman of the Civilian-Military Liaison Committee to the National Aeronautics and Space Administration. The Defense Secretary now says Mr. Holaday will continue as a special assistant to "handle those special aspects of the [missile] program which are beyond the research, engineering, and testing phases." He did not define production as a "special aspect," but it could be.

At the opposite extreme from speculation that ARPA may grow into a fourth service is the school that still expects ARPA to die. There is some opinion that Congress will be derelict in its duty if it does not do something about the persistence with which civilian watchdogs continue to pile up and impede the technological effort. In view of Mr. Johnson's attitude on the witness stand, plus the fact that ARPA was expected to fade away last month, plus the fact that NASA is in most ways a creature of Congress itself, it may not be unreasonable to look for some effort to get ARPA out of the way.

How? Well, a couple of years ago Congress could find no justification for a looney operation in the Commerce Department called the Office of Strategic Information. Nobody could explain why it was there or what it was doing. Congress just stopped appropriating money for the Office of Strategic Information.

What IS the Right Answer?

Sometimes it looks as if the Russians were allowed to write themselves into the script. Maybe they are trying to spur us into harder thinking and greater sacrifices to meet the competition. Examples range all the way from their attitude toward US disclosure that they shot down a C-130 in flames to boasting about their capabilities. Mr. Khrushchev told his party congress that Russia's national income can increase by more than six percent a year, as opposed to about three percent for our part of the world. Marshal Malinovsky, who is Mr. McElroy's counterpart in Moscow, later bragged about how good his missiles are, said they can hit any target, and threw a jibe at the West: "Your arms are too short, gentlemen!"

Some of the reactions to these pronouncements were astounding. Our commander in chief took no more stock in them than he does in the old claim that the Russians invented the airplane. Mr. McElroy says we could win a nuclear war today, and he does not believe we are taking too big a risk about one in the next few years. Inflation is viewed as a bigger threat than Communism, economic war as no threat at all.

(Continued on following page)

While it has little bearing on the national defense situation, we have been fascinated during this hectic period in Washington, by the performance at Albany, N. Y. The state's new governor, a Republican who ran in one direction last November while his party ran in the other, came up with a record budget and a record proposal to increase taxes. Mr. Rockefeller is a realist. We are taken by the idea that this man won an election while his political roommates, who are not realists, lost one.

Not long before the wave of congressional inquiries President Eisenhower did some talking about the possibility of a tax cut in the not too distant future. Nobody asked Mr. Rockefeller for his opinion, but it is fairly clear from his program for the Empire State that he would not use such a platform to gain access to the White House. And, don't forget he *won* last November.

So far, the only bold statement in Washington has come from the estimable John W. McCormack of Massachusetts, a Democrat, who has done a pretty good job in the House, where he headed last year's space studies. He says there can't be any tax cuts; rates may go up.

Now, if the war is on against inflation, and we hear a lot of noise about that these days, it seems to us that higher taxes would be more useful than lower taxes. Supported by such authorities as Nelson Rockefeller and John W. McCormack (Rep. and Dem.) a case could be made for facing up to the facts in this regard. Again, if the war is against the Russians and is a matter of national security, who gives a damn about dollars? It follows, in either case, that we can, and must, afford what we need.

In the economic war this means a national income growth of more than six percent a year. In the military war, hot or cold, it means paying for what Mr. McElroy needs to abolish that risk—make it a sure thing.

How We Buy the Hardware

An unspectacular but important hearing was launched by Congressman Chet Holifield, D., Calif., of the House Committee on Government Operations. As head of a subcommittee dealing with military operations, he is concerned with missile management, covering the gamut from how the show is run to procurement, contractor relationships, and other business aspects. There are plenty of other people concerned with how the hardware works and what it contributes to the defense posture, Mr. Holifield says. He wants to know how we mobilize the effort.

For a starter, he turned the spotlight on the Air Force again and took a look at the Ramo-Wooldridge Corporation, now known as Space Technology Laboratories. Out of this, Washington's lone tabloid newspaper got a couple of headlines, but the remainder of the opening session was surrounded by dignity. James H. Douglas, USAF Secretary, gave a factual report. He explained that it was hard to find the kind of talent needed to manage something as complex as the Thor, Atlas, Titan, and Minuteman programs. A good job, accomplished with speed, was essential. Hence the Ramo-Wooldridge contract.

The committee also heard from Dr. Simon Ramo, head of the company, and Jimmy Doolittle—who knows his way around the Air Force, the scientific world, big business, and Space Technology Laboratories, where he now is chairman of the board. Both of these men were well received.

What few headlines were created out of this did not come entirely from the testimony and, strangely for a nation that is fighting a cold war with Communists, were concerned mainly with the fact that Ramo-Wooldridge

made some money. Because the hearings are being held in a placid atmosphere it was not put into the record very bluntly that USAF feels it got a terrific bargain in its contract with Ramo-Wooldridge and that without it the missile projects might easily have bogged down.

It is too early to spot the direction in which this probe will go, but the entire industry will watch the committee's report with interest. Later sessions will have to look into the management of other missile efforts. The committee staff will not be able to avoid some kind of an evaluation of the arsenal concept of "in-house" development vs. the selection of industry talent to produce a new weapon system.

Deterrent Power Cannot Relax

It is a sad fact that many of the most potent statements made on Capitol Hill during the early flush of congressional quizzes never made the papers.

One of the finest was made before the Subcommittee on Disarmament of the Senate Committee on Foreign Relations by USAF's Chief of Staff, Gen. Thomas D. White. General White started by saying that arms control would be a fine thing to have in this day when time, distance, and destruction have been compressed into such a violent package. But, he added, this very lethality is a thing that makes caution more important than ever.

Then the general quoted the philosopher Spinoza: "Peace is not absence of war; it is a virtue, a state of mind, a disposition for benevolence, confidence, justice." This state of mind, General White pointed out, cannot rest on expressions of intent and good will. We found that cannot work—we tried it after World War II in another wave of economy that brought near-disaster in Korea. Hence we must have peace through strength. The Air Force boss said the strategy of deterrence through nuclear weapons and aerospace power must be continued. Why? Because it is the same power that today forms the primary military threat against us. He went on:

"I agree that it is a peculiar paradox that our 'defense' is primarily based on a strong airpower offensive, but we cannot take a chance on risking our survival solely on a defense system which might someday be found wanting in the face of an overwhelming offense. Consequently, the only plausible course of action is to possess forces which deter an enemy through his fear of the consequences to him should he attack."

There is no way of knowing who has heard or read these words from General White. But after skipping around these congressional quiz programs for a couple of weeks we are convinced that his statement certainly should have been put in the record of half-a-dozen other committees, none of them concerned with disarmament. It should go to the White House as well.

• • •

Two other items of major interest right now are the nuclear-powered airplane program and federal aid to airports. At this writing, the heat has not yet been applied, but it is a safe bet the Administration is not going to write its own ticket. Melvin Price, a Democratic congressman from Illinois, is getting ready to dig hard at the ANP project. He is a member of both the Armed Services and Joint Atomic Energy Committees and plans to put some tough questions to Donald M. Quarles, Deputy Secretary of Defense. For airports, Congress is trying to give the Administration more than twice the money it seeks. The bill faces further action, then the threat of Presidential veto.—END



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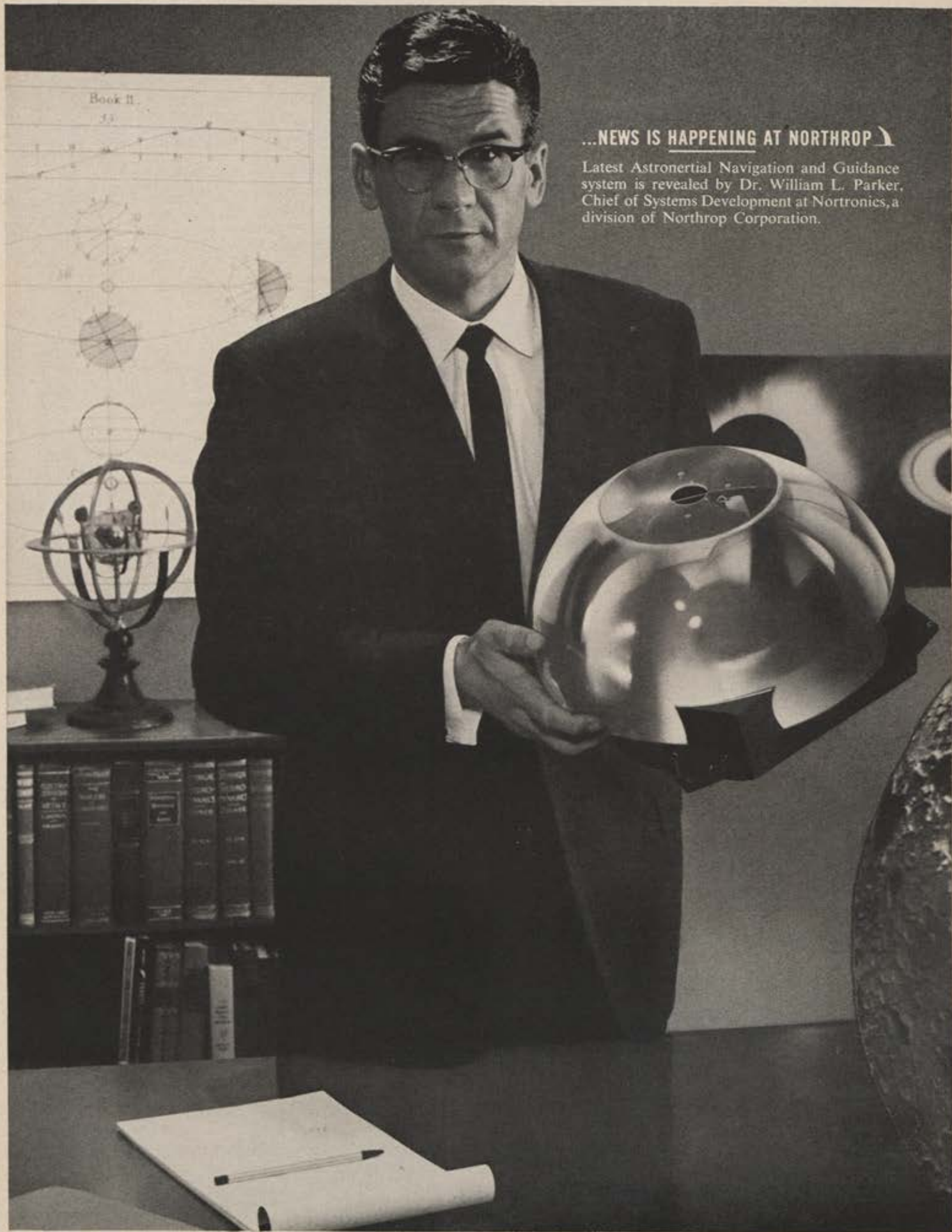
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The N-156F counterair fighter is designed to provide friendly free nations effective tactical defense—at little more than half the cost of comparable fighters.



FLIGHT LINES



USAF is converting two Boeing Stratojet B-47 medium bombers into pilotless drone aircraft to be used for offensive and defensive test missions. The pilotless Stratojets, identified as QB-47s, will be equipped with optical and electronic firing error indicator systems and will be used to measure and evaluate the effectiveness of our ground-to-air and air-to-air defense systems. The Georgia Division of Lockheed Aircraft Corp. and Sperry Gyroscope Co. are converting the 100-ton jet bombers to take off, fly to their targets, return, and land. USAF has scheduled the first of the two QB-47 prototypes for flight test this spring, with delivery to ARDC planned for later this year.

Armed Forces Day 1959 will be observed on May 16. During the period of May 9 to May 17, commands of the Army, Navy, Air Force, Marines, Coast Guard, Reserve Forces, and Civil Air Patrol will hold open houses and will assist national, state, and local civil authorities in demonstrating the US "Power for Peace." Throughout the



Convair 880, powered by four GE CJ-805-3 jets, flew the first time in January. It will cross the US in four hours.

McDonnell 119, four-engine jet trainer and utility transport, rolled out on January 30. Takeoff weight 41,000 lbs., with ten passengers, range 2,033 miles at over 44,900 ft.

country and overseas, the US armed forces will be hosts to their American and international neighbors.

Armed Forces Day has been celebrated since 1950, when the Secretary of Defense, with the approval of the President, announced the consolidation of the four separate service days into a single annual observance. Before 1950, Army Day was celebrated on April 6; Air Force Day was September 18; Navy Day was October 27; and the Marine Corps Anniversary, November 10. This year's observance, the ninth annual combined celebration, will include displays and demonstrations in more than 3,000 communities, with more than 500 parades scheduled. Top event annually is the Armed Forces Day Dinner in Washington, D.C., co-sponsored by the Air Force Association with the Navy League and the Military Order of the World Wars.

The AF has announced plans for construction of facilities for handling Hound Dog GAM-77 air-to-ground missile and Quail GAM-72 air-to-ground decoys at eleven US

bases and one in Puerto Rico. The Hound Dog supersonic missile will be carried by Strategic Air Command B-52Gs for air launch against enemy targets while the B-52s are miles from the impact area. The Quail, which has been air-launched successfully both from SAC B-52 and B-57 bombers, is designed to confuse the enemy air defenses.

Under contract to ARDC, Winzen Research Corp. of Minneapolis, Minn., and Goodyear Aircraft Corp. have photographed a conventional radar at an altitude of 100,000 feet. Suspended from a two-million-cubic-foot free balloon, an unmanned pressure-sealed gondola housed a radar unit and associated automatic controls and instruments, including a programming device that periodically changed the radar settings. An externally mounted camera took aerial photographs, for position indicating. The gondola was recovered after it floated to earth under a forty-foot parachute. The same package will be used for the other two flights called for under the present USAF contract.



The Westover Yankee Flyer, entry of the Strategic Air Command, has won first-place honors among Class IV publications in the annual USAF newspaper award contest. Class IV is composed of papers at bases with more than 10,000 people. Other first-place winners were: Class III (5,000 to 10,000), Ramstein Ramjet, Ramstein AB, Germany; Class II (1,000 to 5,000), the Greenham Herald, RAF Station (SAC), Greenham, England; Class I (up to 1,000), Space Sentinel, Beale AFB, Calif. In Class V, for papers published by commands and serving more than one base, the winner was the ARDC Newsreview, published by the Air Research and Development Command.

On February 1, 1959, the RCAF took over responsibility for the DEW Line stations in Canada. The US government had been authorized by Canada to establish operational DEW Line stations in Canada with the understanding that the situation would be reviewed as con-

(Continued on page 25)

CESSNA U-3A



**Now on duty
to save money
for the
Air Force**

The Cessna U-3A 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 U-3A 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 U-3A makes substantial savings for the U. S. A. F. Cessna Aircraft Co., Wichita, Kansas.

Cessna

Inquire today about the rewarding future your Air Force offers you



The Site of AFA's 1959

AEROSPACE PANORAMA

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

THE above photographs feature Miami Beach's new multimillion-dollar Exhibition Hall, site of Air Force Association's 1959 Aerospace Panorama. The building to the left of, and connecting with, the Exhibition Hall is the Miami Beach Auditorium, where various meetings and briefings during the AFA Convention will be held.

To date, nearly 100 major companies have reserved eighty-five percent of the exhibit space at the Panorama—the largest annual display of defense weapons and equipment in the nation. Companies desiring to exhibit in the Panorama should apply for space as soon as possible to be assured participation. Last year,

in Dallas, a number of companies had to be turned away.

The large photograph also shows a section of Miami Beach's ocean front and several of AFA's official Convention hotels. You will note that each hotel has its own private section of beach, as well as a swimming pool. Although the Beach boasts more than 300 hotels, AFA has selected only twenty-one of them—all located between the Auditorium and Exhibition Hall, at 17th Street, and the Montmartre Hotel, at 46th Street, furthest from the Auditorium and Exhibition Hall.

See page 121 for a complete list of AFA hotels, rates, and reservation form.

ditions changed. The establishment of NORAD made it possible for the Canadians to assume the responsibility for manning these stations. RCAF officers will replace USAF officers as they are trained in DEW Line operations. A USAF officer will be stationed at each main position for liaison between the USAF and the civilian contractors who provide logistic support to the DEW stations.

Brig Gen. William L. Fagg, who retired as Provost Marshal of USAF last December, has been appointed executive director of the American Society for Industrial Security, which has headquarters in Washington, D.C.

George H. Haddock, forty-nine, associate editor of *Nation's Business*, died in Washington, D.C., on January 18. Mr. Haddock was born in Belle Vernon, Pa., and was graduated with a B.A. from the University of West Virginia. He was a reporter for the *Washington Evening Star* from 1938 until the outbreak of World War II, when he became a member of the public relations and policy unit of the Air Forces, the outfit responsible for the wartime *AIR FORCE Magazine*. He left the service in 1945 with the rank of lieutenant colonel to become an executive assistant with the National Association of Manufacturers and in 1946 was one of the original staff members of the Air Force Association. He served AFA as treasurer and was a member of the Board of Directors. Mr. Haddock joined *Nation's Business*, the magazine of the US Chamber of Commerce, in 1949, becoming associate editor in 1954.

STAFF CHANGES. . . . **Brig. Gen. Richard L. Bohannon**, who was Surgeon, Fifth AF, PACAF, APO 953, San Francisco, Calif., has been assigned as Command Surgeon, Hq. PACAF, APO 953, San Francisco. . . . **Brig. Gen. Loren G. McCollum**, Hq. ARDC, Andrews AFB, Md., with duty station at Laurence G. Hanscom Field, Bedford, Mass., has moved up from Deputy Comdr for Programming, to Vice Comdr, Air Defense Systems Integration Division.

At Ent AFB, Colorado Springs, Colo., **Maj. Gen. Harvey T. Alness**, who was DCS/Plans and Operations, Hq. Continental Air Defense Command, and DCS/Plans and Operations, Hq. North American Air Defense Command, has become Vice Chief of Staff, Hq. NORAD and CONAD. . . . **Brig. Gen. Edward N. Backus**, Comdr, 35th AD (Defense), ADC, and Comdr, 35th NORAD and CONAD Division, Dobbins AFB, Ga., has been assigned as Comdr, 32d AD (SAGE) and 32d NORAD and CONAD Division, at the same base.

Brig. Gen. Christian F. Dreyer, Deputy Director of Installations, DCS/Operations, Hq. USAF, Wash., D.C., was relieved of additional duty as Deputy Director for Real Property in that office. The new Deputy Director for Real Property is **Brig. Gen. Robert H. Curtin**.

Brig. Gen. Robert W. Hall, formerly Director, Military Personnel Policy Division, Office of the Assistant Secretary of Defense (Manpower, Personnel, and Reserve), has become Deputy Director of Plans, J-3, US European Command, APO 128, New York, N.Y. . . . The new Director of the Logistics Division, J-4, US European Command, is **Maj. Gen. Albert G. Hewitt**, who was Director of Maintenance-Engineering, DCS/Materiel, Hq. USAF, Wash., D.C.

Brig. Gen. Haskell E. Neal has been relieved from duty as Comdr, European-African-Middle Eastern Airways and Air Communications Service Area, MATS, APO 633, New York, N.Y., to become Comdr, Ground Electronics Engineering Installation Agency, AMC, Griffis AFB, N.Y. . . .



Secretary of the Air Force James H. Douglas presents the exceptional civilian service award to David S. Smith, Assistant SAF for Manpower, Personnel, Reserve, 1954-59.



Secretary Douglas honors Dudley C. Sharp, Assistant SAF for Materiel from August 1955 to January 1959, with the highest USAF civilian award, for his exceptional service.



General Edwin W. Rawlings, Commander of AMC at Wright-Patterson AFB, Dayton, Ohio, for the past seven years, retired in February after thirty years' service. The Air Force estimates he was responsible for spending about \$87 billion of US money during his career in military management.

Brig. Gen. John W. Carpenter, III, who was Assistant Vice Comdr and Director of Plans and Programming, Hq. ARDC, Andrews AFB, Md., has become Comdr, AF Flight Test Center, ARDC, Edwards AFB, Calif.

RETIRED: **Maj. Gen. Alvin R. Luedecke**, **Maj. Gen. Thetus C. Odom**, **Brig. Gen. Glynne M. Jones**, **Brig. Gen. William L. Fagg**, **Brig. Gen. Lawrence M. Guyer**, **Brig. Gen. Herman A. Schmid**, **Brig. Gen. John E. Murray**, **Maj. Gen. George R. Acheson**.

—MICHAEL B. MILLER



There's a new kind of airplane ahead for America's new generation of pilots

Gramp raced through the skies at nearly 100 miles an hour. He flew his fabric-covered biplane by the seat of his pants and the wind in his face.

Some twenty years later, his son flew a P-51 Mustang at better than 400 mph...later on flew a Sabre Jet that approached the speed of sound. There were more dials to watch, more controls to work, till he wondered if airplane designers hadn't reached the limit of human capacity.

Today's Air Force pilots can look forward to piloting a new kind of airplane. It will fly more than 2,000 miles an hour...carry an electronic crew to navigate, find targets, fire weapons, evade attack. Most significantly, its pilot will have as much time as Gramp did to do what man does best: make decisions.

For though machines can see farther, figure faster, and react quicker than men, they cannot cope with the unexpected—nor can they be recalled or redirected. That is why America needs the judgment of men as well as the automatic deadliness of missiles. Her deterrent power will always depend on building the most advanced manned and unmanned weapon systems—and keeping them ready for action.

Three times the speed of sound

North American is now at work on two Mach 3 airplanes for tomorrow's Air Force—the B-70 bomber for the Strategic Air Command and the F-108 interceptor for the Air Defense Command.

The B-70 will skirt the edge of Space to any target

on earth—*flying every mile of the way at more than 2000 mph.* It will carry the most advanced weapons, including missiles it can launch hundreds of miles from ground defenses or primary targets—plus countermeasures against enemy attack.

The F-108 will be able to detect and identify incoming airborne weapons—manned or unmanned—over 1000 miles from our shores...and destroy them.

These manned weapon systems will give true depth and flexibility to our nation's deterrent power.

Mobilizing America's best for the job

North American, as weapon system manager for the B-70 and F-108, has been charged with complete scientific, engineering, and administrative responsibility. To enlist the best brains and specialized skills of American industry, North American has divided each airplane into major subsystems, which are being awarded to the contractors best qualified to handle them.

Though these projects are among the most important ever entrusted to one company, North American's knack for turning revolutionary concepts into revolutionary airplanes is a matter of record. Time and again, North American's designers and engineers have exceeded expected performance—yet made the new airplane practical to build, fly, maintain. This sure hand—result of building more aircraft than any other company in the world—has created more air power for fewer tax dollars.

THESE FAMOUS AIRPLANES WERE READY WHEN AMERICA NEEDED THEM



Subsonic P-51 Mustang—did valiant service in World War II.



Transonic F-86 Sabre Jet—drove the MIGs from the skies of Korea.



Supersonic F-100 Super Sabre—mainstay of the Free World's fighter strength.



Hypersonic X-15—soon to carry the first American to the fringes of space.

THE LOS ANGELES DIVISION OF NORTH AMERICAN AVIATION, INC.



...speaking of

Missile Ground Support

MOBILITY

WE PROVIDE SINGLE RESPONSIBILITY

FOR ANY SIZE PROJECT

Whether it is highly complex missile surface handling equipment, like the giant FMC-designed Thor transporter-erector and launching base—or small, compact mobile missile equipment, FMC provides complete capabilities with fully integrated facilities for the entire project. Coordinated control of each phase of the job from design concept through development, engineering and production, enables FMC to meet contract delivery requirements—on schedule.

FMC's extensive experience gained in the field of mobile equipment stems from over 17 years in designing and building more types of military-standardized tracked vehicles than any other company in America. Applied to missile ground support programs, this ability can provide the answer to your mobile or fixed equipment requirements, with important time and cost-saving economies.

To assure fully coordinated development and delivery of missile ground support equipment, consult with FMC at the initial stage of project planning.

Creative Engineers: Find stimulating challenge at FMC's Ordnance Division.

THOR transporter-erector, launching base and power trailer delivered by FMC in just eight months—2 months ahead of schedule—receives operational check-out.

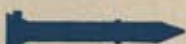
U.S. AIR FORCE PHOTO

HERE IS FMC'S PROFILE OF EXPERIENCE:



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Tracked prime mover



BOMARC

Erector-launcher and
Decontamination system



NIKE- HERCULES

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Transporter-erector and
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Ordnance Division

Missile Equipment Section 5-C
1105 COLEMAN AVENUE, SAN JOSE, CALIF.



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.

The Soviet defense budget continues to go deceptively down in terms of over-all Russian spending. Direct allocations to defense in 1958 totaled 96.3 billion rubles, or 15.3 percent of the over-all Soviet budget. In 1959 the figure is 96.1 billion rubles, or 13.6 percent of the total.

But the money-is-no-object Soviet Academy of Sciences, which was behind the Sputniks and conducts research and development in advanced metallurgy, fuels, and atomic power, is not included in the Soviet defense budget. Its work is classified under "Grant to National Economy" in the semantics-ridden Soviet budget—and this item went from 257.3 billion rubles in 1958 to 308.9 billion rubles in 1959.

• • •

Look for Russia to show a new delta-wing bomber to the outside world almost any time. The airplane has been on test for over a year. One trouble has been that it won't perform as well as the Convair B-58 Hustler, and the Soviet Air Force is especially touchy on such matters these days. "Second best" is an extremely embarrassing position at present in a nation emotionally geared to the Academy of Sciences' Sputnik/Lunik performance.

• • •

Czechoslovakia is conducting an all-out campaign to sell aircraft to western countries. Especially being pushed are a twin-engine executive transport and a single-engine agricultural-type airplane. In each case performance is good and the price is low.

Similarly, look for East Germany to offer aircraft of its own manufacture for sale later this year. East Germany now is producing its own jet transport. West Germany still is restricted by the western powers from going all-out to build its aircraft industry.

In addition, East Germany now is working on a turbo-prop transport to be rolled out sometime this year. The aircraft and engine are said to be of original East German design, not Russian copies or derivations.

• • •

When Khrushchev again denounced booted "anti-Party" bigwigs in Moscow a few weeks ago, he mentioned everyone of importance who opposed him except Georgi Zhukov, former commander in chief of the Soviet armed forces. It may be that Khrushchev still fears what could happen if he got into a running fight with the powerful armed services, which remain a little fed up with both the Party and the government in a carry-over from wartime experiences.

• • •

It is now widely confirmed that the Russians are not yet ready to launch their atomic-powered airplane. Actual construction got under way about two years ago, but the Soviets have had some problems—particularly with the reactor. The plane took headlines in this country late last year with a report that it had been test flown.

• • •

Red designers still aren't achieving truly high altitudes with their jet-powered aircraft. They have made about 70,000 feet with the aid of supplemental rockets, but for

the most part Soviet fighters are ceiling-limited to around 60,000 feet with 55,000 feet far more common. There appears to have been little basic improvement in the altitude performance of Soviet aircraft since the lightweight MIG-15, which is equipped with an old-fashioned centrifugal-type turbojet.

Basic Soviet turbojet engine for fighters is patterned after the M-209 and AM-3 found in the TU-104. This engine is large, heavy, and fuel-hungry. Russia has been less successful in producing a bypass engine than the British, whose Rolls-Royce Conway offers moderate advantages over the conventional axial-flow turbojet—including lower fuel consumption. There is no indication that the Russians have taken up the aft-fan type engine such as General Electric developed in its commercial CJ-805-21. This employs the turbo-fan principle except that the fan is on the rear instead of the front.

• • •

Red China has begun a new buildup of its paratroop forces. Recently Peiping displayed a twin-engine transport said to be a product of Chinese development. It was patterned after the Russian IL-12, which is used by the Red Army to haul paratroopers. The Russians have several hundred IL-12 transports, most of them fitted out for the airborne infantrymen. The Red Chinese seem to be following the Russian model fairly closely in terms of equipment, training, and organization of the paratroop units.

• • •

More Russian MIG-17s are being equipped with all-weather radar. The unit is installed in the plane's nose as part of the center body of the intake and on the upper lip of the intake. MIG-17s are replacing MIG-15s fairly generally in the satellite countries; MIG-21s are also beginning to appear there.

• • •

Top Russian research projects during the next several years include nuclear power, work with rare elements and new alloys that could be useful in aircraft or rockets, and development of semiconductors for communications equipment. Along with further space rockets and artificial satellites, the Soviets plan to develop powerful optical and radio instruments for space study.

• • •

Long-heralded, the Communist-dominated countries have begun jet service into the Middle East—Prague to Cairo—on a once-per-week schedule. The Czechs are flying the route, using TU-104As.

• • •

IL-18 turboprop transports, which closely resemble the Lockheed Electra, are being used in freight service in Russia in a field-testing exercise before the aircraft goes into regular passenger service late this year or early next.

Though they have tried, the Russians have sold no TU-104s to other countries, with the one exception Czechoslovakia. Watch for the Reds to make a new attempt with the IL-18, which promises to be quite competitive with western-type aircraft of the same general configuration and powerplant.—END

How Partisan Can You Get?

To the surprise of practically everyone, Senator Stuart Symington was the recent victim of a partisan attack that described him as a "failure" as Secretary of the Air Force during the Truman Administration. Following is a pointed editorial from the Washington Evening Star for January 19 commenting on that ill-founded charge, and pointing up the fact that it took the Korean War to prove how right the then Secretary had been in his crusade.

THE FINE art of distorting the truth is so highly developed and so diligently practiced in this Capital City that one tends to become a bit bored with it all. Most of these efforts evoke little more than a ho-hum reaction. But the latest Republican blast against Senator Stuart Symington is a thing apart. It soars to such heights of massive misrepresentation as to compel a sort of grudging, though perverse, admiration.

This masterpiece of deceit appears in something called "Battle Line," published by the Republican National Committee. Its thesis is that Senator Symington was a "failure" when he served as Secretary of the Air Force from 1947 to 1950—a conclusion which is "documented" by a fantastic assortment of quotations lifted out of context and by utterly irrelevant statistics. The obvious purpose of this partisan shot is to discredit the Missouri Democrat as a defense expert and to downgrade him as a prospective Democratic presidential nominee in 1960. If Mr. Symington was a dud as Secretary of the Air Force in the late forties, argues "Battle Line," why take him seriously now as a critic of the current defense effort?

It is not part of our purpose to plead the case for Senator Symington as a Democratic presidential aspirant or as a

competent critic of the 1959 defense program. This is a political matter in which there is plenty of room for difference of opinion. It is simply not true, however, that Mr. Symington was a "failure" as Secretary of the Air Force, and somebody should say so. The real truth is, and the record proves it, that Mr. Symington, in the bleak years from 1947 to 1950, had the courage to stand up and fight for adequate airpower for the United States. He did this in the face of the popular but gravely harmful defense "economy" program dictated by President Truman and cheerfully accepted by most of the country. He did it knowing that he was risking his own career in government, and we cannot recall the name of even one Republican politician who stood up and fought with him.

This is not to say that the Symington efforts met with any great success. He was able to persuade Congress to appropriate funds for a somewhat stronger Air Force, but this came to nothing when Mr. Truman impounded the money. The point is, however, that Mr. Symington was fighting for more airpower before, and not after, the Korean War revealed to everyone how weak we really were.

The truth-twisters who drafted this phony "Battle Line" report for the GOP ought to go back and read the report of Air Secretary Symington in January, 1949—a year and a half before the Korean War. This report urged the "vital necessity" of strengthening our air arm before war broke and warned that this country had "none too much time to provide itself with the means of its own protection."

These were not the words of a man who was a "failure" as Secretary of the Air Force. And we hope that this disingenuous Republican effort to take advantage of short memories will come to nothing.

A Policy of Planned Inferiority?

BY STUDYING testimony by the Defense Department leaders as scholars study the Bible, you can now discover the strange mainsprings of the Eisenhower Administration's decision to accept inferiority to the Soviets in ballistic missiles.

The clue to the mystery lies in budget pressures, plus the great difference between the liquid-fueled missiles of the first generation and the solid-fueled missiles of the next generation.

In brief, liquid-fueled ballistic missiles cannot be kept fully ready to fire. Their minimum "reaction time" is a quarter of an hour or rather more. Even by maintaining a costly fuel-alert, in other words, these missiles cannot be fired within less than fifteen minutes of the first warning of the enemy's attack. Because of the same fueling problem, bases for these missiles are also very costly. The expense is further increased by a wide margin if the bases are "hardened" in order to protect the missiles on their pads against anything but a direct hit.

These characteristics make liquid-fueled IRBMs and ICBMs much more suitable for a nation that can attack first and by surprise, like the Soviet Union, than for a nation like the United States that has vowed not to attack first. If the necessary money is spent to disperse and "harden" the launching sites, liquid-fueled Atlases and Titans in sufficient quantity can certainly even up the ICBM balance between this country and the Soviet Union. But Atlas and Titan are interim weapons, which will certainly have to be replaced as soon as possible.

The planned replacement is the solid-fueled Minuteman missile. Minuteman will hardly be able to carry as powerful a warhead as the more powerful liquid-fueled Atlas and Titan. But the solid-fueled Minuteman missiles will be cheap to produce in quantity. Having built-in fuel, they will have zero "reaction time" and their launching sites can even be made mobile, for greater protection.

For the United States, therefore, the second generation of ICBMs is immensely preferable to the first generation,

except for one tiny fact, Atlas missiles can be obtained now, and Titan missiles can be obtained soon. Minuteman missiles, in contrast, will hardly be available in operational quantities until five years from now, and the delay may be considerably greater than this.

All these facts are so important because the Eisenhower Defense Department has never been able to get used to the idea of disposable weapons. This is certainly odd in a country that invented the disposable facial tissue, and in a Defense Department reshaped and still dominated by that great man, Charles E. Wilson, who is such a strong advocate of the disposable automobile. Nonetheless, Wilson also rebelled, and his successor, Neil H. McElroy, still rebels against the basic need to maintain force in being by purchasing weapons now that will have to be replaced later.

This being the psychology, the Defense Department is buying very few liquid-fueled missiles now, and waiting to buy a lot of solid-fueled missiles later. The result, inevitably, is acceptance of heavy inferiority in missile striking power, at least until the distant date when the Minuteman missile will become available in quantity.

This lighthearted treatment of the "missile gap" has in turn been justified by two devices which would cost the greatest executive his job, if he used them while still in private business. In the first place, the "missile gap" has been made to seem very much less dangerous, by com-

fortably downgrading the opposition. To be sure, the comfort of General Motors would not be long-lasting if GM production and pricing policies were based on the belief that the people over at Ford Motor were a bunch of slack-twisted incompetents. But this is the best parallel for the Defense Department method of judging Soviet missile capabilities.

In the second place, the dangers of the "missile gap" have been further obscured by the simple act of cooking the defense balance sheet. The comparatively useless IRBMs being sent to our NATO allies are counted on the balance sheet as major assets, the far more numerous and immeasurably more useful Soviet IRBMs are not counted at all; or, if reluctantly mentioned under senatorial pressure, the Soviet IRBMs are not put down on the debit side of the balance sheet. Other examples of this interesting practice might also be cited.

If American newspapers would print something comparable to the grimmest Biblical commentary, chapter and verse could also be cited to prove all the foregoing that may seem incredible. But for present purposes, this is commentary enough on the McElroy gospel. It remains to examine the risk, the allegedly "calculated risk" to which the McElroy gospel exposes the US and the free world.

—Joseph Alsop's "Matter of Fact" column for February 2, Copyright 1959, New York Herald Tribune, Inc., reprinted with permission.

Repeating Some Unhappy History

THE testimony of Secretary McElroy and other defense officials about the country's missile preparedness would be more impressive if there were not unhappy memories of very similar arguments nearly a decade ago. For budgetary reasons the Administration is proposing a missile program that in future numbers will fall far behind the Soviet capability, with the explanation that a balance of delivery methods will assure American superiority. Much the same sort of case was made for the \$12.5 billion defense budget on the eve of the Korean War.

Now, to be sure, there is a vast difference between a \$12.5 billion budget and the \$41 billion proposed for the next fiscal year. A number of able and sincere men have devoted their energies to weighing the various demands in the budget. They would not consciously sell the country short. Moreover, there is good evidence that American missile development, as contrasted with quantity production, is coming along well, even ahead of schedule. It is reassuring to learn that funds have been released to permit maximum work on the Air Force solid-fuel Minuteman—though why this fact could not have been disclosed earlier is an unanswered question.

But fundamentally the defense program remains a big gamble. The validity of the decision to accept a possible three-to-one numerical lag behind the Soviet Union in intercontinental missiles depends upon the assumption that other means of delivery—intermediate missiles and strategic bombers—would not be neutralized and would be adequate to break through enemy defenses in the event of war. There seems to be a concerted effort to play down intelligence estimates of Soviet capabilities, particularly in intermediate missiles; and there seems to be an accompanying tendency to discount possible improvement of Soviet defenses. Recent history is unfortunately replete with instances in which this country has underestimated the Soviet Union.

Obviously it would be presumptuous to say that one

fixed sum would assure an adequate defense program and that anything short of it would be insufficient. The military power of the United States will be formidable by any analysis. Nevertheless, there is serious question whether a decision not to keep pace with the Soviet Union in certain basic elements of strength—plus the lack of any conspicuous effort to build up limited war forces—might not diminish the effectiveness of the deterrent and invite enemy risk-taking in the future.

Some of this apprehension is detectable in the statements of members of the Joint Chiefs of Staff. Whereas the Chiefs agree that funds are sufficient for the next year, each member seems to have a reservation about the future. The cumulative effect of the failure now to provide for replacement of ships and planes and for modernization of the Army could sap future effectiveness. It is impossible to avoid the conclusion that security is being shaped to budgetary edicts. . . .

If the Administration were investing heavily in other items related to the over-all struggle, there might be some justification for added risks in defense. A strong case can be made that, provided that the basic deterrent is maintained, the most pressing challenge is in economic development for the emergent countries of Asia, Africa, and Latin America. But here too budgetary myopia afflicts the program.

It would be wrong to accuse the Administration of lack of faith. It has altogether too much faith of the wrong kind—a sort of Micawberish hope that something will turn up and things will come out all right. What is lacking is another kind of faith—faith in the maturity of the American people to accept the hard facts of the challenge and willingness to respond to leadership in approving the measures, including more taxes if necessary, to assure that the country will do what it is capable of doing.

—Editorial in the Washington Post and Times Herald of February 2, reprinted with permission.

Using Yesterday's Strategy Tomorrow

"Where there is no vision, the people perish."—PROVERBS: 29:18.

I AM writing this just after reading a "think piece" by a loyal Navy admiral in which he practically reads our dear old Strategic Air Command right out of any up-and-coming World War III, when-and-if!

You'd never guess who this gentleman in blue-and-gold has nominated to carry the brunt of the fighting—not to mention the lion's share of appropriations handed out by Congress—in the future, now would you?

(Any of my readers who might pinpoint the admiral's home service may proceed to the head of the class).

Well, it seems that SAC's "massive deterrent" has become almost too massive by this time and, according to the latest thinking of the hour, we are all stalemated up with nowhere to go except perhaps some little "brushfires" to fight here and there around the periphery of the Soviet Union in the days ahead of us. And these, according to the admiral, are likely to be much too small to risk fighting with SAC's "Sunday punch." Might trigger off a real war!

After wading through this fine old sea dog's very competent and highly professional article—although I did not agree in this case with his conclusions—I had to admire his proficient presentation of his material. Essentially it centered around an increased reliance upon Army, Navy, and Marine units over SAC in the future. The admiral cited presently projected naval plans to build a "modern fleet of fourteen large aircraft carriers in which nine World War II ships are being replaced by the six new Saratoga-type carriers and eventually by atomic-powered carriers."

This lets the cat pretty well out of the bag. What is apparently now being envisaged by conventional-arms people in the armed services is nothing less than a reversion back to the obsolescent "triphibious" concept of warfare with which we fought—and won—the last world war. But how about the next?

If given their way the triphibious advocates would completely reverse the present trend of monetary allocations to the services which presently accounts for the Air Force being in line to obtain approximately eighteen billions of dollars as against a residue of twenty-four billions left in the military budget—the latter to be divided among Army, Navy, and Marines.

The admiral suggested that "twenty percent of the annual defense budget," or approximately eight billions of dollars,

would be quite enough for our Strategic Air Force. With this I must respectfully disagree with the accomplished naval authority, even if he is one of my favorite foreign correspondents. I admire his astute analyses of the European situation on nearly all occasions—but I would be less than honest if I pretended to buy his brushoff of SAC in our future plans to deter Red aggression and win the next war if it comes.

In the first place, modern science may have already done much more than is generally realized to outmode these proposed "fourteen new aircraft carriers," atomic or not, before they are even launched—and we have only to look aloft in the heavens to understand the reason why. The main argument advanced in the past for our "floating air fields at sea" was that they were highly mobile landing platforms which—because of this very desirable mobility—presented an extremely elusive target and one as hard to locate as the proverbial needle in a haystack.

This was true enough before the advent of rocket-driven space satellites hurled aloft which carry scanning devices, such as television cameras, in their long list of new, electronic equipment. There are already some reports to the effect that the Russians may quite likely have such a reconnaissance satellite in orbit above us at this time. . . .

At any rate, such items of celestial hardware are being very much talked about at this time and it will not likely be much longer before both global contestants will have them sailing overhead in rapid order. And it is only a short hop-step-and-jump from having reconnaissance satellites aloft and thereafter being able to relay coded information electronically to guided missiles in flight, which will enable them to ultimately zero in on any type of surface vessel afloat.

Submarines, of course, are another matter and much more difficult to destroy with present equipment on hand or in the contemplative stage; electronics still has a far way to go to become completely effective in underwater regions, as yet.

But I wouldn't give a plugged nickel for the chances of any surface ships in the next war to stay above water for long, what with reconnaissance satellites in orbit overhead. Would you?

—The foregoing, by George Todt, appeared originally in the *San Fernando Valley, Calif., Valley Times* for January 17, and is reprinted with permission.

Logistics Without Wheelbarrows

The following is excerpted from the last letter the editors of AIR FORCE/SPACE DIGEST received from the late Maj. Gen. Clements McMullen before his death on January 9. General McMullen was an outstanding thinker and doer in the long-neglected field of air logistics, and we think his views are worth preserving.—THE EDITORS

IT IS my belief that everybody runs away from modern logistics because no one understands it. I think I discussed with you about four years ago the fact that we could convert obsolete B-36s into C-99s for about \$500,000 per airplane. Such a conversion would equip us with a \$3 million logistic-support airplane. I discussed this problem with everyone who had anything to do with the procurement of airplanes. . . .

Today the old C-99 is in salvage. In 1953, entirely upon my own, I sent the biggest load of air freight to Europe with the C-99 that has ever been transported by air over the Atlantic. You must recall that the C-99 was designed and its manufacture started in 1941 when it looked like Hitler would take England and we would have to support our troops by air. It was a wonderful conception. I admit that, with knowledge extant on the manufacture of aircraft, C-99s converted from B-36s today would look like and perform like obsolete or obsolescent airplanes. Howsoever, any small positive is better than zero or a negative. We are presently in a completely negative condition. Recall also that we had invested about \$1 billion in B-36s and their supporting maintenance parts. Additionally, each time a B-52 is taken into a squadron, nine experienced Air

Force personnel are excess to the manning of that B-52 since the crew of a B-52 is five and the crew of a B-36 is fourteen.

A logistic C-99 needs a crew of seven people provided there are enough people stationed along its logistical route to give the ground support at its essential stops. Since I operated only one C-99, I had built into the aircraft 5,000 pounds of crew-comfort equipment and always manned the aircraft with sufficient people to take care of ground repairs when it landed at its objective. When I sent it to Europe, I sent along about 20,000 pounds of repair parts in addition to the 65,000 pounds of payload to ensure the airplane would be taken care of at each place it stopped. A hundred such aircraft would cost us \$50 million. They would be worth \$300 million or maybe \$50 billion if we went to war at the present time because we surely can't support air logistically any Air Force operation with the wheelbarrows with which we are now equipped.

Just as essential to the air logistic flying equipment is the air logistic ground organization. It does no good to rush equipment to a place if personnel are not available for properly unloading the aircraft. The C-99 was disapproved by inexperienced top people because they said its holds were inefficiently arranged. Along with two Mexican laborers, the operator of a tug towing a line of flats, and an engineer inside of the airplane to operate the electric hoist equipment, I have unloaded, myself, forty tons of air freight in thirty minutes. If I can do it, anybody can do it because mostly I sit on the ground with my hands in my pockets. . . .

With all of the handicaps of operating an experimental airplane, we still moved freight in the C-99 at around twelve cents per ton mile. I had both American Airlines and Braniff Airways cost out the operation and made charges against my operation in the same manner they would. This was a marvelous performance.

A Missile Wife's Diary

A SAC wife here sets down her tearful, cheerful impressions immediately after watching the first pure-Air Force Thor missile head out over the blue Pacific from Vandenberg AFB, Calif.

The launch took place last December 16, an historic day for Air Force missilery. The USAF's 1st Missile Division christened the new SAC missile installation at Vandenberg with a successful 1,500-mile Thor shot. It was the first time that a regular Air Force crew, rather than a special scientific team, conducted a missile firing.

The Thor blasted its fiery trail into space at 1543 hours that afternoon after delays totaling three-and-a-half hours caused by technical difficulties.

Julie Easton, who wrote the following when she returned home from watching the launch, is the wife of Col. John J. Easton, commander of the 576th Strategic Missile Squadron (Atlas) of SAC's 1st Missile Division.

NOW WE know. Now we know what it's about and why missilery has this fascination for those who come in contact with it. As our Thor soared today after hours of tense delay, tears and cheers came from Air Force wives bursting with pride.

This is why we're here. This is what our men have been training for. When it happens right in your own front yard, and your next-door neighbor is in the guidance building, and it's another neighbor's Thor squadron, and all the missile complex is manned by your friends' husbands—well, it's a lot different from reading about a launching at the Cape.

There'll be other launchings from our base, but there'll never be another to compare with this—our first—and nothing could unite a base any more than the community spirit that was in this first launching.

Everybody was pulling for us. From all the surrounding area folks who really hadn't been too interested in missiles before this time were among the first to wish for the success of this launch. The feeling in the air was contagious.

Since our security-trained men emulated clams, we learned about this launching in devious ways. None of us knew exactly when or where to station ourselves for the actual "bird-watch."

I was lucky. I received last-minute permission to watch with the working press from an 8,000-foot vantage point on the mesa. My local writeups of base women's activities qualified me for this privilege.

In case I am so lucky again I will go better prepared,

with lunch, knitting, and with low-heeled boots to wade in the sand.

I hope always, however, to feel just the same amount of faith that I had today that we would have a successful mission. Even though the waiting time did seem to drag and we wondered what was going on.

Watches were coordinated on each wrist and binoculars adjusted at each T-count.

"Look through these trees and you'll see Thor's protective shed move back and the missile rise into position," someone said.

Then the word came: "Holding."

So the wait continued. With all the squinting and peering, it almost seemed at points as if the trees themselves were taking off into outer space.

Between times like that people seemed to relax. But eyes were kept peeled toward the launch site. Expressions varied, some tense, some expectant, some tired. There was nowhere to go while standing by, except maybe to wade in the sand.

Miscellaneous thoughts floated through my mind as I sat in the wooden press bleachers through the afternoon. As an Air Force wife and mother, I kept thinking of all our many youngsters and their interest in this. I wondered if the children would have to walk home from school because we used their school buses to go out to the mesa.

I also wondered whether the noise and vibration from Thor would scare our little dog at home alone.

A mobile lunch wagon made the rounds for the second time late in the day and just as I had taken possession of a foot-long sandwich called a "Poor Boy," someone called, "T-minus-fourteen." With the sandwich in one hand and borrowed binoculars in the other, I turned my attention back to the area through the trees.

Then, Thor rose into position. Cloudy vapors wound around her as she was being fueled. It was hard to realize that those smoky fumes were actually nearly 300 degrees below freezing. Suddenly, with less noise than we'd expected, Thor proudly thundered into space—straight and true—farther than we could see.

There are few words to describe one's feelings at a first missile launching. It's an awesome sight for anyone, and, because SAC wives have always felt that SAC is theirs too, every wife at this base felt responsible for that missile.

Tears? Yes. Women cry when they're happy. Cheers? You bet. Peace is our husbands' profession and now we are really in business—the *First Missile Division*.—END

SHOOTING THE BREEZE

WITH THE EDITORS OF AIR FORCE MAGAZINE



How is a pilot's shape similar to Mother Earth's? Two revelations supplied the answer last month: Man and planet are both broader in the beam than hitherto believed.

Revelation one came from an Ohio sociologist, Dr. Everett Rogers, called in on two occasions to conduct Air Force surveys. His mission in each case was to supply warplane designers with a crucial statistic—the width of the average *derrière* among USAF pilots.

The first time around in 1942, he pursued his study with 10,000 subjects and came up with the mean figure of twenty-two inches. Now, seventeen years later, Dr. Rogers has been back for a second look and announces that the average has expanded by two inches to an even two feet, an even meaner figure.

Almost simultaneous with release of this information, which perhaps should have been classified for morale reasons, came revelation two, covering an even greater girth. The Vanguard satellite was reported to have sent back data indicating the world is *not* shaped like the grapefruit of familiar analogy but has more the dumpy, middle-aged look of a pear as it moves through space.

Earth and man—older and wider.



For all the news that's fit to print about USAF's 680th Aircraft Control and Warning Squadron, we'd like to recommend *The New Yaak Times*. Or if you'd like to know about Ladd AFB, Alaska, subscribe to the *Midnight Sun*. The *Space Sentinel* is not a reconnaissance satellite but a weekly published at SAC's Beale AFB, Calif.

These were some of the entries (*see cut, below*) in the USAF base and command publication contest, in which our Senior Editor, Claude Witze, was one of the five judges. Witze, who was impressed by the high standards of the fifteen prize winners, also brought back these names: the

Otis Notice, the Yankee Flyer, the Big Thunder. The *New Yaak Times*, incidentally, is published at Yaak, Mont.



USAF and the Southern Pacific Railroad have announced an agreement to keep missiles and trains from getting involved in each other's traffic patterns. Officers at Vandenberg AFB, SAC's first operational missile base (*see "Views and Comments"*), and railroad officials arrived at this arrangement of coordinating missile firings with passage of trains that skirt the base some 1,500 yards from launching pads:

The AF will endeavor to schedule firings not to conflict with eleven regular daily train runs. Local Southern Pacific officials will, in turn, inform the base of all unscheduled freight trains, about six of which pass through each day, and hold them until given an AF go-ahead.



An Air Force sergeant stationed on Baffin Island south of the Arctic Circle brought the age-old institution of the proxy marriage up to date early last month in a manner befitting his radar specialty. S/Sgt. Ollie J. Coe was many, many steps ahead of those married in the past with the aid of "stand-ins" because they couldn't be physically on hand themselves.

Coe, holding the radar line in the Far North, did it with electronics, marrying his Washington sweetheart, Edgie Eason, by short-wave radio. A Washington judge officiated, asking Coe the usual questions over the air waves while Miss Eason stood blushing before him in the nation's capital.

Coe, slated to come home in about six months, signed off sending "a billion, trillion kisses" to his bride—something of a divergence from the time-honored closing of "Roger. . . ."—END



Names chosen for USAF base newspapers reflect missions of the commands and geography—even of places like Yaak, Mont.



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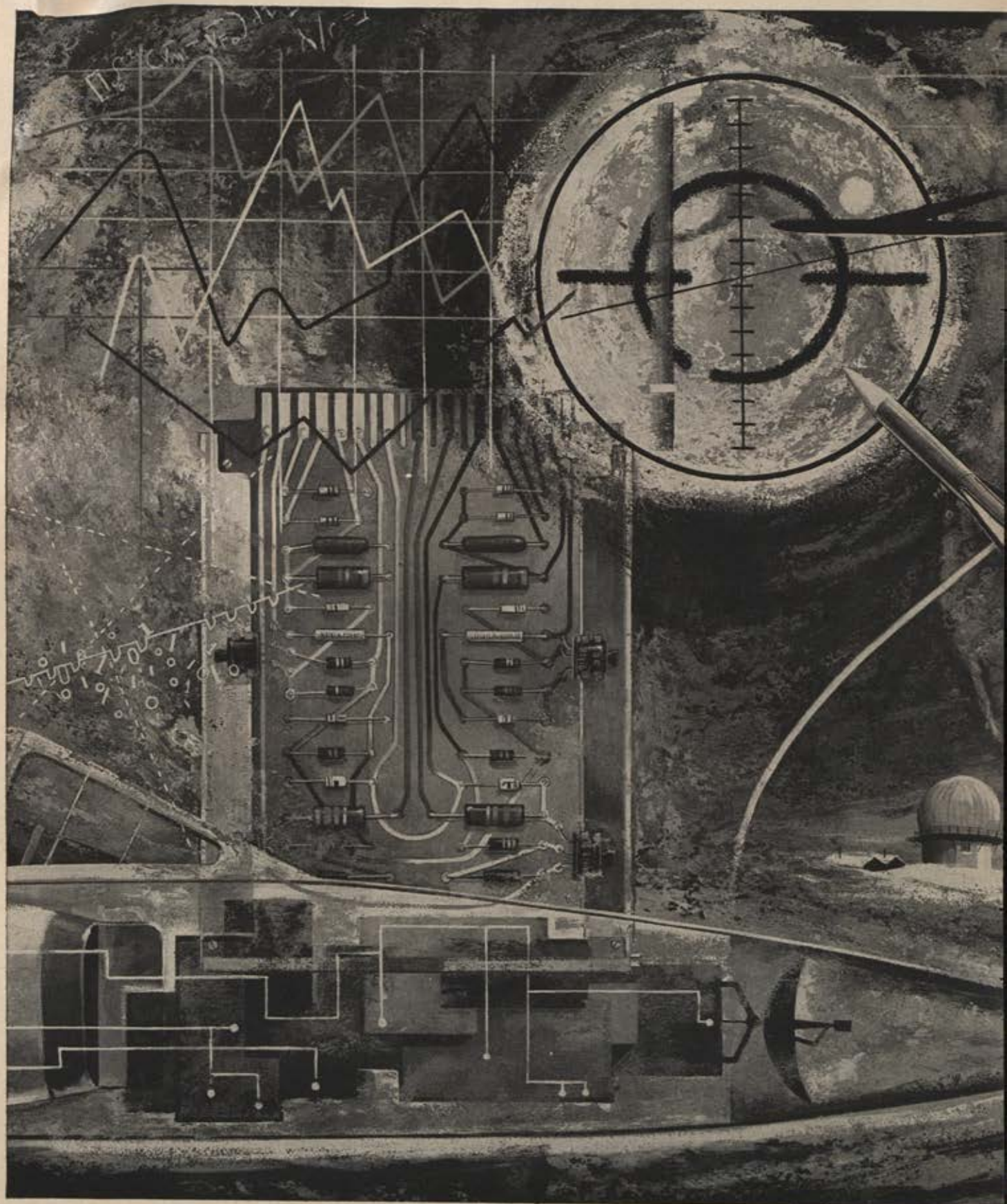
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What makes the



"weapons system concept" click?



Not so very long ago a plane was built to perform a single task—fly higher, faster or farther. If armament was necessary, guns or rockets were added. If a navigation or communications system was needed, these also were added.

No longer will that old approach work. The problems are too complex. The consequences are too severe. The timing is too critical. The electronics in the modern aircraft perform as vital a function as the carrier itself. In fact for many missions the plane is primarily a vehicle to transport the electronic systems.

To achieve the integration of these many elements into a single working unit is the "weapons system concept."

It takes competent TEAM MANAGEMENT to make this "weapons system concept" click!

Hughes has the experience and capability to manage a team of systems specialists. The Hughes MA-1 Integrated Electronic and Control System, combined with the Falcon air-to-

air guided missiles in the Convair F-106 all-weather interceptor, represents the first successful approach of this concept.

This Hughes system provides automatic mission control of all vital functions from take-off to touch-down. It provides automatic navigation, automatic flight control, automatic data link, automatic attack and weapon control and automatic landing system by Digitair, the first airborne application of a digital computer.

It took competent TEAM MANAGEMENT to make this "weapons system" click!

Over 6000 highly trained scientists and engineers provide the "think" at Hughes. They form the motivation behind the 30,000 Hughes people dedicating their efforts to the electronics "systems concept."

The experience of these people in the research, development, manufacturing and field service of advanced electronics systems makes Hughes ideally suited as an electronics weapons system team manager.

Creating a new world with ELECTRONICS

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AIR FORCE

MARCH 1959

HOUSING...

**one of USAF's
unsolved
problems**

WHERE WILL HE SLEEP TONIGHT?

John F. Loosbrock

EDITOR

THERE used to be a phrase to describe a man who had decided to make a career of the military service. We said, "He found a home in the Air Force." Or the Army. Or the Navy.

For a single man this might still be valid. But for the serviceman who wishes to exercise his God-given right to marry and raise a family in decent surroundings it's still a long way from being true. Adequate family housing is still the exception, rather than the rule. And there's no excuse for it. The amount of money involved is minute, compared to the vast sums ticketed for weapons, and the serviceman actually pays for it himself.

There are two reasons why the shortage of homes for Air Force families is not only foolish but dangerous. One is based on the military fact of life that the finest weapon systems in the world are but lifeless hunks of metal until they are vitalized by the brains and hands of men—men who are on the spot when needed, not in some shack an hour's drive or more away. The second reason is fiscal—that it makes little sense to invest half a billion dollars or more in a base and its weapons, with careful provision for the housing of aircraft, trucks, and typewriters, yet fail to risk the two percent or so additional that it would cost to house the high-priced men who man this costly gear.

Only recently I left Washington—with its buzzing talk of missile gaps, multibillion dollar budgets, and space cap-



sules—to get a firsthand look at why the Air Force desperately needs more homes for its families. I returned convinced that family housing, at the type of base I visited at least, is as much a part of the operational requirement, of the great deterrent if you will, as intercontinental ballistic missiles, hydrogen warheads, or supersonic interceptors.

We visited a segment of the so-called northern tier of bases, some still under construction. With a few exceptions, this northern tier was originally programmed to serve the Air Defense Command mission, housing SAGE installations and fighter-interceptor units to stop air attacks coming over the short and inviting polar route to the heartland of the United States. Even before some of the bases were completed, new programs threw on them the additional burden of housing bomber and tanker units of the Strategic Air Command, as part of SAC's policy of dispersing its units and thereby multiplying the number of targets the Soviets would have to take out in an initial attack.

This combination of missions—defense and attack—makes this northern chain of high strategic importance indeed. As of this writing, the very survival of this nation depends on how well they can do their job.

What does family housing have to do with all this? Plenty. Right now it is by far the weakest link in this all-important chain. At these bases and many others it is an

when completed, to house McDonnell F-101B interceptors for ADC and Boeing B-52 bombers and KC-135 tankers for SAC. By June 1962 it will have a complement of about 3,500 uniformed personnel and 300 civilian employees. Glasgow, Mont., population generously estimated at about 7,000 (last census showed 3,821), is the nearest town of any "size," and it is twenty miles away by a narrow, two-lane highway. On the half-hour ride into town we passed three farmhouses.

When the base is fully manned, it is estimated that almost 1,400 officers and airmen in the upper grades (the only ones now eligible by law for on-base housing) will need homes for their families. In addition, Air Force experience factors indicate that almost 600 airmen in the lower grades will want to bring their families to Glasgow.

Where will they live? On base now are 267 family housing units, built by the Army's Corps of Engineers under the military construction program by direct appropriation at an average cost of \$20,100 apiece. These are no bargain, even at the high construction costs prevalent in the area. A SAC first sergeant told me of a day when the tempera-

These three examples of where Air Force families are living today are for real. The first is occupied by an airman second class. He pays \$60 per month. The second is called home by a master sergeant—\$65 a month. Apartment in third is occupied by an airman second class—\$50 a month.



integral part of the operational requirement, part of what it takes to get the job done, not just "something nice to do for the boys."

On our northern swing we visited Kinross Air Force Base, twenty miles through the evergreen forests from Sault Ste. Marie, in upper Michigan; Grand Forks and Minot Air Force Bases, near the cities of the same names in North Dakota; Glasgow Air Force Base, Mont.; Malmstrom Air Force Base, outside Great Falls, Mont.; with a stop at Wright-Patterson Air Force Base, Dayton, Ohio, where SAC and ADC missions have been superimposed on the great complex of Headquarters, Air Materiel Command.

At each the problem was basically the same. The Air Defense Command operational requirement calls for its alert personnel to live not more than five miles or ten minutes from their duty station. SAC gives its people a little more time—ten miles or twenty minutes. At none of the bases visited was housing available off the base that met these time-distance criteria for more than a handful of people. And in some cases, not even for the handful.

Take the most dramatic example, Glasgow, scheduled,



ture was an even zero, with a forty-knot wind. He turned up the thermostat full blast but couldn't coax the temperature in his living room above sixty degrees.

Some 460 additional units are being built on the base under provisions of the Capehart-Rains Act (more on this later) with another 300 units hoped for but not yet approved. At best this adds up to 1,027 units, leaving a balance of nearly 1,000 families who will be unhoused.

According to the theory of the Department of Defense, which must approve Air Force housing programs, this balance must be absorbed by the local community. At Glasgow this is about like trying to stuff six pounds of sand into a five-pound bag. The civic leaders there are sympathetic and want to be helpful, but there is little they can do.

We chatted with them over coffee and cookies in a downtown cafe—the mayor, the president of the Chamber of Commerce, the bank president, the newspaper publisher, the superintendent of schools, the chairman of the housing committee. The latter, Mr. O. H. Bundy, explained the situation. Available local capital is just about enough to finance the normal expansion of the town—fifty to sixty

(Continued on following page)

family housing units per year. There is little or no hope of building privately financed rental housing on a speculative basis. When the base was first planned, for Air Defense Command units only, the town figured it could muddle through somehow. But when the SAC units were programmed in, as Mr. Bundy put it, "we got a bigger package than we bought."

And if, in a burst of wild optimism, one imagined that housing might become available overnight in Glasgow, it is still twenty miles and at least half an hour's driving time away under ideal weather conditions.

The only rational solution is to build housing on the base under Title VIII of the National Housing Act, called the Capehart-Rains Law from the senator and representative who cosponsored it. Briefly, the Capehart-Rains Law calls for housing to be built, under private contract with the lowest bidder, with the mortgage insured by the Federal Housing Administration and payment guaranteed by the military services. The contractor must obtain his own financing, and the mortgage payments are made from the rental allowances of the officers and airmen involved. The government isn't out of pocket unless the base is later closed, in which case it's holding the bag for an infinitely larger investment in the base facilities.

At the moment there are several reasons why this is only a partial answer. First of all, the Capehart-Rains Law expires at the end of the current fiscal year (June 30). It must be extended and probably will be by a friendly Congress. Second, current policies of the Department of Defense place a ceiling for on-base housing of fifty-five percent of the requirement at an average base and seventy-five percent at remote places like Glasgow—the balance to be absorbed by the local community.

What happens when the local community can't absorb this balance—or when there isn't even a local community within the time-distance criteria—is a question which the Defense Department answers with a figurative shrug.

Third, even a hundred percent fulfillment of the authorized requirement through Capehart-Rains housing leaves unanswered the problem of shelter for the families of married airmen of the four lower grades. These, while granted modest housing allowances, are presently not entitled to housing even on bases where it might be available. They must turn to local community resources, and the fact that their rental allowances are not high—in the \$60 to \$75 range—means that it isn't economically practical to build speculative rental housing for them. In most cases, they must leave their families somewhere else.

At some bases a partial solution is found in a provision of the law which permits the government to buy Wherry Act housing (built several years ago under different legislation) and renovate and remodel them. Unfortunately, Wherry housing, while it was welcome relief at the time it was built, was constructed under a price ceiling of \$11,000 per unit and after five years or so of occupancy much of it is marginal. And funds for rehabilitation have been forthcoming in only a few instances.

While Glasgow is more isolated than the other bases we visited, the general picture is about the same at all. Available local housing, except for a fortunate few, is either substandard, too expensive, too far away, or a combination of all three. At Minot I talked with an airman first class with ten years' service. He has five daughters. The baby shares a bedroom with him and his wife. The other four girls are crammed into another bedroom. At Great Falls the wife of a lieutenant colonel with almost twenty years' service told me they were anxiously waiting for their Capehart-Rains house to be finished.

"We go over and look at it every time we get a minute," she said. "It will be the first chance we've had to live like a colonel's family should be able to."

By July 1962, 1,100 families will need housing at Kinross AFB, Mich., 1,500 at Grand Forks, another 1,500 at Minot, 1,700 at Malmstrom. And so it goes.

Action is urgently required. While we accelerate our missile programs and make grand plans to put man into space, we must remember that even a spaceman has to come down some time, and when he does he'd like to have a decent home to head for.

What kind of action?

1. Extension of the present Capehart-Rains Law, with improvements if possible.

2. Legislation to make permanent the present quarters allowances for airmen in the four lower grades. The present allowances are a temporary measure, enacted to ease the financial burden for men recalled to duty in the Korean War. If the allowances were made permanent, then on-base housing could be programmed for these men.

3. Substandard, over-priced housing in adjacent communities must not be counted as an asset when programming housing needs.

4. Where the local community cannot provide adequate rental housing commensurate with quarters allowances, the Department of Defense ceiling for Capehart-Rains housing should be raised from seventy-five percent to ninety percent. (One hundred percent is not realistic since one simply cannot program that closely. The number of married men with families assigned to a given base will vary from the averages for the Air Force as a whole.)

5. Consideration of the housing problem on an individual basis, judging each base in terms of mission and location rather than clinging to unrealistic blanket criteria.

Of the above factors, most crucial is a change of heart on the part of a hitherto adamant Department of Defense. This year it cut a proposed 20,000-unit program for the Air Force down to 8,000 units, and thus far it has stubbornly resisted attempts to raise the ceiling at remote installations. One might almost think that the housing money was coming out of the personal funds of Defense officials, rather than out of the pockets of the airmen themselves.

One way to improve the present Capehart-Rains arrangement would be to adjust the cost limits so as to reflect varying construction costs in various parts of the country. The present law says that the average cost per unit in a Capehart-Rains project cannot be above \$16,500. This means that in high-cost areas, like the northern tier bases, the \$16,500 buys a minimum of house, since a big chunk must go for heating units, insulation, basements, and the general high cost of shipping in materials from long distances. On the other hand, the same amount of money in Florida buys a good deal more.

Another improvement would be to set aside, where possible, a little of the Capehart-Rains money to be spent on the kind of facilities provided by the average community—playgrounds, baseball diamonds, tennis courts, a community building for youth activities.

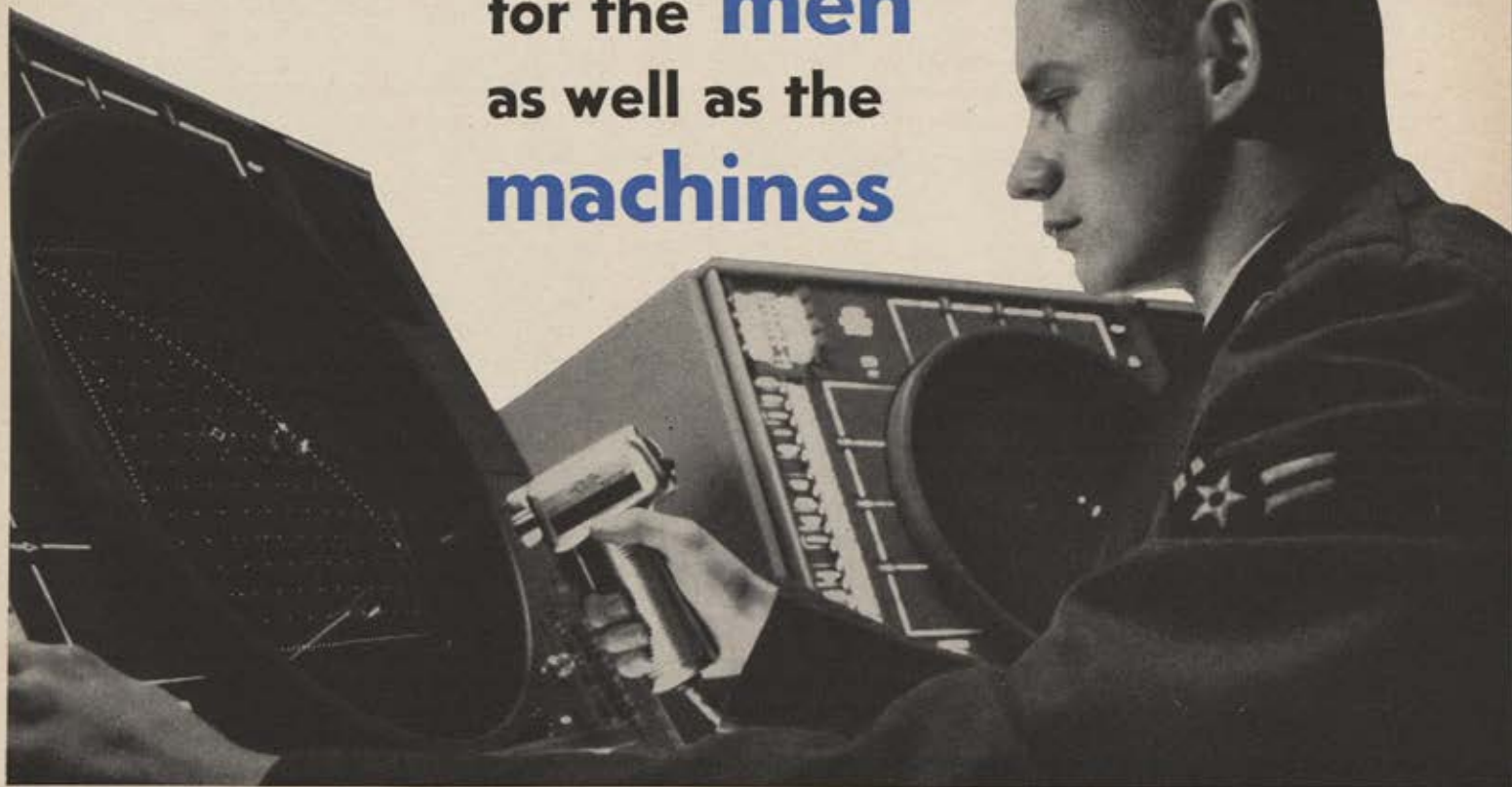
More than a hundred years ago an Englishman named Sydney Smith wrote:

"A comfortable house is a great source of happiness. It ranks immediately after health and a good conscience."

We as a nation could do much for our safety, and help the state of our conscience as well, if we would accept the responsibility of providing homes for the men who are defending us. Moving the sergeant's living room close to his airplane may keep Russian boots out of our own.—END

QUALITY CONTROL

for the **men**
as well as the
machines



Claude Witze

SENIOR EDITOR

QUALITY control is being applied to men as well as weapons in today's US Air Force. It never has been harder to get into a USAF uniform, nor harder to stay in it.

A memorandum being passed around last month in Air Staff offices pointed out that more than seventy-two percent of USAF airmen have at least completed high school. Ten years ago the figure was forty-four percent. More than fourteen percent have had some college training. In 1948 the figure was six percent.

If we move into the officer cadre, the ten-year improvement in educational level is equally impressive. The percentage of high school graduates has gone up from 95.6 to 99.4. The percentage of officers with some college training rose from 62.2 to 87, and the percentage of college graduates from 24.6 to 47.3.

Quality control applies today in all ranks, and the men with bars, leaves,

and birds on their shoulders are subject to new standards regarding demotion and outright dismissal from the service. The goal is set by the law governing officer personnel, which aims at keeping only the highest quality men as colonels and general officers. Any officer who does not pass the rank of lieutenant colonel in twenty-eight years of service is forced to retire.

From 1951 to 1957 only five officers were demoted in the Air Force. Since October of 1957 some 650 have been singled out for possible demotion, and at the beginning of this year nearly 150 already had been slashed in rank.

Basic to this program is the fact that we no longer can fight a war with anything but competent and professional people. Starting with the rookie airman recruit, USAF's manpower effort assumes that selectivity is essential to build the professional

force demanded to fight a modern war. The standards of human reliability must be as high as those of the electronic black boxes, the vehicles, the ground equipment, and the propulsion units.

Enforcement of the new standards is not looked upon as a major personnel problem, largely because the really dedicated officer and airman is eager to pursue his career, widen his own utility to the Air Force, and take advantage of new opportunities.

On a recent visit to headquarters of the 3500th Recruiting Wing, Wright-Patterson AFB, Ohio, *Air Force Magazine* found the big headaches do not come from the higher standards now used in selecting men for enlistment and reenlistment. Almost the only spot where the wing is not meeting its quotas today is in the enrollment of pilots and navigators.

Figures for the first half of fiscal
(Continued on following page)

1959 show only 788 new pilots acquired out of a requirement for 1,310, and 1,052 navigators out of a requirement for 1,725. The reason, according to Maj. Gen. E. S. Ligon, Jr., Commander of the 3500th, is in large part the wave of publicity given in the past couple of years to the erroneous idea that the Air Force no longer has seats to be filled in cockpits. The exact opposite is the truth, and the flying Air Force will be here for many years to come.

An additional factor is the quality-control effort itself. While the requirement is increasing—USAF needed 710 new pilots in fiscal 1958, needs 3,170

costs, important in itself, is in a sense an extra dividend. The much-discussed Cordiner Committee studies, now nearly two years old, declared that actual budget savings could be made by steps designed to cut down on the training requirement.

To make up for the lag in ROTC candidates, which the Recruiting Wing expects will correct itself in a few years, USAF now looks to its Aviation Cadet program and the relatively new Officer Training School concept. Attrition rates at Aviation Cadet examining centers remain high—sixty-six percent of the pilot candidates and forty-four percent of the navigator candidates are rejected. Also, starting in fiscal 1958 applicants were forced to agree to serve four years on active duty after completion of flight training, which has discouraged enrollments.

A more recent effort to enroll qualified officers is the new OTS program, designed to attract college graduates who are fitted for essential USAF positions, not necessarily in cockpits. These men will not be ROTC-trained in college, but they presumably will have a genuine interest in Air Force careers. The new program will overcome the two-to-three-year lead-time problem required for producing officers out of ROTC. It will provide a commission for accepted candidates after ninety days of training. Wearing second lieutenants' bars, Air Force Reserve, they will draw pay and allowances of staff sergeants for two years while taking specialized training based on individual qualifications and preferences. Then they will get Regular USAF commissions and serve three years of active duty.

The Air Force confidently expects the officer-retention rate will improve as progress is made in the effort to "build a Rose Bowl team." The retention of ROTC-rated officers in the past has run about thirty-five percent. In the future, personnel chiefs predict, this figure will run about sixty-five percent.

One of the main inducements will be the new Officer Career Management Program, introduced early this year. This is an effort to make sure each man is utilized in the place where he will contribute his maximum to the USAF mission. It provides an Officer Career Management Structure, grouping all specialties into career patterns, and guidance to keep each officer in a planned path of career development.

The Officer Career Management

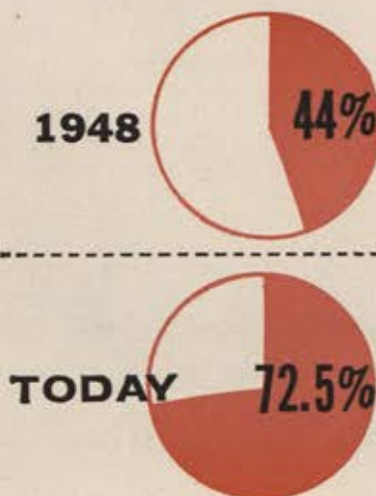
Program is designed to develop both technically competent and broadly qualified officers. A new lieutenant will specialize in a narrow field, based on his best qualifications. In the non-rated areas, these fields might fall under the broad scope of such subjects as scientific, research and development engineering, civil engineering, electrical and maintenance engineering, materiel, comptroller, administration, or security. A new officer will enter a narrow segment of one of these fields and with each promotion be eligible for assignment in a wider sector.

By the time he reaches the rank of lieutenant colonel, he can be considered for a job in any of four of the major activities listed in the career structure. The program promises to fit the Air Force for the space age ahead by continuing each man's specialization in highly complex skills where they are needed. It will plan for progressive broadening of officers as managers and commanders, help put square pegs in square holes, and generally improve the career prospects for each qualified man.

There is nothing binding about this program, and the men who drew it up are the first to say it will have to be altered as time goes on. They anticipate revisions twice a year. It deals with both rated (flying) and non-rated (nonflying) officers. The man with a cockpit job, pilot or navigator, will develop a second capability outside his aircraft, somewhere in the scientific, administrative, or professional areas.

Lt. Gen. Emmett (Rosie) O'Donnell, Jr., Deputy Chief of Staff for Personnel, says the long-range benefits of the new program will be in the development of young officers, upon whom USAF will depend for its future success. What is equally true, but unstated in the regulations, policies, and directives, is that Officer Career Management can lick one of the old bugaboos of military management. This is the prevalent idea that the Air Force, for example, is made up of airplane jockeys and that there is no professional career possible if a young man dons a uniform with the idea of staying in it for most of his working life. The new program emphasizes that USAF needs scientists and engineers and production experts and financial wizards and personnel experts. Despite the fact that they all wear the same blue suits, USAF officers today have many of the same opportunities for career advancement they would enjoy in outside business.

Airmen Who Have At Least Completed High School

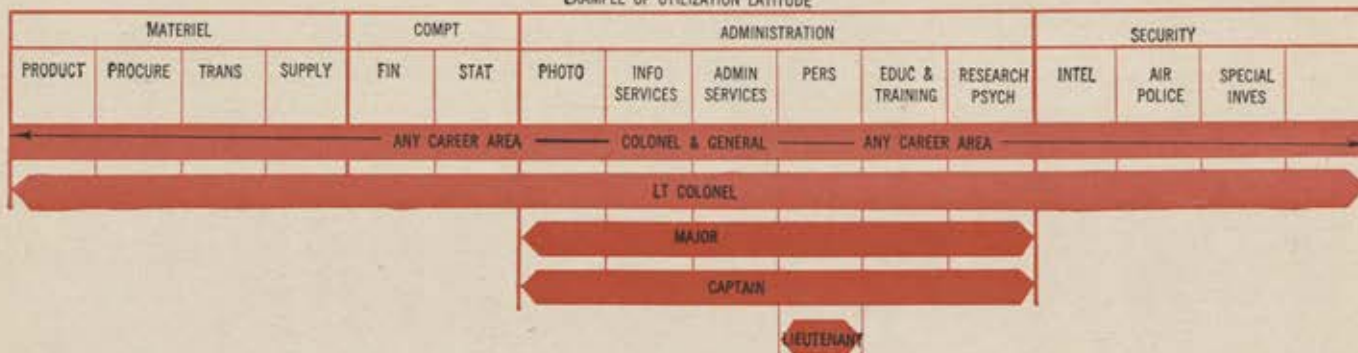


Improved level of airmen is matched by officers, where percentage of college graduates has risen from 24.6 to 47.3

in fiscal 1959—the period of service for men out of the Reserve Officer Training Corps has been raised from three to five years with the result that fewer students are signing up. This change, invoked in 1957 for pilots and in 1958 for navigators, was made necessary by the long and expensive training program in effect.

It costs \$125,000 to put a new pilot through fourteen months of flying school. He is not a proficient member of his combat wing until he has been in uniform for three years. If the quality standard is to be maintained, it follows that the rated officer must sit in a cockpit for a longer period of time after he has become proficient. The saving in training

EXAMPLE OF UTILIZATION LATITUDE



Here are the opportunities open to a young lieutenant when he joins the Air Force for a job in Technical Support Areas under the new Officer Career Management Structure. In this example, he would start in Personnel as a "utilization field" because he was properly equipped for the job. Upon promotion to captain and major he will move to a "career area" and will be available for assignment in any of the six "fields" under administration. As a lieutenant colonel he is considered ready to branch out into any of four career areas comprising Technical Support. By the time he achieves the rank of full colonel, he can be shifted out of Technical Support and into the Scientific and Engineering areas.

Application of the quality-control program to USAF's airmen takes place at initial enlistment and reenlistment. Retraining is stressed and so is elimination of the marginal producer. As with the officers, the standards are being lifted and aptitude tests are being used to make sure competent men are utilized properly and made to appreciate a career in the Air Force.

It is tougher than ever to get into the Air Force. Not long ago a study was made of 375,000 airmen who donned USAF uniforms in fiscal years 1955, 1956, and 1957. About 94,000 of these men will not be eligible for reenlistment, and 58,000 of those will be out for the simple reason that they have no aptitude for training. Out of every 100 men with no previous service, twenty-five would not qualify for reenlistment under today's standards, and out of every 100 in the lowest mental group about seventy-five do not have the aptitude required for entry into a USAF training course.

An Airman Qualification Examination was started almost a year ago and made a requirement for both new enlistees and reenlisting personnel. Each man is required to get a minimum score. To sign up for another hitch he also must show that he is able to continue training.

One result of this program is that in fiscal 1958, seventy-one percent of the separated airmen declared ineligible for reenlistment were kept out by these quality standards. The corresponding figure for the previous year was forty-six percent. But the service was made more attractive for the men who did stay in. The reenlistment rate for those eligible jumped from forty-eight to fifty-five

percent. Much of the credit for this is given to the military pay bill passed by the Eighty-fifth Congress; but other, and substantial credit, must go to the improved outlook for the career airman.

All commands, according to personnel experts, are happy. The ranks are fast being depleted of men who cannot make two promotions in four years, who fail the Airman Qualification Examination, and whose conduct makes them undesirable.

The AQE, it is stressed at Recruiting Wing Headquarters, is not an intelligence test. It is an aptitude test, designed to find promising candidates in the electronic, mechanical, general, and administrative fields. Month by month, the Air Training Command tells the 3500th how many men it needs in each of three aptitude levels in each of the four areas. The changing nature of our Air Force is revealed swiftly in the requirements. On a recent report seen by this reporter there was a demand for 350 men with the highest scoring in the electronic area, only twenty with less aptitude for the work. There was no demand for men with mechanical ability who made a high score, but more than 1,400 were needed for the lower echelons.

In the area of outright elimination, USAF has reported that the number of airmen forced out has grown since the regulations were streamlined starting in 1956. Only 6,000 airmen were booted in 1955. In 1957 it was 15,000, and in 1958 an estimated 18,000 got their walking papers.

At USAF Headquarters, where the policies are determined and the demand for quality is most evident, top generals say they must keep good men, get rid of the non-producers.

One reason this is urgent is the simple fact that USAF today faces a stern transition in which it must be capable in both the airplane and missile fields.

"We must maintain the old Air Force for many years to come," says one of General O'Donnell's aides, "and develop a new one at the same time. That is why we insist that a man be capable of taking training in new areas and why officers must expand their horizons as they move ahead in Air Force careers. So far as personnel is concerned, we never have had a time in US military history when good management was so important."

Headquarters also calls attention to the fact that the ratio of career-minded USAF officers and airmen has increased to the point where it no longer is profitable to try merely to raise the over-all retention rate. The standards of quality have got to continue rising, just as the complexity of the weapons is going up and the reaction time in case of war is getting smaller with every new missile and faster aircraft. USAF's entry into the space age will add further complications.

Here is the way USAF describes its program:

- Apply quality standards.
- Apply selectivity in career progression.
- Weed out marginal and sub-marginal personnel.

In the future there will be more emphasis on assignment controls and reenlistment controls. There will be more retraining of airmen. Promotions will be harder to get.

As the standards go up, the pride of wearing Air Force blue will spread through 845,000 men. Better firepower demands better manpower.—END

A distinguished analyst of military affairs examines . . .

WHERE WE STAND

Brig. Gen. Bonner Fellers

US ARMY (Retired)

AT A recent press conference, President Eisenhower was asked how the government could hope to reduce expenses when the expanding missile program would be so costly. He replied:

"When guided missiles prove their efficiency, then certainly there must be some other kind of weapon that they are displacing. . . . We have got to do some good hard thinking . . . not just pile one . . . system of weapons on another and so in the long run break ourselves."

This expresses the essence of effective, efficient defense. If our government is to remain solvent and free enterprise survive, we must replace old-fashioned, inadequate, and expensive weapon systems with the most effective and hardest-striking modern weapon systems that American genius can devise.

The President did more than state a principle. He followed with a significant cut in military manpower. By June 30, 1959, our armed forces, principally the surface forces—Army, Navy, and Marines—must reduce their strength by 70,000 men.

Behind the scenes there is a more drastic proposal—this one is dangerous. It has been transmitted by letter from the President's National Security Council representative to the Joint Chiefs of Staff. The message suggests the idea of a *minimum deterrent*. By this is meant a deterrent only strong enough to knock out a limited number of enemy targets—principally cities. The theory is that the potential destruction would be great enough to be unacceptable to the Soviets.

The minimum deterrent program would effect vast savings in our air and missile development and production. But soon the Kremlin dictators would have decided air and missile supremacy. Nevertheless, advocates of the minimum deterrent argue that, since we would have sufficient striking power to inflict unacceptable losses, it makes no difference how strong Red air and missile power may be. But the minimum deterrence theory is more attractive fiscally than militarily.

The manpower cut and the deterrent proposal represent two possible approaches to husbanding our defense dollars. The first would save money by burying the past. The second, also with the national pocketbook in mind, would risk burying our future.

In any event, whatever our course, the cost of modern defense is prodigious, and the accent on economy grows

Troops at a nuclear test blast: "To the soldier the Army . . . is the ideal limited-war weapon."



more and more pronounced. And the public question of which service gets the largest slice of the limited financial pie yields this startling fact year after year.

If the next war comes, *each service, supported by the other two, plans to play the dominant role*. This, in brief, is where each stands:

THE ARMY holds there can be no victory in war unless land areas which support the enemy's military effort are occupied. The Army feels that, supported by the Air Force and Navy, it must win the land battle as the final decisive act of any war. Man, the Army reminds us, lives on the land. There he has his home, his village, his country. Therefore, the decisive element of victory must be to take the enemy's vital land from him.

The Army further argues that the US and USSR have reached parity in nuclear weapons, and neither could survive all-out nuclear war. As a consequence, such a war is becoming increasingly improbable. We must prepare instead for limited war in the form of bit-by-bit encroachment on the free world, the Army contends. To the soldier, the Army, with air and sea support, is the ideal limited-

war weapon. But should an all-out war materialize, the Army proposes as well to defeat the Red Army on its home ground.

To quote from Army doctrine:

"Army power is the power of discretion. It fights troops and captures Communist leaders rather than destroying a country. It can, in conjunction with the other services, preserve the peace, meet Korean-type wars, and defeat the full might of the USSR in the event of an all-out war."

THE NAVY'S concept of the next war is that nuclear-armed intercontinental bombers and missiles would knock out both our own and the Soviet land and air weapon systems. The Navy says her ships, safe at sea, would survive. And these ships—especially the carriers and submarines—could then make quick work, the Navy believes, of finishing off the enemy.

The Navy also claims a dominant role in limited war. The Navy can strike anywhere. It has its own movable air bases. It has a Marine amphibious force with tactical air support. The Navy's atomic submarines could strangle enemy shipping and are testing IRBMs to fire deep into enemy territory. As these atomic-powered vessels come into general use, the Navy feels it will be able to cruise

Navy confederacy urges more money for missiles and for the expansion and modernization of our surface forces to meet the limited-war threat. Except for aircraft to support and transport their surface forces, the Army and Navy chiefs maintain that the Air Force as we know it today is gradually being phased out of existence.

The Air Force fights back. It points out that the only true war deterrent in the world today is the United States Strategic Air Command. And since it will be some years before the ICBM can even partially replace the intercontinental bombers, SAC needs more, not fewer, bombers.

From this desperate interservice rivalry loom two potentially fatal dangers.

First, duplication brought about by each service planning to play the major role in war lifts defense costs even higher than necessary. This defense outlay combined with foreign aid and domestic expenses is, in the view of many, undermining our economy. If our economy collapses, there can be no adequate defense.

Second, interservice rivalry results in intolerable compromise. In some cases it leads to actual abandonment of defense measures vital to our survival.

In shaping its defense budget, the Administration faced



Army, Navy chiefs declare SAC's big bombers, like B-52, are "almost obsolete," soon will be replaced by missiles.

◀ Left, USS *Forrestal*, an air base with a "fatal weakness."

or fight for indefinite periods of time in any critical area.

THE AIR FORCE maintains that its strategic bombers, and soon the ICBM, can strike and destroy *almost instantly any target anywhere on earth*. Thus, according to our airmen, strategic airpower has become our first line of defense and our principal war deterrent.

The Air Force holds, and the Army and Navy agree, that control of the air is a prerequisite to successful surface operations. But the Air Force claims more than the ability to control the air. With air control achieved, in either a limited or all-out war, the Air Force obviously could attack and destroy enemy surface forces on land or sea.

This latter air capability clashes head-on with the traditional roles of the Army, Navy, and Marines.

Jointly subscribing to the theory that limited wars are more probable than all-out war, Army and Navy chiefs have launched an effort to reduce the fiscal year 1960 Air Force budget by some \$6 billion. They would, of course, increase their own budgets accordingly.

The big bomber is almost obsolete, they declare, and will soon be replaced by ballistic missiles. This Army-

a quandary. It had decided to hold defense expenditures for FY 1960 to some \$41 billion. The services originally wanted close to \$57 billion. Naturally, the line of least resistance was taken and something like a thirty percent cut straight across the board was imposed. The result will be a defense characterized by compromise, only partially responsive to this air/space/nuclear age.

THE RED THREAT

The United States had to move into the air/space/nuclear age. The enemy was already in it. Conventional surface weapons cannot materially influence air/space/nuclear weapon systems. One reason today's defense is so costly is that the Army and Navy are endeavoring to superimpose air/space/nuclear weapons on antiquated surface forces.

Enemy capabilities are well known. Both the Soviets and Red China are committed to vast standing armies to control their populations, hold satellite peoples in check, and threaten the free peoples on the Eurasian continent.

(Continued on following page)



"Russia's intercontinental bombers are believed close to our own SAC bombers in quality." Left, Russian TU-16 Badger bomber, twin-jet, medium-range, nuclear-armed component of "the world's largest air force."

The Soviet-Red China axis, self-sufficient so far as strategic war materials are concerned, has little need for large surface fleets. But the Russians have more than 500 modern submarines, a frightful threat to free-world shipping and overseas troop transport. In addition, Red submarines will relatively soon be able to fire IRBMs with nuclear warheads against our cities and military installations.

Russia boasts the world's largest Air Force, Red China the third largest. The Red Chinese have some 2,500 modern combat planes, more than the Chinese Nationalist Air Force and America's Pacific Air Forces combined.

The Soviet Air Force consists of some 22,000 modern combat planes, mostly jet. The air defense force has 4,000 supersonic jet fighters. Russia's intercontinental bombers are believed close to our own SAC bombers in quality. How many ICBMs Russia has ready to strike is unknown. But the Kremlin arsenal of nuclear bombs and delivery systems is feared full enough to level the United States and Europe.

To counter these Red capabilities, we need not three war plans, but only one war plan which takes full advantage of the inherent capabilities of each of the three combat arms; once more in service-by-service format:

ARMY. Neither the US nor the rest of the free world can afford armies comparable in size to those of the Soviet Union and Red China. Nor is there reason to do so. The Communist governments have neither the air nor the naval lift to transport their armies overseas. Not only is Europe vulnerable to invasion by the Red Army, but Soviet bombers and IRBMs could devastate Europe *without* a Red Army invasion.

Even were it possible for the NATO powers to create armies fully capable of defending Europe against Red Army invasion, Europe could still be destroyed from the sky before troops could be moved into battle.

Thus the United States need not create nor plan to create armies to engage the full weight of the Red Armies. Consequently the Army is free to turn its attention to defense of strategic bases, participation in continental defense, and other roles.

NAVY. In a future war, we would not be sending millions of troops overseas. The Navy would be relieved of the hazardous transport role. The Communist powers have no surface fleet of magnitude; our own fleet can concentrate on base supply and *resolving the menace of Red submarines*. Our surface fleet can be materially reduced. The British, although steeped in naval tradition, have all but abandoned their fleet. The United States is, in fact, the only power today which clings to an enormous surface fleet.

The Navy takes violent exception to the idea that our surface fleet could safely be reduced. It is making a desperate fight for a nuclear carrier force. One ship is

being built; six are planned by 1966. There are impressive advantages to the nuclear carrier. Mobile, it can cruise in critical areas without refueling for the duration of an emergency. Its air arm can attack enemy ships and bases; it can strike enemy inland targets; it can support landing operations; it is less open to sabotage or capture than an overseas land base.

But the carrier has a fatal weakness. *It is vulnerable to air and undersea attack.* In combat against an enemy with the largest air and submarine forces in the world the carrier cannot survive. The fireball of a megaton nuclear bomb is four miles in diameter. The heat it gives off is more intense than that from the surface of the sun. Thus a direct hit would not be necessary to melt a steel vessel.

The submarine, however, is not especially vulnerable to enemy air attack. Atomic submarines, eventually to be armed with nuclear IRBMs, could strike deep into enemy territory. Because such submarines will be able to fire the IRBM while submerged and then remain under water indefinitely, this striking potential obviously should be developed to its maximum.

A nuclear submarine costs some \$200 million. Construction of nine has been authorized by the Congress. A nuclear carrier is more than twice as expensive as a nuclear submarine.

Despite the recognized vulnerability of the costly carrier and the obvious advantages of the submarine, the Navy is psychologically unable to abandon the carrier and go all-out for the submarine. Should the carrier go, with it goes most of the surface fleet and naval air arm. A carrier-vs.-submarine fight rages within the Navy itself, of course. The President and Congress should settle the matter—on behalf of the submarine.

AIR FORCE. The Red Air Force is the most fearsome, deadly threat the United States has ever faced. The best defense against its nuclear and missile threat is an effective maximum war deterrent. The United States has one true deterrent. It is the Strategic Air Command. At this writing, SAC is believed to be stronger and have more experienced and talented crews than the Red Strategic Air Force. In ICBM, IRBM, and space development the US appears behind the Soviets. We must work unceasingly in these fields.

The Air Force is now developing the technique of firing an air-to-ground IRBM, or an air-launched ballistic missile (see *AIR FORCE, February '59*). This means that SAC bombers will be able to release the ALBM 1,000 to 1,500 miles from the enemy objective, thereby increasing the effectiveness of the bomber and enhancing the safety of its crew.

In another field of endeavor we must make giant strides. We are desperately in need of an adequate antimissile defense missile. No expense should be spared to provide
(Continued on following page)

this. Our fighter-interceptor defense against Red bombers is inadequate. It must also be improved.

NATO

From the beginning, NATO has followed a surface defense concept which commits NATO ground forces against the Red Army. Since World War II the Soviets have kept some 175 Regular Army divisions in the field. In addition, there are 300 Red reserve divisions, well trained, with modern equipment. The central European satellite states have some eighty-five additional divisions.

Despite this enormous Red strength, at the 1952 Lisbon

conference Italy agreed to accept IRBMs but as yet has not built bases for them. Turkey, under the muzzles of Red weapons, is eager for the IRBM but has not the technically trained men to handle it. Norway, Denmark, Belgium, Luxembourg, Holland, France, North Africa, Greece, and Portugal have turned thumbs down.

The Berlin crisis at the close of 1958 brought forth another NATO Conference. From it came a bold announcement that we would meet force with nuclear weapons. It was something of an empty threat in view of the fact that of all the NATO powers in Europe only Britain is accepting nuclear IRBMs.



Above, USS *Nautilus*, the Navy's first atomic-powered sub. Atomic subs "can strangle enemy shipping and are testing intermediate-range missiles to fire deep into enemy territory."

Right, USAF Atlas ICBM lifts off during test at Cape Canaveral, Fla. Far right, Douglas Thor IRBM blasts into the sky in one of its final tests before the missile reached operational status. "The United States had to move into the air/space/nuclear age. . . . Conventional weapons cannot materially influence air/space/nuclear weapon systems."



The facts compel these conclusions: We should produce fewer IRBMs; we *should* have more ICBMs to be based on the North American continent and able to reach any target in the Soviet Union.

THE LIMITED WAR FALLACY

The most dangerous assumption which Pentagon planners could make would be to rule out the possibility of an all-out nuclear war against the Soviets. Such a war can be avoided, but only if we lead in air/space/nuclear weapons.

In determining the number and types of weapons we need, we must recognize the possibility that the enemy will probably strike first. Our weapons must, so far as possible, be given underground protection. We must have enough weapons to retaliate successfully after absorbing the initial enemy strike.

We must face the fact that war between the Soviet Union and the United States is a possibility. Conventional causes for war already exist. The Soviets have shot down American planes, killed some of the crew members, and interned others. Kremlin leaders openly criticize our institutions; they boast of a Communist-dominated world.

Recently the Soviets have undertaken a massive civil defense program. But the Russians know full well that we have no intention of striking unless we are attacked. One must then assume that the Red bomb shelters are to protect against American retaliation.

The second most dangerous assumption which Pentagon (Continued on following page)

Conference NATO decided on fifty divisions and 4,000 aircraft as its minimum defensive force. Today, more than six years later, there are scarcely twenty-one NATO divisions between Switzerland and the North Sea. Of these, five are American and three British. Thus the continental NATO powers, with a population of more than 200 million, have under thirteen divisions on the line for the defense of Western Europe. The NATO air support for these twenty-one divisions is insignificant compared to the strength of the Red Air Force.

After Sputnik I was put into orbit, alarmed NATO members met in Paris in December 1957. There President Eisenhower personally promised European NATO members they would be supplied with the most modern of all weapons—the American IRBMs, Thors and Jupiters. The concept was to emplace a line of IRBMs from England, southeast through Western Europe, and on into Greece and Turkey. Such a chain of well-stocked IRBM bases could send a devastating nuclear barrage deep into the Soviet Union.

But European NATO powers have not reacted as anticipated. While we offered our allies the IRBM as a striking force, we provided them almost no protection against Red nuclear attack. Actually, we are unable to do so. Quite realistically the NATO powers envisage total destruction by incineration should the Reds retaliate with nuclear IRBMs and bombs.

At the close of 1958 only Britain had accepted and was emplacing a limited number of our IRBMs. These, as they should be, are under British command. Some

planners could make is that we can fight limited wars and thereby avoid all-out war. We cannot depend upon the Kremlin to keep such a war "limited."

Moreover, after war starts its course may lead anywhere, regardless of the initial intentions of the adversaries.

The fact is, limited wars would be to our great disadvantage. Limited wars in the traditional sense cannot be decisive. Korea was a limited war which resulted in a most unsatisfactory armed truce. Victory in any limited war would not resolve the issue with the Kremlin. We would be weakened, bled white in manpower, and our economy strained. Meanwhile, the Kremlin's position would grow stronger in comparison.

We have but to glance about the globe to see an array of potential limited wars. The Formosa Strait, Southeast Asia, the Middle East, North Africa, and Berlin all present explosive situations. Commitments in one or more such conflicts would be most unfortunate.

But, if we did have to fight such a war, the weapon system which could strike first would be airpower. Airpower can move rapidly and decisively. At the outbreak of the Korean War our fighters crossed the Pacific with only two stops. During the Lebanese crisis, fighters moved from the US to that area in seventeen hours. It is routine for fighters to span the Atlantic nonstop in five or six hours.

With nuclear weapons the striking power of one of our fighters is now a thousand times greater than that of a B-17 in World War II. Development in the size and types of nuclear weapons has given tactical air a new dimension to its power and flexibility. On short notice, tactical air can deliver a variety of firepower ranging from small-arms bullets through rockets, napalm, and high explosives to nuclear bombs. With such a variety of weapons, tactical air can destroy enemy communications, troops, supply bases, and other military installations. This striking power combined with speed and range renders tactical airpower decisive in any limited war.

To place chief reliance on surface forces in limited war would mean that the conflict might be lost before our troops could be committed to battle. Dependence primarily on tactical air makes a would-be aggressor hesitant. He knows that before he can win he will feel the full weight of modern airpower.

Thus, tactical air becomes our best limited-war deterrent. Against this reasoning, surface-force advocates will argue that ground forces will be flown into limited-war combat and arrive promptly with the fighters. This is conceivable but unrealistic. If the enemy initially has control of the air over the potential combat zone, it is unsafe to fly the troops into the area. In any case, it would appear clear that:

1. In limited war tactical air can be the first to strike;
2. Necessary reliance on the full exploitation of tactical air in limited war makes the surface combat role a minor one;
3. The great lesson in considering limited war is that we must be prepared to fight an all-out nuclear war.

If we are prepared to win an all-out nuclear war, we most certainly can win a limited war by using the same, if modified, means. And with the power to win an all-out war the probability of being able to avoid any kind of war is greatly enhanced.

CONCLUSIONS

The *minimum deterrent* idea suggested to the Joint Chiefs must be rejected. If the *minimum deterrent* in our hands is expected to keep the Soviets from striking us, then a maximum deterrent in Red hands will keep us

from lifting a finger in defense of our allies, ourselves, or to keep the peace of the world.

In the past we had a superior deterrent and the Reds had a minimum deterrent. The Red minimum deterrent did not prevent our entry into the Korean War because we had the means—SAC—to fight an all-out war if challenged. The Reds with their minimum deterrent were not in a position to challenge us, and we fought a limited war.

We know that at this time the Reds want to continue their gains without risking all-out nuclear war. Our real problem is how to deter the Reds from taking over critical and exposed areas such as Berlin, the Middle East, and Formosa without resorting to an all-out nuclear war. None of these critical areas can successfully be defended without our using nuclear weapons. And this means the risk of a nuclear world war.

If the consequences of all-out nuclear war are worse for us than for the Reds because we have gambled on the *minimum deterrent* theory, then, in a crisis, we will be more likely than our enemy to back down. The Reds know this.

Adoption of the *minimum deterrent* theory could end our influence in Europe and Asia.

Our leaders are now examining a program which soon would give us a *minimum deterrent* and the Reds a maximum deterrent. Should we permit this condition to eventuate, we shall have forfeited our present position in the world. The Reds would likely assume a bolder, more arrogant attitude toward the free world.

Our survival today depends upon:

- A striking force capable of destroying Red military capabilities. It must consist principally of air/space/nuclear weapons.
- An effective war deterrent, which means an effective striking force.
- An adequate continental defense of antimissile missiles and fighter-interceptors, together with the techniques to handle the submarine menace.

Our conventional surface forces—the mass army and the surface fleet—must be largely displaced. Neither of these forces, nor the two combined, can be decisive against the Reds. Our major striking power has passed from surface forces to air, space, and submarine nuclear weapon systems.

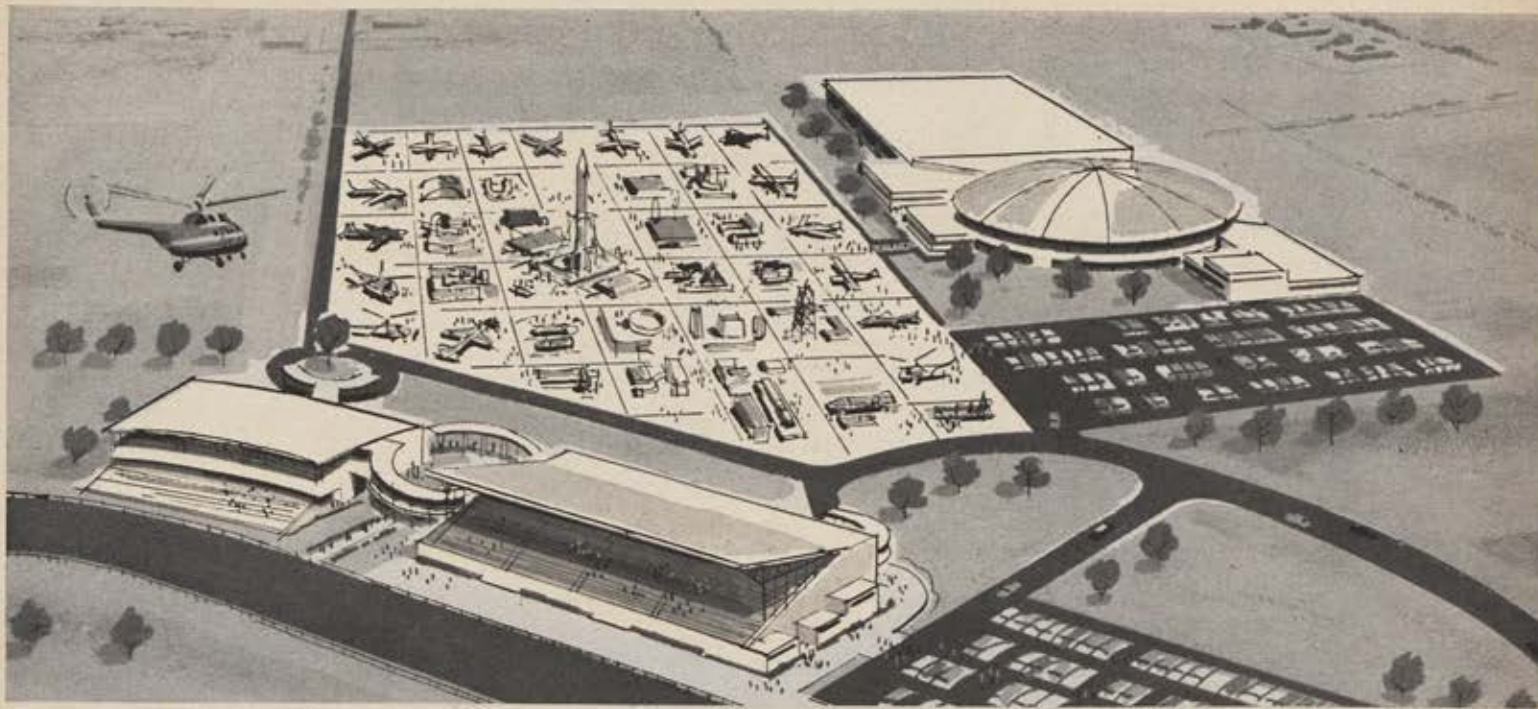
The ICBM has not yet displaced the intercontinental bomber and is not likely to do so for at least five years. Consequently, our cut-the-dead-wood formula should not be applied to SAC's manned bomber force. Actually, SAC must be sufficiently strengthened to ensure our overwhelming air and space superiority.

The President would be justified in cutting deep into surface force budgets. Their combined budget is over \$20 billion. A fifty percent cut would be militarily safe.

None of our essential defense bills will be too high if we realistically tailor our arms budget to the needs of the times.—END



The author, now National Director of For America, was with British forces in North Africa in 1940-42, later was General MacArthur's Chief of Planning in the Pacific. Since retiring from the Army in 1946, he has written and lectured widely on national defense, and in 1953 was the author of the book *Wings for Peace*.



Hub of World Congress of Flight—left, Stadium and Joe W. Brown Race Track, where private, utility, and VTOL aircraft will be flight demonstrated; right, new \$5 million Convention Center, where conferences and Industrial Exhibition will be held; between, Stadium Area, light and VTOL aircraft, missile, and ground-handling equipment displays.

THE WORLD CONGRESS OF FLIGHT

Shapes up in Las Vegas

SECRETARY of State John Foster Dulles moved decisively in late January to place the forthcoming World Congress of Flight significantly in the international arena.

Before his recent hospitalization, Mr. Dulles sent letters to the official representatives of seventy-seven governments throughout the world encouraging them to take part in the mammoth World Congress—slated for Las Vegas, Nev., from April 12 through 19. The Secretary said it would provide “an excellent means of encouraging the future development of world trade to the mutual benefit of participating countries.”

This top-level call was contained in a letter of transmittal from Mr. Dulles accompanying an invitation letter to the governments by Nevada's Governor Grant Sawyer.

The Dulles letter highlighted a period of buildup for the World Congress. Other developments included:

- Secretary Neil McElroy announced that the Defense Depart-

ment “will do all we can to make the World Congress of Flight a success.” Participation by the Army, Navy, Air Force, Marine Corps, and Coast Guard was already scheduled, although nonmilitary aviation was slated for major emphasis at the week-long event.

- Dr. Edward Teller, world-known nuclear physicist, joined the already impressive roster of the World Congress of Flight Committee.

- Eastman Kodak's Edward P. Curtis, general chairman of the World Congress of Flight and long-time aviation leader, announced that more than 150 leading American and overseas manufacturers of aircraft, missiles, spacecraft, components, electronic equipment, ground-support items, and miscellaneous related materiel had leased exhibition space.

- Nationwide observance of Pan American Day, April 14, will be highlighted at the World Congress by a tribute to the unique role that aviation has played in the development of

Latin America. Mr. Walter Benaghi of the Argentine Republic, council president, ICAO, will be honored and will make a major address.

- A NATO anniversary banquet honoring the tenth anniversary of the Atlantic Alliance, with top-level figures from the US and her allies on the dais, was set for the evening of April 15. This will be the focal point of the Congress so far as ceremonial activities are concerned. Military air displays, put on by the different services as well as visiting NATO aviators, were placed on the card for that afternoon at nearby Nellis AFB.

- Throughout the past month new aviation groups have been joining the ranks of organizations participating in the World Congress along with those cooperating with the Air Force Association as sponsors. Latest to join, with the number well above two dozen, were the Association of Local and Territorial Airlines (itself com-

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Aerial view of Las Vegas' world-famous "Strip," where 15 of the 18 World Congress hotels are located. New Convention Center appears at the extreme right.

posed of fifteen lines) and the National Air Taxi Conference (138 separate companies).

These and other indications that the World Congress of Flight should outdistance the most optimistic expectations of its sponsors brought chairman Curtis to observe that, "We are assured this will be the greatest event of its kind ever held."

Nevada's governor Grant Sawyer noted in his letter of invitation to the seventy-seven governments that the World Congress of Flight program "will present flight in its broadest concept as an instrument for the benefit of all mankind. It offers aviation interests of the world a unique opportunity to present their products in a setting which will give new perspective to the revolutionary impact of modern flight on world trade."

In his letter of transmittal, Secretary Dulles said that the World Congress of Flight "enjoys the cooperation of the government of the United States and the government of the state of Nevada, as well as leading aviation and industrial organizations, and prominent business and civic leaders."

"The World Congress will portray

and analyze the impact of modern aviation on the international economy. It offers aviation and business leaders an unusual opportunity to display products, exchange views, witness demonstrations, and attend conferences on many phases of air logistics," he said.

In announcing the program of events, chairman Curtis reported that the Congress program will feature Jet Age Conferences on April 13 and 14, a Missile Management Conference on April 16, and a Space Age Conference on April 17. Leading world authorities will take part in presentations and panel discussions.

Simultaneously, the host of participating organizations have scheduled events during the World Congress of Flight ranging from board meetings to full-scale symposiums.

Among the latter are: Symposium on the Efficient Use of Air Space, sponsored by the National Pilots Association on April 15; Symposium on International Research for the Air Force, sponsored by the Air Research and Development Command on April 15; International Flight Safety Symposium, sponsored by the Flight Safety Foundation on April 16; Inter-

national Test Pilots Symposium, sponsored by the Society of Experimental Test Pilots on April 16; International Conference on Aerospace Education, sponsored by the Space Education Foundation in cooperation with Fédération Aéronautique Internationale, US Office of Education, University Aviation Association, and the Link Foundation on April 16; Symposium on Advanced Air Traffic Control and Navigational Aids Concepts, sponsored by the National Business Aircraft Association on April 16; and a Safety Symposium for Private Pilots, sponsored by the National Association of State Aviation Officials and the Flight Safety Foundation.

The manufacturers' displays, inside the Exhibit Hall, outside in the Stadium Area, and at adjacent McCarran Field, will present a complete array of the world of flight—from the latest missiles and intercontinental jet airliners down to the tiniest components, as well as ground-support equipment. A wide range of civilian and military aircraft will be on hand for inspection.

The near-perfect flying weather enjoyed by Las Vegas the year around promises to add an extra dimension to the World Congress of Flight, as does the fact that there is ample airspace over the desert region to schedule aerial demonstrations.

One of the highlights of the World Congress of Flight is scheduled for the afternoon of Monday, April 13, when landing and takeoff characteristics of America's new fleet of turbo-prop and jetliners will be shown to the delegates at McCarran Field. Noise suppression devices will also be demonstrated.

Similarly, manufacturers of general aviation aircraft can take advantage of the unique site at Las Vegas to display the latest advances in their art through aerial and ground demonstrations at the Stadium Area, adjoining the Convention Center and Exhibit Hall. This location offers seating for a "grandstand view" of landing and takeoff qualities of personal aircraft, VTOL, and STOL craft.

The paved area between the Convention Center and the Stadium will be utilized during the World Congress for static displays of private and utility aircraft, missiles, rockets, and ground-handling equipment.

While attendance at the World Congress of Flight is by invitation, the final two days, April 18 and 19, will be devoted to public displays and air demonstrations (free of charge) at the Exhibit Hall, Stadium Area, and McCarran Field.—END



Las Vegas' new \$5 million Convention Center, where World Congress sessions and Industrial Exhibition will be held. The Center can seat 7,500 for sessions.

How Much Calculation — HOW MUCH RISK?

John F. Loosbrock

EDITOR

THE INITIAL skirmishes in the annual Battle of the Potomac, otherwise known as the budget debate, have quite clearly indicated the views and the strategies of the opposing camps, with few uncommitted neutrals.

The lineup, as might be expected, closely follows party lines. With the Democrats in the saddle on Capitol Hill and the Republicans in power at the other end of Pennsylvania Avenue, head-on clashes are the order of the day, rather than the more subtle maneuvers that occur when the same party controls both the executive and legislative branches.

In broad terms the defense issues boil down to a conflict of opinion as to what threat offers the greatest danger to the nation over the next several years. The view of the Hill, by and large, is that the military might of the Soviet Union presents the clearest and most immediate danger. Administration spokesmen admit a sizable military threat but, either explicitly or by implication, hold that the military problem must take second place to the fiscal problem—that inflation is more to be feared than Soviet missiles.

A smaller and more daring splinter group in Congress feels that both problems can be licked but only through the politically unpopular—some would say politically suicidal—device of increasing taxes.

The latter solution, according to many impartial observers, has the weight of logic on its sides, a disadvantage which will prove tough to overcome. In fact, the average person instinctively fears higher taxes more than he fears either the Soviets or inflation.

At the moment the debate centers on the so-called "missile gap"—whether or not the budget for fiscal 1960 will allow the Soviet Union a sizable numerical advantage in intercontinental ballistic missiles through the next three years.

That such a gap will exist has been admitted by the Administration. Mr. McElroy, the Secretary of Defense, indicated that the USSR may have as much as a three-to-one advantage by 1961, by which time the dispersed and hardened Minuteman and the mobile Polaris would begin to redress the balance. (Richard Rovere, writing in the *New Yorker*, points out, however, that "we have no solid-fuel or mobile base missile 'operational' now, and the only one that is in an advanced state of development—the Navy's Polaris, designed for release from a submerged submarine—has a short range, a low accuracy rating, and not very much of a warhead.")

The three-to-one ratio is disputed by a number of experienced citizens. Their estimates range from a sanguine four-to-one to a gloomy ten-to-one.

We are not trying to match the Soviets missile for missile, the Administration is saying, because we are able to take up the slack with long-range B-52s of the Strategic

Air Command, SAC's B-47s and B-58s, and the Thor and Jupiter intermediate-range ballistic missile squadrons now being emplaced in Great Britain (and later in whatever other NATO nations may be willing thus to embellish their attractiveness as targets).

The other side of the argument is that intercontinental ballistic missiles represent the one category of weapon systems in which a one-for-one match is the irreducible minimum. This theory holds that the Soviets are not only making ICBMs faster than we are but also faster than we can multiply and/or harden the targets that the USSR would have to take out in an initial attack. Thus our preponderance in long-range bombers would lose its significance—a majority of them would be destroyed on the ground. The balance of the SAC force would probably do no better than match the Soviet manned bomber force plane for plane. Further, our own air defense system would have been punished in the initial attack while Soviet air defense systems would be alerted and ready to welcome SAC's aircraft.

No number of IRBMs deployed in Western Europe will influence the outcome of this kind of battle. In fact it can be argued that such deployment actually increases the requirement for a US-based intercontinental force. The shorter-range missiles will be only as effective as the long-range umbrella permits them to be. Otherwise we will be in the position of an Army commander who emplaces his artillery in the front lines with inadequate provision for long-range counterbattery fire. It's a good way to get pounded to pieces without ever hitting back. Certainly, as the accompanying editorial from the Boston *Herald* suggests, if our long-range posture deteriorates vis-à-vis that of Russia's, our Western allies may reply to our offers of more IRBMs, "No, thanks. We just had some."

To rectify the situation obviously calls for more money than the Administration is willing to spend. Congress is chafing at the bit, and the chairman of the House Military Appropriations Subcommittee has predicted that some \$500 million will be appropriated over and above what the President has requested. He further said that this sum is only one-half to one-quarter of what he thought should be added. George H. Mahon (D.-Tex.) is a veteran of appropriations battles and is not noted for being an exceptionally free spender. His predictions are not to be taken lightly.

More money would certainly help the Air Force at this juncture. Maj. Gen. Bernard A. Schriever, who runs the USAF ballistic missile program, has pleaded on the Hill for more production of Atlases as the fastest way to reduce the missile gap. Atlas is proving a reliable weapon: the

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hard work of development is past, and it seems a shame not to cash in on our investment.

True, the Atlas at this point cannot be hardened by going underground like Titan or Minuteman, but progress has been made in reducing its vulnerability through so-called "toughening" (raising the missile to its upright firing position only at the last minute).

There are other areas besides ICBMs that need a financial shot in the arm. Housing at operational bases is one. More B-58s to replace the aging B-47s is another. Air defense, because it offers no answer to Soviet ICBMs as yet, is dwindling in effectiveness and popularity.

The Bomarc program has been cut in half, and we are buying no manned interceptors with FY '60 money. Yet, as pointed out above, the Soviet manned delivery system remains formidable under the way we have elected to play the game. Any kind of airborne alert, although not contemplated for the immediate future, will require money to prepare for it and in the long run will call for more aircraft, more crews, more fuel, more tires, more of everything.

The current debate on the Hill is a useful exercise in airing the issues publicly, even though the taxpayer finds it difficult to pick out the grains of truth that are hidden in the welter of conflicting claims and opinions. Unfortunately, the history of the past several years, under both Democratic and Republican Administrations, indicates that congressional action has little positive effect on our defense programs. Knowledgeable senators and representatives, who are honestly concerned about our military position undoubtedly are vexed at this, and it will be interesting to see what they attempt to do about it.

Quite a long time ago, Mr. Truman made headlines when he impounded (refused to spend) \$800 million that Congress had appropriated for the Air Force. Impounding was news in those days.

Now it is so common as to be accepted as a normal way of doing business. Many times \$800 million have been appropriated but not spent for national defense over the past several years. The closest to any explanation ever vouchsafed was a recent remark by the Pentagon's moneyman, Assistant Secretary of Defense Wilfred McNeil, who said, in reference to money ticketed in the last budget for acceleration of Minuteman:

"Oh, we spent it all right. But we took it out of another pocket."

Abraham Lincoln once told another Congress, "The dogmas of a quiet past are inadequate for the stormy present. We must think anew, we must act anew, we must disenfranchise ourselves."

Now would appear an appropriate time for Congress to rise up in righteous wrath. Congress represents the duly constituted voice of the people, but in the context of the times it has become largely a voice crying in the wilderness of bureaucracy.

We chatter about how much the country can afford while there are twice as many people unemployed as there are under arms. We counter intercontinental missiles with aircraft that may never get off the ground. We woo allies while denying them the long-range protection that makes their help meaningful. We talk of calculated risks in the face of weapons that make such risks unacceptable.

A little more calculating and a lot less risking would seem to be in order.—END

THE CRUCIAL FOURTH DIMENSION

DEFENSE Secretary McElroy the other day announced this country's retirement from the long-range missile race. The United States will not attempt to catch up with the Soviets in this field; even may be consenting to a three-to-one superiority by the Soviets.

This announcement should have shaken the country to its foundations. We appear to have surrendered to our enemy clear priority in the decisive weapon of the future.

Now we can have an effective defense without matching the Russians in every other weapon. We could not possibly match them man for man. Our need for submarines is less than theirs. We ought in fact to tailor our whole defense system to our special requirements.

But there is no counter to Soviet missiles other than missiles of our own. Here is a whole new fourth dimension of warfare, which is not ships at sea or armies on land or planes in the air. But more than that, it is a dimension which is crucial. We could have in the years to come command of the air, command of the seas, and command of land areas within our defense positions, and still lose if we lacked adequate missile strength.

If not ICBMs, what?

We are at present relying on B-47s for ninety percent of our potential for delivery of nuclear bombs. Yet these are obsolete, or soon will be obsolete, against Russian air defenses. Moreover, Secretary McElroy conceded the other day that our bases in Europe are vulnerable to medium-range Soviet missiles. And finally we must face the danger that any loss of confidence in this country's powers of deterrence will make our allies disinclined to permit us to remain in these bases.

Even the program for the B-58s to replace the B-47s has been cut down. And the Polaris missile for firing from submarines has had its range cut from 1,500 miles to 800 miles.

This is a dark picture, and it ought not to be made any darker than it is. The defense budget does provide for more B-52s capable of firing the Hound Dog air-to-surface missile to paralyze enemy air defenses. There are to be funds to keep a third of the aircraft of the Strategic Air Command on fifteen-minute alert at all times.

The Administration is not asleep. Within the confines of a \$41 billion defense budget it is working wonders.

But what Americans ought to be asking is whether this is enough. By what coincidence does the Administration find that an adequate defense fits into a balanced budget?

There is abundant evidence that the American economy can meet considerably increased defense costs. Last year the Rockefeller Studies Group, warning that the balance of power would shift to the Soviet in two years, urged an immediate increase of \$3 billion a year in the defense budget and similar increases each year for the following six years. The Committee for Economic Development has said that there is no factual basis for the notion that we are near some "breaking point" in defense spending. "We can afford what we have to afford," the CED stated.

We must face it; bigger defense would mean heavier taxes. Missiles are not cheap. But the price of preserving our place in modern weaponry—and with it the effectiveness of our foreign policy—is within our ability to pay.

—From an editorial in the *Boston Herald* for February 6, 1959.

Do we need

UNLIMITED FORCES FOR LIMITED WAR?



Col. Robert C. Richardson, III

THERE are some who claim that the only wars nations need worry about in the future are cold wars and limited wars. The principal argument is that all major powers now realize the futility of general war, that general war is no longer a profitable means of achieving national objectives, and that henceforth aggression can only have a profitable outcome in the cold and limited-war fields.

The idea has its origin in fear of massive atomic destruction. This fear causes many, including responsible officials, to "wish away" the threat on the assumption that no nation will ever start a war that could only result in mutual annihilation. It is the so-called "stalemate concept."

In a democracy defense programs are frequently influenced as much by intuitive public and official opinion as they are by scientific study and objective analysis. As a result, questionable defense concepts, promulgated by individuals with parochial views or with little or no military background, may well gain general acceptance, particularly when they appear valid to the layman and cater to what people would like to believe rather than to the facts. Much of the current talk of the alleged need to augment the limited-war effort of the United States falls in this category.

National defense programs cannot be influenced either by wishful thinking, based on assumed enemy intentions, or by a "hot-and-cold" approach to specific parts of the over-all effort. One cannot disassociate the general and limited-war effort from one another, concentrating first on one and then on the other while ignoring the relationship between the two at any given time.

While much has been written about our apparent neglect of the limited-war threat, this threat is seldom discussed in the context of our over-all deterrent posture, or, particularly, to the general-war capability. Yet, the relationship of the war posture to the goal of deterring or fighting both general and limited wars is all important. As stated by General Gavin (see box), any one posture can only be intelligently argued within the context of the others.

I propose to argue that a policy of deterring war—all types of war—may well be best served by a diversified general-war capability, supported by a well publicized willingness to use it effectively to deal with major acts of aggression anywhere in the free world. In the final analysis it is the general-war capability that contributes most to deterring major limited acts of aggression and not the real or alleged ability to deal locally with such acts. Before we can usefully argue this thesis, however, we must

be clear as to just what we are talking about when we speak of "limited war," "general war," and "unlimited war."

The terms "general war" and "limited war" mean different things to different people. The general or limited nature of a future war will also depend to a great extent upon the position, or situation, of the nation defining it. For instance, a war that would be considered limited by the US can very well be considered a total war from the point of view of other participants who may be expected to act accordingly. Korea, which for us was a limited war, was a total war from the point of view of the South Koreans.

General war can best be defined, from the point of view of the US, as a war in which the armed forces of both the US and a major opponent, such as the USSR, are overtly engaged and their populations and economies are subjected to direct military attack. General war is further characterized by the use of all weapon systems available to the extent that these may contribute to the political and military objectives of either side, and by a total lack of any geographical restrictions with respect to where combat operations may take place.

There is a tendency to equate the terms "general war" and "unlimited war," which, according to my definitions, are not necessarily the same thing. A war can be "general" from the point of view of all major participants, and,

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General Gavin, in his recent book, War and Peace in the Space Age, had this to say about the relationship of limited to general war:

"A much discussed topic today is limited war and much of it, I fear, is wishful thinking. For a limited-war concept is only valid within an impressive over-all capability to wage general war. No opponent will ever accommodate us to the extent of allowing us to fight a limited war merely because that is what we want to fight, and, more significantly, because that is all that we are capable of fighting. Actually, a nation dare not risk a limited undertaking without possessing the obvious capability of fighting a general war. And to the extent that we have the latter capability, we may indulge ourselves in the former. This applies to both the US and the USSR."

at the same time, include certain mutually accepted restrictions with respect to the amount of destruction sought by either side or the ultimate objectives of either side.

On the other hand, unlimited war implies that there are no bounds to the nature or scope of military operations. Unlimited war calls for the unrestricted use of any and all types of destruction with the ultimate objective of achieving a complete overthrow of the opponent's major sources of power, including his political and economic structure.

Thus, an unlimited war will also be a general war, but the converse need not necessarily be true. This is an important difference in the atomic age since mutual deterrence concepts, annihilation theories, and atomic limitations stem more from fear of "unlimited" war, where populations are primary targets, than from a fear of "general" war as we have defined it.

Consider how a general war could take place without being unlimited. Let us assume that a NATO nation is attacked, on the assumption that fear of mutual annihilation will prevent the free world from committing its general-war strategic forces, thus promising a favorable outcome to the aggressor who has local superiority. Let us further assume that the aggressor misses his guess and that we honor our commitments to use any and all forces required to defend our allies. The resulting misestimate of our will and capabilities would result in the free world's gaining the strategic initiative—a not unlikely situation since it is what occurred in Korea, Greece, and Jordan, where in each case we intervened when the enemy thought we would not.

In the situation we have just postulated, the enemy objective might well be the overthrow of a NATO nation, *not* the overthrow of the US. The US response, no matter what forces it involves, could be calculated to defend the NATO nation under attack.

With this objective in mind, and having decided that a successful outcome requires a strategic effort, we might well attack, first, enemy strategic capability, in order to protect us from subsequent retaliation in kind, and, second, the forces specifically threatening the allied nation concerned. In this case, I believe the desired objective could be achieved without unlimited attack on the enemy population or the overthrow of the enemy government. This would fit our definition of a general war *but* not an unlimited war, and our capability to act in the above manner is clearly the best deterrent to the assumed act of possible aggression.

From this example it is easy to see that there can be more than a subtle difference between the military requirements for general war and for unlimited war. I shall have more to say on this after we consider the definition of limited war.

Limited wars can be defined as wars in which the full armed strength of the major participants is not overtly engaged and their populations and economies are not subject to direct military attack. Limited wars are generally characterized by sanctuaries, selective application of force, and the implicit desire by all parties to keep the military action localized and the political objectives circumscribed. Under these conditions, and by this definition, the objective of the major powers must be such that their national survival is not directly at stake.

There are many historical examples of limited wars—more in fact than there are of general wars—at least from the US point of view. Losses anticipated in a general or unlimited war, in the past, did not threaten national survival until the advent of airpower extended the battle-

field to all parts of the opposing nations. Thus, unlimited war is a product of the atomic age, and general war is the result of airpower with global accessibility. This accounts for the fact that military historians have never adequately dealt with the relationship between unlimited, general, and limited war in the modern sense. It also helps to explain why there is now a need to see clearly in these matters if the military is to have a sound defense policy in the atomic age.

Another relatively new concept is that of deterrence. Deterrence was a recognized objective in the past but never to the extent that the military capability was influenced primarily by this consideration. Today, however, deterrence has assumed such importance that defense structures are frequently oriented more for their deterrent effect than for their war-winning possibilities. It is important, therefore, that we understand the basic possibilities and limitations of deterrence as well as the different types of war we might have to fight should deterrence fail.

So much has been said about deterrence in relation to national survival that there is a growing tendency to orient the national military organization, and particularly the general-war forces, solely toward this goal. While deterrence of war is clearly a desirable objective, the military planner cannot overlook the possibility that it will not succeed. It is more a political than a military objective since deterrence aims at the national decision rather than at enemy forces. As such, from the military point of view, a national defense organization, while contributing to deterring war, cannot allow preoccupation with deterrence to detract unduly from its main purpose of successfully prosecuting war of any type, should it occur. This is an important consideration since the military capabilities associated with deterrence are not necessarily synonymous with those best suited to fighting, either in limited or general war.

Deterrence is achieved by a combination of military and nonmilitary measures, actions, and capabilities, designed to dissuade a potential enemy from deliberately initiating limited or general war, by convincing him that the cost and the risks involved outweigh his chances of gain. By this very definition, an adequate deterrent force is not necessarily an adequate fighting force, although an adequate fighting force acquires deterrent capability as an extra dividend.

For example, it can be argued that the ability to destroy a very high percentage of an aggressor's population under any given set of circumstances meets the requirements of deterrence of general or unlimited war. This ability, however, without the accompanying capacity to destroy the enemy's military threat, is certainly not the best way to ensure a successful outcome should the deterrent fail, nor will it deter limited wars wherein the objectives of both sides do not warrant risking mutual annihilation.

Another word which has assumed importance in public discussions on national defense is "retaliation." When one speaks of modern military capabilities in connection with deterrence or with prosecuting a war, the free world tends to qualify the military effort as being a retaliatory effort. The intent is obviously and properly to imply that the onus of initiating the conflict is on the other side. As in the case of deterrence, however, the use of retaliation in connection with our military effort tends to mislead some people with respect to the situation that might actually exist at the onset of a "hot" war.

Mr. Dulles, in speaking to the Senate Foreign Relations Committee, in June 1958, stated: "I think it is important

in estimating these things to bear in mind that a calculated attack would be made only if it were a prior calculation that it could so destroy our capacity to *retaliate* that the *homeland* of the attacker would be relatively immune. We do not believe that there is, or at any predictable time will be, a capacity to so knock out our *retaliatory power* that the homeland of the attacker would be immune. We believe, therefore, that we have, and will continue to have, an effective deterrent." (Italics supplied.)

The use of the word "retaliation" in the above context, while technically correct, frequently conveys to the general public meanings beyond those actually intended. The principal one is the assumption that, when the word is used in conjunction with strategic general-war forces, it implies that the enemy's act of aggression leading to our "retaliation" must be a general-war act and/or include an attack against the US proper or against US forces. This is not necessarily correct.

From a military point of view, we must make it clear that "retaliation" in no way defines the location or scope of our response, the size of forces involved, or the nature of the act of aggression.

"Retaliation" also tends to convey the idea of "revenge." Obviously, no sound national defense policy can be based on revenge, nor can the military concern itself with planning and developing forces for military operations which do not contribute to the outcome of a conflict in a measurable way. To avoid such implications it seems desirable to minimize the use of the word "retaliation" in connection with military operations. While we can properly state that our policy is to retaliate in response to an act of aggression, we do not do so with "retaliatory forces" or by "strategic retaliation."

Presently, the US is committed to defend its NATO allies. While this commitment does not necessarily spell out exactly how this would be done in the event they are attacked, allied faith in our ability to defend them in an emergency must be largely based upon the presumption that, if necessary, we will use our general-war forces for this purpose. Thus, any misuse of the word "retaliation," to the effect that our general-war forces will respond only to an attack against America, confuses the issue and reduces allied confidence in the US.

Let us now return to the interrelationship of general and limited war as this may affect national forces and defense activities. We have made a distinction among unlimited, general, and limited war, and we say the requirements for deterrence are not necessarily synonymous with the requirements for war. We now also understand that a retaliation policy by no means precludes taking, under certain circumstances, the strategic initiative with its attendant deterrent and war-winning advantages.

A sound defense posture must first of all assure the national survival, together with an acceptable outcome to general war regardless of how it starts. In addition it must provide an optimum deterrent to unlimited war and the maximum possible deterrent to both general and major limited war. The principal difference here lies in the fact that, since one cannot postulate an "acceptable outcome" to unlimited war, the best one can do is deter it, whereas this is not true of limited atomic wars or even of some general atomic war situations.

The likelihood and size of future limited wars will depend on national ability to deter limited aggression. Since an enemy obviously will not initiate a local attack unless he calculates that he has local military superiority, effective deterrence of limited wars calls for having either superior military defenses at all threatened points, or a general-war capability whose possible use would more than compensate for the lack of local superiority.

To match an enemy local war threat at all points would

mean that the free world must maintain several times more over-all force than the enemy. This stems from the fact that the Communist bloc enjoys inside lines of communications when it comes to shifting its strength to its various borders, and because the free world has been unable—even in NATO—to realize the benefits of a collectively balanced effort. National requirements and aspirations result in much duplication and in the financing of forces in many countries which cannot be counted as assets in either limited or general war with the East.

Thus, it would seem unrealistic for the free world to attempt to build or deploy forces adequate to deal locally with any and all possible acts of aggression, nor is this necessary. Early NATO plans attempted to provide for an adequate defense in Europe independent of the global strategic effort. After this effort had been costed out at the NATO Lisbon Conference of 1953, this concept gave way to one that recognized the complementary nature of the US strategic and local defense efforts. The lessons of Lisbon notwithstanding, I still hear people advocating the development of forces to deter and fight all wars outside the US on a limited basis, on the questionable assumption that such forces can be paid for out of the very cuts in the strategic effort which will invite the attack.

If one rejects the idea of maintaining standing forces in all vital areas of the free world that are adequate to deter or fight successfully without the support of the global strategic effort, we must consider whether it would be realistic to rely for the defense of these areas on post-D-Day deployments from the US or other allied areas. This was the classical US approach to overseas defense in the pre-atomic age of wars of attrition where the relatively slow pace of destruction with TNT weapons permitted a holding and buildup phase to precede decisive military operations.

Since Hiroshima it has become more and more difficult to conceive of a major war of attrition. This is not due to military choice, but to the fact that the atomic weapon has conferred on major powers the ability to build and stockpile in peacetime the maximum destructive power that their most sanguine plans call for. Under these conditions any atomic war must envisage the delivery of these weapons from the onset.

In atomic war the initial phase will no doubt be the decisive phase. There can be no holding or buildup requirements except as needed to provide additional delivery means for the weapons in stock. Under these circumstances, reliance on post-D-Day deployments cannot hope to deter major limited wars if the aggressor is prepared to use tactical atomic weapons, for in this case the time factor becomes crucial, and deployments through ports, airfields, or across beaches are all too easily interdicted with nuclear weapons.

The only remaining course of action is to rely on the over-all general-war capability to deter or defeat local aggression. I submit that this can and must be done, as it has to date, and without necessarily invoking the concept of massive retaliation.

An aggressor can rationally begin a limited war only in an area where he is reasonably certain that our national policy will preclude our responding to the extent of general war, or, if he considers that his general forces are strong enough to deter us from extending the war regardless of the threat it may present to our survival or that of our allies, notwithstanding the fact that he offers us the initiative.

The ability of the strategic force to attack and destroy the existing long-range air and missile threat to this country, given the initiative, is the major deterrent to aggression, particularly in Europe. This deterrent is not syn-

(Continued on following page)

onymous, however, with the so-called concept of massive retaliation as generally understood. Massive retaliation relates principally to what happens after the enemy tries a surprise attack against the US proper. The deterrent to an attack of this nature lies in the Strategic Air Command's capability, even after having been hit first, to strike back, "retaliate," with sufficient atomic power to wipe out the enemy's major urban centers. This is massive retaliation. The targets are cities; the forces used are those that survive the initial attack; and the objective is to devastate the enemy nation to the extent that it would not be able to capitalize on its act of aggression.

Now, the ability to destroy cities—the main target of massive retaliation—may constitute a deterrent to surprise attack against the US. It does not, however, in any way deter aggression anywhere else in the world, including NATO. What has deterred aggression in Europe and in other vital allied areas for the past ten years has been primarily the counterforce aspect of the general-war capability, backed up by the expressed willingness to use any and all forces to defend the free world if it should become necessary.

Why is it the counterforce capacity of our strategic force that deters major limited acts of aggression, and not the so-called massive retaliatory or city-bombing capacity? Principally because massive retaliation, with cities and peoples as the primary target, would be invoked only as a last resort, and the enemy knows this. In a case of this nature, the enemy long-range forces have already hit us and our reduced strength limits the number of targets we can engage. Under these circumstances it appears neither profitable nor possible to destroy the enemy military threat *per se*—instead we are obliged to go for the jugular vein of the nation for lack of a better military objective. This is unlimited war, which by our earlier definition neither side would rationally initiate since the outcome would border on mutual annihilation.

On the other hand, the counterforce capability of the strategic general-war forces constitutes the one threat to an aggressor which, if exercised effectively, would lead not to mutual destruction but to the defeat of the aggressor. The one thing the Communist powers can never afford to do is surrender to the free world the strategic initiative under conditions where our exploitation of it—should we accept the challenge—would result in the destruction of their military capability to attack the US. Fear of this is the real deterrent to major limited aggression.

This leads to the conclusion that limited war can only occur under conditions which specifically relate to the general-war capability. In other words, without a fully effective general-war capability, the US cannot respond effectively to an act of limited aggression.

Should the national general-war capability become suspect as a result of policies which preclude its use except in a case of last resort, wherein US survival *per se* is at stake, or should it become suspect as a result of decreased emphasis on the development and production of our general-war forces, or a combination of these two considerations, we would clearly invite a major limited aggression in any and all areas where an aggressive enemy could hope to obtain local preponderance of force.

An enemy nation will be most effectively deterred from attempting major acts of limited aggression if and when he can be made to realize that the US has both the *will* and the *physical capability* to retaliate with our general-war forces, and that, should we do so, the resulting possession of the initiative will lead to our destroying the enemy's general-war capability without invoking massive

retaliation, but in such a way as to prevent him from achieving his limited objectives.

Because strategic general-war forces have the capacity for massive retaliation, in the event an aggressor should initiate unlimited war, does not mean that they cannot also be organized and equipped for more selective employment in a lesser situation. In that case the nation's general-war forces are called upon to deal with the lesser threat but without the need for prior redeployment. Their known ability to do this, and the nation's stated intentions to use them, if necessary, in this manner constitute the best possible deterrence to limited war.

Regardless of its deterrent value, however, a sound, flexible, and adequate general-war defense and strategic offense posture is becoming more important than in the past, since the likelihood of a general war developing out of lesser conflicts is growing daily. This stems not from any reappraisal of enemy intentions but from the steady improvement in the Communist ballistic missile and long-range bomber threat.

When and if the enemy's military capability leads him to believe that he has achieved a favorable position vis-à-vis our general-war capability, he will undoubtedly become more adventurous politically and militarily, since he will become less concerned about the possibility of our responding with our general-war forces in answer to lesser acts of aggression. This, in turn, will enhance the risk of general war.

An objective study of the relationship between the general-war and limited-war requirements, therefore, suggests that the free world defenses are best served by continuing to generate and maintain a general-war posture capable of deterring both general and major acts of limited aggression. This requires that the nation's general-war force structure has a selective counterforce capability, which can be used either in response to acts of limited aggression or in retaliation for a surprise attack against America. It also tends to make suspect the implication in many current writings that the US is not devoting sufficient attention to the development and maintenance of forces specifically designed to meet the limited-war threat wherever it may appear.

In the final analysis it is the so-called big-bomb capability that prevents limited war in areas of real concern to our security. This capability, however, is not necessarily synonymous with massive retaliation. Admittedly, there are areas where limited conflicts may occur and where neither our commitments nor our interests require us to respond with the general-war forces. In these areas we can anticipate limited military operations, and we should maintain a capability for this purpose.

On the other hand, any area of the free world whose loss is of sufficient concern to the US to warrant the commitment of the general-war capability for its preservation requires only token local defenses of shield forces. This being true, provided we maintain the necessary general-war posture, we can keep our limited-war requirements quite modest.

Failure to maintain the flexible counterforce capability we now have in our strategic effort will lead to establishing unlimited requirements for local defense operations. This is a policy which could lead to political, economic, and military bankruptcy, and which would almost inevitably spell defeat.—END

The views expressed in this article are the author's own and do not necessarily reflect the views of the US Air Force or the Department of Defense.

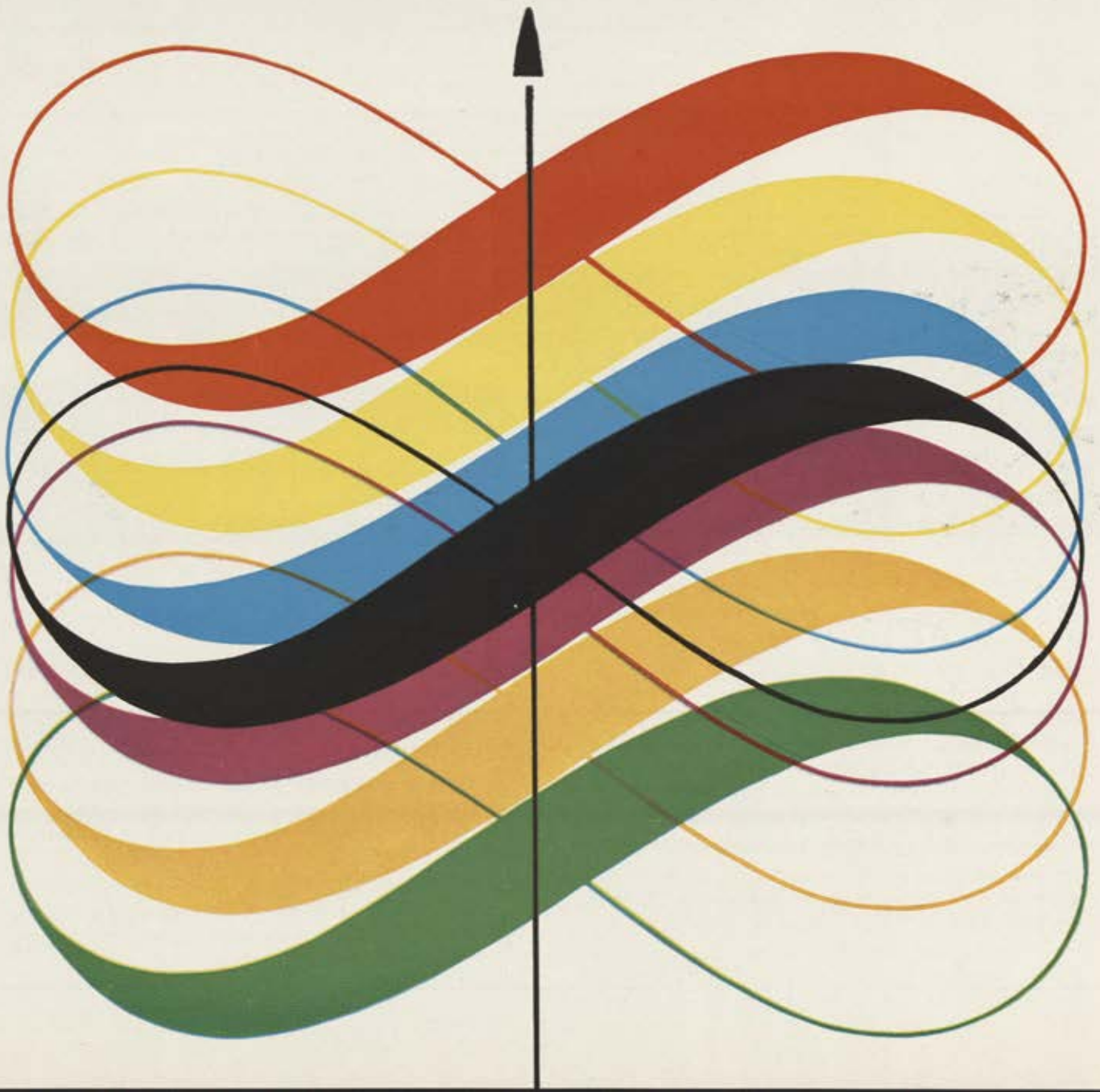
March • 1959

SPACE



DIGEST

THE SPACE AGE IN PERSPECTIVE





Marquardt

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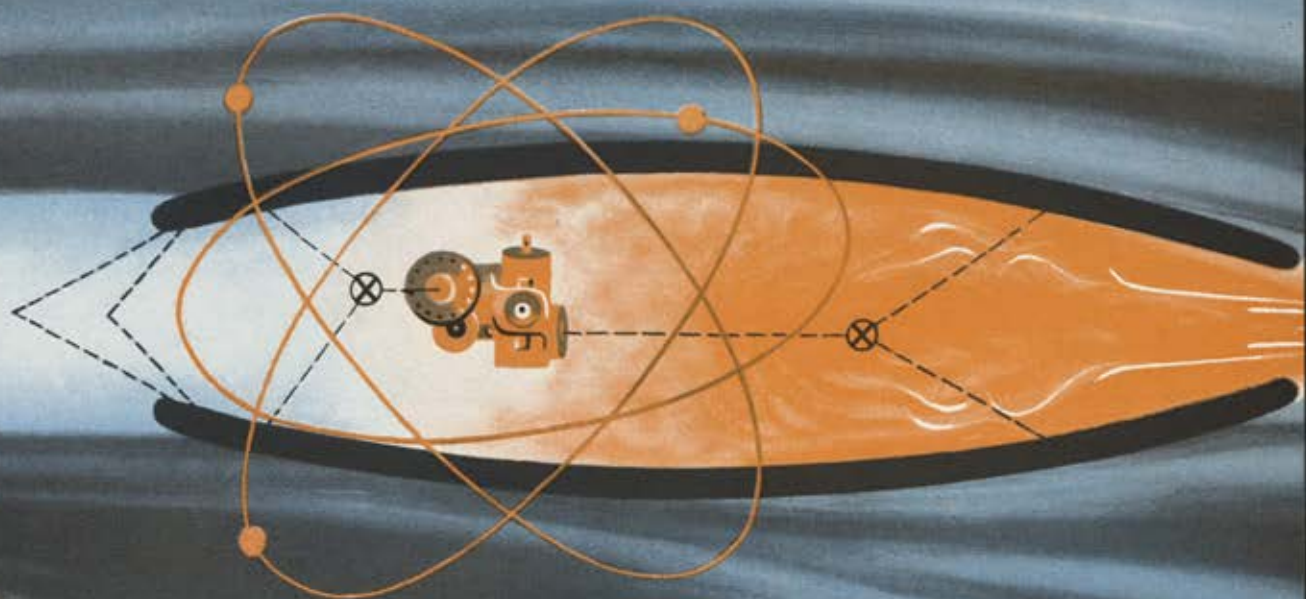
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SPACE DIGEST

• CONTENTS

Project Mercury . . . First American into Orbit	62	<i>William Leavitt</i>
Target: Mars	66	<i>Clyde W. Tombaugh</i>
USAF's Department of Space Medicine . . . After a Momentous Decade	71	<i>William Leavitt</i>
Space, Science, and Education	72	<i>Donald W. Douglas</i>
Bombing from Satellites	76	<i>From the House Space Committee's Space Handbook</i>
Congressional Space Committees . . . Watchdogs and Fact-Finders	77	
The Senate Standing Committee on Aeronautical and Space Sciences	78	
The House Standing Committee on Science and Astronautics	82	
Speaking of Space	84	<i>Michael B. Miller</i>
A Scientist Ponders Faith	94	<i>Warren Weaver</i>



From the Editors...

IN THE face of the continuing (and highly necessary) public discussion and inquiry into the state of our astronautical art, it is refreshing to mark events like the tenth anniversary celebration last month of the Air Force's Department of Space Medicine. They underscore the fact that—as in all scientific areas—there are always men of great vision who see beyond their time. The men who sparked the establishment of Space Medicine, and their colleagues at other Air Force aeromedical centers, men like Col. John Paul Stapp, never doubted that someday man—by whatever necessity—would open his exploration of the universe.

Since World War II—plagued by low budgets and probably some official scoffing—they have

devoted thousands of hours to the compilation of the basic knowledge needed for that "someday."

Under international pressures, the "someday" and the money to pay for it may arrive earlier than anticipated by the men who dreamed of it.

Today, millions of words are written, in both the scientific and popular vein, on the subject of space. Much of the copy is written by people who a few years ago thought space was strictly fantasy. Indeed, it is no criticism, rather a tribute, that most people who think are today getting as fast an education in the subject as they can.

But it is a far greater tribute to the prophets of space medicine who gathered at San Antonio last month that today's miracles were no surprise at all to them.

"He will be a university graduate, with a degree in physical sciences or in engineering. . . . He will have graduated from one of the military test pilot schools, and will have a minimum of 1,500 hours of flight time in his logbook. . . .

He will be younger than forty and not taller than five feet, eleven inches. In superb condition, he will possess the physical and psychological attributes suited for spaceflight, as determined by top aeromedical specialists. . . ."

FIRST

—T. KEITH GLENNAN
NASA Administrator

HIS NAME, rank, and serial number are unknown today, but within eighteen months to three years, the most precisely chosen test pilot in the history of flight will board a cramped, cone-shaped "cabin," probably at the Air Force Missile Test Center at Cape Canaveral, Fla., be strapped onto a form-fitting contour couch, and be blasted into an orbit approximately 150 miles above the earth. He will circuit the planet at an incredible 18,000 mph (once around the globe every ninety minutes). How many circuits he will make is a question that cannot be answered now; the probable maximum time of the mission would be twenty-four hours. But it is more likely that one or two successful orbits, then the crucial business of safe reentry, will be the program.

Certainly *one* successful orbit and safe landing of the human pilot will be considered a monumental success by the managers of Project Mercury—the National Aeronautics and Space Administration, backed by the missile and medical know-how of the Air Force and other services.

If all goes well—and the talents of thousands of technical personnel combine to make that "if" as small as possible—the orbiting man will re-

turn safely to earth to tell his story. If he makes it, his historic journey will spell a giant yes to the question: Can a man endure the stresses of spaceflight, the awful increase in body weight during the acceleration upward, the sudden shift to weightlessness in orbit, the eerie isolation from his home planet, the decelerative stresses and fiery reentry through the atmosphere as he and his vehicle hurtle earthward from nearly airless space to the lower layers where the friction of air against vehicle could vaporize him and his ship if they were unprotected?

The rocket that will take our American astronaut into orbit will be, according to best present estimates, the Convair-built Atlas. Atlas has already made the orbital flight itself as the famed "talking" (but unmanned) satellite of late 1958.

The countdown for Mercury's monumental flight will go something like this:

The Mercury capsule, with the spaceman aboard, will sit on the top of the approximately eighty-foot-high Atlas missile. Inside his new "home" the astronaut, clad in a pressure suit and strapped into his seat, will recline back to the floor. If hardware recently developed at the Air Force's Wright Air Development Center at

MERCURY

ORBIT INTO

AMERICAN

.....

WILLIAM LEAVITT
Associate Editor



Wright-Patterson AFB, Ohio, is used, the seat will be something like a netted hammock and the restrainer will be a tight cloth across the spaceman's middle with an accordion-type "control" panel he can operate even under heavy G stresses.

The air in his capsule will consist of carefully mixed helium and oxygen plus other breathable gases circulated mechanically in his closed environment. The spaceman will probably have food and drink aboard, available for use during orbit and for the time he will wait to be picked up by the air-sea task force standing by for his recovery after reentry. If he eats or drinks in orbit, it will be via devices such as suction tubes or squeeze bottles. This method is necessary because he and his capsule will be weightless in orbit.

Secured in his seat, the spaceman will be hooked up to a network of medical instruments designed to relay to the ground his every recordable physiological reaction. He will look at the world below him through a periscope device, and have radio contact—by voice—with the ground.

From the moment he enters his spaceship—the capsule to be built by the McDonnell Aircraft Corporation—a tense group of doctors and engineers and other technicians will be following his

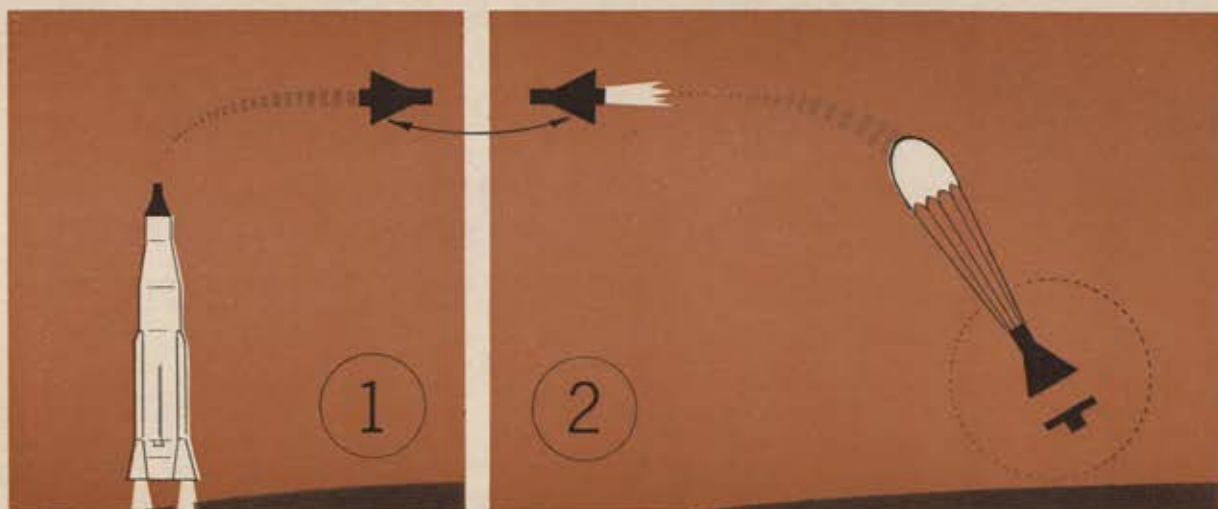
every reaction. The final countdown, unlike any other in missile history, will be under way.

Ground crews will make last-minute checks.

Then, finally the dramatic blastoff.

The next few split seconds will be vital. If anything seems to go wrong, ground control will touch off a mechanism to blast and parachute the astronaut to safety thousands of yards away from the fiery exhaust of the missile. An ambulance will rush to his landing point, what went wrong will be analyzed and reanalyzed, and the process will begin over again, days or weeks later.

If all goes well at blastoff, the astronaut will brace in his pressure suit for the seven or more Gs he will have to take on his way up. The crushing pressure will push eyes and internal organs downward against the spaceman's horizontal axis. When the missile reaches orbital velocity of 18,000 mph, the man-carrying nose cone will be separated and will begin its orbit. Man and capsule will be weightless. The capsule will then be tipped by reactor jets in airless space to a horizontal attitude, and the spaceman inside will ride facing forward. The pitch, roll, and yaw of the capsule will be controlled automatically by "sensor" jets.



This is the flight plan, as presently conceived, for the ICBM-launched, manned Project Mercury capsule. As missile-borne capsule reaches orbital velocity, it will be separated from missile (1) and ride horizontally in orbit. For descent (2) capsule will be somersaulted, come "home" bottom down, be slowed by a drogue parachute, then land, further slowed by conventional chute, after eject of heat shield.

The descent from orbit will follow this procedure:

At a critical moment, precalculated on the ground so that trackers will be able to determine the landing area, the capsule will be somersaulted by jets (probably at a ground-issued signal) and then slowed by retrorockets to start its descent.

The astronaut will again be riding with his back downward. In strong contrast to the weightlessness of orbit, the G stresses—this time pushing *up* at him—may be even more hazardous than the pressures he took earlier.

As he curves downward toward the thicker layers of the atmosphere, a drogue parachute will be released to slow his descent and lessen the enormous frictional heat of capsule against air. With the drogue will burst out metal chaff to aid radar tracking of his descent. A heat-absorbing beryllium shield on the base of the capsule will protect him and his vehicle from vaporization. Once the capsule reaches lower altitudes where a conventional parachute can operate, another ground signal will release a large landing chute, eject the heat shield, and the man will come floating home. Assuring his safe impact on land or water—and planners are now figuring on water—will be an inflatable bumper. The bumper will keep the capsule afloat as the astronaut awaits his rescuers.

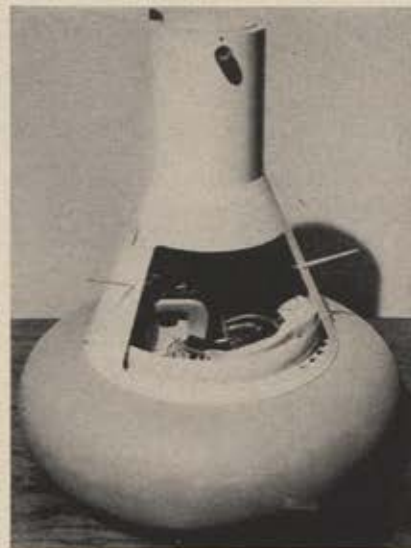
From the moment the spaceman leaves orbit, his trajectory will be plotted to pinpoint his expected landing site as exactly as possible. It will

be imperative to get to him with utmost dispatch, since the capsule will be limited in its ability to support his needs after he arrives home.

As of March 1958, the process to choose the man to perform the incredible mission described above is under way, under the technical management of NASA.

The NASA training program has made meaningful a quiet flurry of activity during recent months at such centers as the Air Force's WADC at Wright-Patterson AFB, Ohio, where since last November researchers have been putting finishing touches on screening programs for space volunteers. By late February, two screening programs—one to last five days, the other twelve days—had been completed, and by now one of them is probably in full play as an aid to the selection of the twelve-man team to be chosen from the thirty-six volunteers who in turn have been chosen from the nucleus of 110 Air Force, Navy, and Marine pilots called to Washington during February for briefings on the mission by NASA. From the final twelve-man team selected will emerge, just prior to the mission, the Mercury Astronaut who will perform the mission.

What will the screening be like? If WADC's plans are any indication, the thirty-six volunteers will be going through a regimen of thorough physical examination, deep psychiatric interviews, isolation chamber tests, subjection to centrifuge accelerations, performance tests in heat, noise, and pressure chambers. They will be measured



Model of the Mercury capsule. At left, cutaway shows position of pilot at launch and escape system atop vehicle. Center, the vehicle after escape system is jettisoned. Right, the landing configuration with bumper inflated.

by anthropologists, have to submit to cold-water immersion of their feet to measure heart and respiratory toughness, take hard turns on automatic treadmills to check the limits of their constitutions. And they will probably take zero-gravity rides in the WADC's C-131B, whose roomy cabin allows actual floating in the air for brief periods.

Headquarters for the twelve-man Mercury Astronaut team will be at NASA's Langley Research Center, Va., where they will be assigned to the Space Task Group. The project officer for NASA will be Robert R. Gilruth. The program will be under the general supervision of NASA's Dr. Abe Silverstein.

From their Langley headquarters, the group will return for intensive training at Wright-Patterson, Randolph AFB's Space Medicine Division, missile test ranges, and, importantly, to Johnsville, Pa., where the Naval Air Development Laboratory's giant human centrifuge can take them on up-to-forty-G accelerations, sufficient to simulate reentry shocks and buffetings. The Johnsville centrifuge has already been used extensively for the training of the X-15 pilots.

The spaceman selection program will doubtless bear a strong similarity to the regimen described on these pages in May 1958 ("Blueprint for Tomorrow's Spacecrews").

Hardware development will proceed simultaneously with personnel training. Capsule mockups will be tested by technical teams, using short-range, solid-fuel boosters to take them through

suborbital trajectories. As the McDonnell capsule proves out, more powerful boosters will take the mockups through longer-range flights. Eventually animals (life-supporting containers for animals are under development at the USAF Division of Space Medicine at Randolph AFB, Tex.) will ride the capsules in ballistic trajectories. Final stages in the program will probably include animal launchings into orbit. And it is possible that Mercury trainees will take ballistic trajectory rides also. Research along that line is under way at the Army Ballistic Missile Agency.

The capsule itself? Present design gives it the appearance of a truncated cone, or as some suggest, a television tube before you fit it into the cabinet. Seven feet across at the base, the capsule is expected to weigh about a ton. Both ends of the cone will be blunt and covered with heat-absorbent material, probably beryllium. The capsule will be about twenty-nine feet high, including its projecting hardware, antennae, and the like.

On the day Project Mercury becomes a reality, a man-machine complex of incredible precision will have been created. But of the two components, the man—and this is regardless of the success or failure of the mission—will be vastly more important.

Whether his ancestors came over on the *Mayflower* or on the *Mauretania*, his descendants will be able to say:

"My grandfather volunteered—and was chosen—to go into orbit."—END



Our sister planet. Man someday will set foot on red sands of Mars.

TARGET: MARS

The target for balloon observations and interplanetary probes, the red planet presents mysteries of physical form and life. The answers may enhance our understanding of the earth

CLYDE W. TOMBAUGH

A CENTURY and a half ago, Herschel observed the seasonal changes in the white polar caps of Mars with his homemade telescopes, which were the most powerful of his time. He also saw bluish dark markings (maria) distributed over the reddish disk, and thought them seas of water surrounded by continents of ruddy-soiled land.

For nearly a century after, it was generally believed that Mars was a world much like the earth, except that its diameter was only half earth's and its year nearly twice as long.

In 1877, Schiaparelli, an Italian astronomer, discovered a curious network of long dark lines, which he regarded as channels, connecting the dark areas. They were mistranslated as canals. Schiaparelli continued to observe the planet carefully and assiduously, and he noted that the dark areas underwent remarkable changes in color. This seemed unbecoming for seas. Finally, he ascribed this behavior to changing depth of water in very shallow seas. Indeed, some of them seemed to dry up altogether during certain seasons.

Astronomers were never successful in seeing the virtual image of the sun reflected from the maria, which should have been possible from bodies of water. When several astronomers in 1892 saw narrow, darker streaks within the dark areas, and Percival Lowell observed that the required change in water depth to produce the changes in color would involve unthinkable quantities of water to be evaporated, it became evident that Mars was a world without an ocean.

In 1894, Lowell erected an observatory at Flagstaff, Ariz., where, until his death in 1916, he and his associates studied Mars diligently with a fine twenty-four-inch refractor. The curious behavior of the canals and the small, round, dark dots

(known as oases) especially interested Dr. Lowell. He concluded that the canals were long, narrow strips of irrigated vegetation bordering artificial water courses which transported water from the melting polar snows. The oases he thought canal junctions—probably the cities of Mars.

Lowell proclaimed the canal system a vast worldwide engineering works of a highly intelligent race of beings slowly dying of thirst. He believed that the dark maria of vegetation were the sites of dried-up seas. He overlooked the fact that such areas would be sterile with salt and possibly appear whitish if they were not too badly covered with reddish dust from adjacent deserts. . . .

But less romantic eyes than Lowell's turned to Mars. Astronomers have since given a fair description of the atmosphere and climate of Mars. . . .

First, there was strong evidence for a Martian atmosphere, if not for seas. The polar caps shrink during the planet's spring and summer. While one cap melts and evaporates, the cap in the opposite hemisphere reforms by successive deposits of frost. The transport of this vapor requires a permanent atmosphere.

The remarkable clearness of the markings and their colors in the central part of the Martian disk indicates that the atmosphere is very thin. But it does affect our views of Mars. Halfway from the center of the disk to the limb, the colors of the surface markings begin to lose vividness; and especially noticeable is the progressive fading of the rich reddish-ochre desert areas into filmy whitishness toward the limb. The density of Mars' atmosphere near the ground is estimated to be only one-tenth or less than that of earth's near sea level. Occasionally, clouds and haze obscure the surface of Mars, but far less than on earth.

After Lowell, astronomers attempted to analyze the Martian atmosphere with powerful spectrographs attached to telescopes. No trace of free oxygen could be found and only doubtful indications of water vapor. The nitrogen lines are in the ultraviolet beyond our reach because of the ozone absorption in the earth's atmosphere. But since nitrogen is an inert gas, we can reasonably assume that it makes up the bulk of Martian air. There is carbon dioxide and probably also some argon.

If Mars ever did have free oxygen in its atmosphere, what happened to it? A molecule of oxygen is relatively heavy and very little should have escaped into space. It is generally thought that oxygen combined with metals, principally iron and aluminum, to form part of the crust of Mars. Spectrographic studies suggest the formation of a mineral like feldspar. But it seems unlikely that the problem of Martian surface texture and minerals will yield easily to spectral and polarimetric analysis. The final answer can only come from an actual manned landing on Mars.

What has been deduced of the climate of Mars? The distance of Mars from the sun varies from 128,000,000 miles at perihelion to 154,000,000 at aphelion. This causes a difference in solar energy received of fifty-three and thirty-six percent, respectively, of what the earth receives. The poles of Mars are so tilted that the summer solstice of its southern hemisphere occurs near perihelion; whereas, summer solstice of its northern hemisphere occurs near aphelion. Consequently, the seasons of Mars are quite unequal in length.

The northern summers are 183 of our days (177 Martian days) and chilly; radiometric measurements indicate that mid-day temperatures scarcely rise more than a few degrees above the freezing point of water. The southern summers are 158 of our days, but warmer; the maximum temperature shortly after noon is about seventy degrees Fahrenheit. A fringe of the subantarctic zone possibly may not freeze at night at the time of summer solstice. Otherwise, the temperature drops far below freezing at night, even in the Martian tropics. The diurnal range of temperature is about 200 degrees Fahrenheit over most of Mars.

The difference in the climates of the northern and southern hemispheres has profound effects on visible phenomena. In the southern hemisphere, with its warmer summers, the maria are vividly green at times. They undergo about the fullest range in seasonal colors, from green to bluish-gray and brown. The northern maria exhibit very

little green, a neutral tint being more characteristic.

Also, the north polar cap behaves differently than its southern counterpart. Both present vast expanses of white when their respective poles become tipped toward the sun in the early spring seasons. Since the orbit of Mars is exterior to the earth's, it means that what is tipped toward the sun is also, more or less, tipped toward us for view. Accordingly, there is a seasonal displacement of the markings northward and southward on the Martian disk.

The north polar cap is exactly centered on the north geographical pole. It is quite round in shape and uniform in whiteness. At maximum, it extends down to the fifty-fifth degree parallel. When the gradual spring shrinkage is well under way, a dark-bluish band surrounds the edge, and thence retreats with the cap, getting wider as the season progresses. Lowell interpreted this band as free water in a temporary narrow polar sea. But it seems more likely that this dark-bluish band is wet ground rendered bluish by Martian atmospheric haze.

Various facts, such as shrinkage rate, the thin atmosphere and available solar energy, indicate that the snow cap can hardly be more than a few inches in depth. The water content could not be more than a few tenths of an inch. Since there are no visible breaks in the dark polar band, it would be asking too much to expect the entire polar region to be so perfectly flat and level.

By the time the north polar cap shrinks to a diameter of about twenty-five degrees in the middle of Martian May, the arctic atmosphere becomes hazy. A translucent vapor hood extends over the entire polar zone—hundreds of miles beyond the dark band, which can be seen faintly through the haze. This phenomenon occurs every Martian year at the same seasonal date. Apparently not much evaporating water is required to saturate the cold, thin air.

In Martian June, the haze gradually disappears, with some brief fluctuations. The pure white of the cap again appears but the diameter is less than eight degrees across. One major rift occurs in the cap when it nears minimum size, due to the invasion of a canal. It appears exactly in the same geographical position each Martian year, and it therefore represents a permanent feature of the landscape.

The north polar cap never disappears completely, remaining five or six degrees across for several weeks. Four of our months after the sum-

mer solstice, thin depositions of frost begin to occur in large patches in high northern latitudes. These increase in frequency and intensity. The polar caps appear to reform through a succession of frost deposits—not by snowstorms.

The south polar cap is the larger, at maximum extending to an average latitude of about forty-two degrees. It suffers a prominent dent in the Hellespontus Depressio vicinity, where it is limited to the fifty degree parallel. Thus, we have an indication that the polar cap limit at maximum size is due to temperature, particularly the noon-time frostline within which the frost can steadily accumulate.

The noontime frostline would be expected to reach to a lower latitude during the antarctic night when the planet is at aphelion, which explains why the south cap is larger. It is not unusual to see ephemeral extensions into lower latitudes toward the morning and evening limbs of the disk, but melting or sublimating back to higher latitude in the noon portion of the planet, then reforming in the late Martian afternoon. This phenomenon, of course, occurs when the antarctic region is lost in the polar night.

With the coming, near perihelion, of the southern hemisphere summer, the polar cap recedes rapidly. The dark border does not appear blue, perhaps because it is too narrow for us to perceive its color. The narrowness may be attributed to the ground not staying wet as long because of the warmer temperature. Several major rifts occur while the cap is still large. These rifts widen, finally breaking the cap up into several unequal pieces, which are referred to as the Mountains of Mitchell. Seldom does a polar haze set in, meaning that the warmer air is able to absorb all of the melted and evaporated moisture. . . .

What kind of life does Mars hold, and what are its canals?

As to life, new spectrographic evidence makes it appear likely that there is organic matter on the surface of Mars, covering perhaps three-eighths of its surface sufficiently to prevent us from seeing clearly the color of the soil. As Mars has little water, the only moisture being thin vapor diffused into the atmosphere from the polar caps during its spring and summer, we would expect any carbon-cycle vegetation on Mars to absorb water from the atmosphere to live.

This suggests "lichenlike" organisms. But, as Frank Salisbury of Colorado State University points out, lichens, as we know them, do not exhibit color changes of seasons—a pronounced

event on Mars; they are very slow growing, and consequently hard to reconcile with some of the sudden and extensive temporary darkening such as occurred over an area the size of Texas about 1,700 miles northeast of the Syrtis Major in 1954; and they are a flat life form, which is not consistent with the observed reemergence of the Martian dark areas in a relatively short time after being covered by yellow dust.

A vegetable life like that on earth must, then, be highly specialized on Mars; or Mars harbors unknown life, a parabiology, as Salisbury calls it. We know the polar caps are water. Gerard Kuiper of McDonald Observatory has shown the atmosphere of Mars to contain 1.8 times the carbon dioxide of our atmosphere. Hubertus Strughold has discussed at length some very significant factors in cell physiology under the severe conditions of Mars. The ingredients for a life and a photosynthesis within our imagining are definitely present on Mars.

Another important factor for life processes as we know them is protection against the lethal-ultraviolet radiation from the sun. On earth, nature provides this protection in the form of an ozone layer, which exists between twenty and thirty miles above the ground. Dr. Kuiper found no traces of ozone on Mars. Neither did he find any sulphur dioxide, which also can absorb ultraviolet.

Photographs taken through filters which transmit violet and ultraviolet light only cannot penetrate the Martian atmosphere. Even in blue light, the photographs do not normally record surface markings. These wave lengths are intensely scattered, thus indicating that the Martian sky is dark blue in color. However, for a week or so, at certain opposition times, the Martian atmosphere suddenly becomes partly transparent to blue light, and surface markings are translucently recorded as "blue clearings." Two explanations have been suggested for this phenomenon.

Normally, the southern maria range from green to blue in color. The long dark sash, Sabaeus Sinus, running east to west only a few degrees south of the equator, is habitually bluish-green. Amazingly, when a blue clearing occurred in 1954, this marking—including the famous Dawe's Forked Bay at the west end, altogether some 2,000 miles long—suddenly turned to bright lavender or perhaps magenta! The other maria did not. Why? Can vegetation inhabiting this area shield itself by changing pigment to reflect away a sudden influx of lethal radiation? . . .

The long-time question of the meaning of the Martian canals, however, now lends itself to reasonable interpretation.

During the past twenty-five years, important contributions to our knowledge of physical conditions on Mars were made by various astrophysicists, who measured temperatures with new devices and methods, analyzed the atmosphere with more powerful spectroscopes and polarimeters, and re-evaluated various data in the light of new findings in physics. The sum total of this new knowledge reduced Mars to a world much more harsh than was previously thought. The idea of an intelligent race of Martians faded away. The canals were relegated to optical illusions.

But, during thirty years' study of Mars, I had seen over 100 of the controversial canals too well, with telescopes of great effective power, to dismiss them as unreal. This study included the canals in relation to the oases and maria. Comparison of the canals to volcanic dikes and fissures was found to be wholly inadequate, and was subsequently abandoned.

Since 1932, a dozen small asteroids were accidentally discovered whose orbits crossed the earth's, with aphelia beyond the orbit of Mars. If several were discovered accidentally near the earth, how many hundreds, unobserved, cross the orbit of Mars? The idea was very suggestive.

Over the ages, Mars must have been hit by many asteroids. Such dreadful collisions must have produced some visible marks. It was tempting to compare the resemblance of the canals to the radial fractures produced by a stone hitting a car windshield.

In macroscopic proportions, igneous rock is isotropic in strength, unlike sedimentary and metamorphic rocks. Therefore, under sudden shock, as would be produced by an asteroid hit, the igneous rock should fracture like glass. Collisions with asteroids a few miles in diameter going at velocities of the order of fifteen miles per second might well fracture a planet to the bottom of its crust and to radial distances of hundreds or even a few thousand miles. Here it should be noted that, because of its lesser gravity than earth's, the Martian crust might be as much as 100 miles thick.

Where a fracture line met the surface, a long narrow strip of shattered rock would be produced and would offer some haven to a hardy form of vegetation. This may well explain the existence of radial canal patterns and, also, their seasonal visibility produced by the moisture wave from the summer polar region. The oases, then,

would be impact craters surrounded by concentric zones of scattered rock—again, a haven for vegetation—to make dark contrast against a light felsite rock terrain.

But this is not all. It had long been noted that the maria were angularly shaped quadrilaterals and triangles, slender and broad, small and large. A planet crisscrossed with shear-lines would allow crustal blocks to move up or down in response to the internal pressures of diastrophism. There is strong evidence that this has occurred on Mars. The maria are sunken blocks (known as grabens). Some appear to have subsided to a constant depth. Others appear to be deep at one end, becoming more shallow at the other. A shallow end may be regarded as the axis of a vast diastrophic hinge. Pronounced examples of such hinges are found in the middle of the Syrtis Major, at the southern end of the Margaritifer Sinus, and many other places. The locations and orientations of these hinges are revealed by the premature thinning out of vegetation toward the close of the vegetaldarkening season.

Some maria—such as the Syrtis Major and the Mare Acidaliu—do not have fracture lines from a single asteroid impact. Such impacts may have been separated in time by millions of years. . . .

To Martian northwest, from the Trivium Charontis, lies a vast plateau called Elysium, which is probably the highest land on the planet. The area is sharply pentagonal in shape, bounded by five long canals, two of which are common to two sides of the Trivium Charontis. Except for the relatively small neighboring Trivium, the remainder of the surrounding area is desert. The northern twenty degrees parallel runs through the center. The corners of the pentagon extend 600 geographical miles from the center.

During most of the Martian year, Elysium appears much the same as the surrounding desert. By midsummer of the northern hemisphere, this area becomes white with frost except around noon. The eastern side, next to the Trivium, gets white first. Frequently the whitening develops over the entire area, but it always stops abruptly at the edges of the pentagon.

One is forced to conclude that the five sides represent enormous vertical escarpments—and just where we should expect them—along the canals. I have many times seen the entire Elysium in its late Martian afternoon as intensely white as the oval polar cap, but five-sided in shape. Because of the lesser gravity on Mars, its atmospheric density gradient must be less abrupt. To

produce such an outstanding meteorological difference must surely require altitude difference of many thousands of feet.

The distribution of the maria and desert highlands is also significant. When the Martian surface markings are plotted on a globe, the pattern becomes striking indeed. It is noted that there are three major regions of maria in the southern hemisphere and three minor ones in the northern hemisphere. Those maria in the south are approximately centered along the twenty-five degree parallel. Those in the north lie along the parallel of forty-five degrees. In each respective hemisphere, the maria are spaced about 120 degrees apart in longitude. Curiously, the lesser maria of the north have the same longitudes as southern counterparts. The great expanses of Martian desert are centered along the north twenty-five degree parallel, also spaced 120 degrees apart in longitude, but staggered so as to occupy intermediate positions with respect to the maria in both hemispheres. The pattern is remarkably tetrahedral.

What does this mean?

If we assume that the interior of Mars slowly lost heat during its past ages, there should have been a small amount of global shrinking. A spherical planet will deform in a way that will involve the least disturbance. In shrinking, then, Mars should develop a tetrahedral pattern, because the forming of the tetrahedron (solid geometric with least volume for surface area) would cause minimum change to its surface, i.e., minimum crustal buckling. A tendency for the surface to buckle would also be opposed by a thick crust and the the short crustal radius of curvature. Tetrahedral collapse of the surface of Mars should thus be expected, and so it is found.

On Mars, the maria represent the faces of the tetrahedron while the desert highlands represent the vertices. It was mentioned earlier that three great desert areas were centered along the north twenty-two degree parallel. Where is the fourth vertex? It is very near the south pole, where one would expect it. Indeed, another dissimilarity between the Martian north and south polar caps appears to be explained by it. Unlike the north cap remnant, which centers on the geographical pole of rotation, the south polar cap is off center by six degrees. An up-thrust crustal block (known as a horst) in this region would displace the pole of cold from the pole of rotation. This is a strong indication of the presence of the fourth vertex. A north polar face would favor centering of the polar cap. With the three great maria in southern

low latitude, the north polar region constitutes the fourth face, and it is just where we should expect it to be located. This comprises the major tetrahedral deformation of the Martian globe.

The distribution of ocean basins and continents on earth exhibits a similar tetrahedral pattern.

The lack of sterile salt deposits and dendritic erosional patterns is pretty strong evidence that Mars never had oceans, hence never very much water. There can thus have been no explosive volcanism depending on superheated steam.

Without oceans, water erosion, and volcanos, Mars must have a geology much less complicated than ours—one lacking sedimentary beds of rock, erosional carving (which gives our familiar talus slopes, valleys, and canyons), exposed metamorphic rock, and the kind of minerals and rocks formed through sedimentation and metamorphism, and so forth.

The planet, moreover, must lack our familiar high-level sources of energy. That prime source, solar energy, averages a little less than half on Mars what it does on earth. The geological conditions preclude the formation of coal and oil. The quantity of fuel from the scanty vegetation must be pitifully small, and the atmosphere too poor in oxygen to sustain much combustion. Thus the planet lacks a major means to smelt ores and to drive machinery. Sobering thoughts to those who are so sure that intelligent beings similar to us inhabit Mars . . . —END



Clyde W. Tombaugh, one of the country's best known astronomers, is the man who discovered the planet Pluto. As a young man, he built his own telescopes. Drawings of Mars and Jupiter which he made with a nine-inch telescope led to his employment at Lowell Observatory. It was from here he made his sighting of Pluto in 1930. He won a scholarship at the University of Kansas where he received an M.S. in astronomy in 1939. Since then he has been as astronomer and teacher at Arizona State College, the University of California at Los Angeles, White Sands Proving Ground, and currently, at New Mexico College of Agriculture and Mechanic Arts. At White Sands he contributed to the application of planetary photography to high-altitude rocket tracing. Professor Tombaugh is a Fellow of the American Rocket Society, from whose journal, Astronautics, for January 1959, this copyrighted article has been digested, with permission.



USAF's Department of Space Medicine

AFTER A MOMENTOUS DECADE

TEN YEARS ago, in February 1949, at Randolph AFB, Tex., a small band of scientists, sparked by the then commandant of the Air Force's School of Aviation Medicine, Maj. Gen. Harry G. Armstrong, set up a new shop at the famed center.

They dubbed the new operation the Department of Space Medicine. Its serious mission was basic research to prepare airmen for their inevitable invasion of airless space that is the next step beyond the aerodynamically navigable atmosphere. The vision of space medicine's pioneers—and USAF's courage in openly working at what many people considered "Buck Rogers" business—has, of course, since then been more than underscored. And last month, ten years to the day since the historic establishment of the department, a warm reunion of the founders earned headlines.

On hand to review the decade past and to predict what might come tomorrow were General Armstrong; Dr. Hubertus Strughold, first chief and now research adviser to the department; astrophysicist Dr. Heinz Haber, today scientific consultant to the Columbia Broadcasting System; Dr. Konrad Buettner, now professor of climatology and meteorology at the University of Washington; Dr. Fritz Haber, presently director of marketing and applications at AVCO's Lycoming Gas Turbine Department in Connecticut.

Joining in the celebration and forecasts of things to come were Maj. Gen. Otis O. Benson, Jr., present commandant of SAM, and Col. Paul A. Campbell, who is now chief of the Division of Space Medicine, new designation of the expanded operation. Both men are space medicine pioneers in their own right. Guests at the modest banquet marking the anniversary were Lt. Gen.

Roscoe C. Wilson, USAF Deputy Chief of Staff, Development, and T. Keith Glennan, administrator of NASA.

It was old home week for the space medics. In the officer's club at Randolph reporters covering the "birthday party" could take their choice of scientists to corner on what's next in space-flight. How do forty Gs feel crushing against you? Ask USAF Col. John Paul Stapp, veteran rocket-sled passenger and now chief of the Wright Aero Medical Center at Wright-Patterson AFB, Ohio. Or, how would a baby born in the zero-gravity conditions aboard a spaceship cope with gravity when he landed on earth? Ask Dr. Strughold. With a twinkle, he'll tell you that such an infant would probably first learn to swim, then walk.

Some of the founders' thoughts on the future:

- **DR. STRUGHOLD:** Possible discovery of infrared photosynthesis as a life process on Mars, later potential discovery of artificial photosynthesis as a human survival method in space.

- **DR. HEINZ HABER:** The need for realistic information for the public to avoid ill-founded space-cadet attitudes.

- **DR. FRITZ HABER:** Eventual routine astronomical travel, minus stringent medical requirements.

- **DR. BUETTNER:** Further advances in solution of environmental problems of space travel.

- **GENERAL ARMSTRONG:** Gradual unlocking of the secrets of the universe.

In ten years space medicine has come a long way. As it planned for its new, expanded home on the other side of San Antonio at Brooks AFB, it could look forward to even busier space-age achievements in its second decade.

—WILLIAM LEAVITT

DONALD W. DOUGLAS

Space, Science, and Education

WESTERN civilization has known the estate of the clergy, that of the nobles, the third estate of the commons, and the fourth estate of the press. Each grew to power and made lasting impacts on the institutions and way of life of the time. None seemed to hold more promise than the present and coming ascendancy of the engineer.

The pace of the technological revolution speeded by the genius of such men as Edison, Urey, Whittle—and many others—is sweeping forward and upward with a fierce vitality. The scientists and engineers are today clearing the frontiers of space. The fields of past learning are being weeded of errors and misconceptions. No longer does it appear that man's fate is to spend the balance of his time in the confining atmospheric bonds of the present, "chained to this rock and lost in the stars."

But if our habitat inexorably is to be extended, if a limitless new dimension is to be added to our way of living, the probe of that destiny will surely depend to a large extent upon the findings of pure research coupled with the ability of many specialized engineers to weld the yield of this research into the complex vehicles of space penetration.



I say "many specialized engineers" advisedly, because the past ten years have seen a growth and breadth of engineering development in our industry far beyond any comparable advance in an equivalent decade.

Today, missiles engineering has a requirement for well trained, experienced engineers and scientists in no less than eleven major categories, including, in addition to aeronautical experts, architects, chemists, metallurgists, nuclear physicists, and mathematicians. Within the major categories we must have access to the talents of more than thirty different classes of specialists, each an expert in his own field.

Basically, this requirement for more specialized talents may be attributed to the advent of the missile age.

But that, I think, is an oversimplification and deserves a bit of analysis.

Today's most pressing aim in the look to outer space is toward the admittedly difficult—perhaps unattainable—goal of full performance reliability. We want to hit—or orbit—the moon, but we don't want to do it as the result of one lucky shot.

Hence, missile design and construction have brought the need for much more advanced research by the aircraft companies themselves, work that in the past has been shared with the National Advisory Committee for Aeronautics, that agency, however, carrying the major share of the load.

It has become increasingly necessary to keep close watch on research developments country-wide, because with the "systems" concept the lack of one perfected component can effectively block the completion of a system design.

If a weapon system is under consideration, this lack makes it impossible to offer the using military service a fully developed operational proposal, which is to say no proposal can be made.

Hence, the increasing need for an accelerated "do-it-yourself" research program. Some advances come so fast that we simply can't wait for the outside development of the missing component.

This need for a greatly increased volume of independent research will require the talents and the best efforts of a highly educated and truly dedicated team of men and women, scholars who must sustain enthusiasm for their explorations in the knowledge that, of all basic research, ninety-five percent may be negative, with only five percent productive.

Which brings us to what I regard as a most serious matter, a realistic appraisal of our educational system.

It finally has been recognized that the state of the nation cannot be evaluated without including education as one of the main yardsticks.

We owe this new situation to the Russians with their supersonic fighters, their big jet transports, their nuclear explosions and their satellites. Across the skies, over every farm and city in our land, they have written the ancient truism that "knowledge is power."

It is for us vital that the nature of this change is generally understood and suitable action promptly taken.

To this end various groups in recent months have been analyzing our educational system and all of the practices, facilities, and people involved in it. They have criticized methods and revised techniques. They have made motivation surveys among the children, argued about federal subsidy, devised new aptitude tests, and sought opinions and statistics in all walks of life, even to the point of asking advice from people who, like myself, employ engineers and scientists.

Being an engineer, I must respond by first pointing out that there is utterly no basis for assuming that our educational system has failed us in any way. I can make this assertion safely because we never have had any generally accepted criteria for the end products. There is a saying attributed to a great scientist, Lord Kelvin, to the effect that "If you can't measure it, you don't know what you're talking about."

Without such a yardstick, our teaching policies could remain matters of opinion indefinitely and probably never would be mentioned in connection with the state of the nation. The system could drift through successive experiments in the name of progress, without the means of measuring that progress. The result, being leavened by the vagaries of free enterprise competition, would lead to no conclusion unless one were willing to measure the product in dollars.

Now we have had thrust upon us, for the first time, a yardstick of our educational achievements. We are confronted with a record of Russian technical progress that sets some hard new goals for us.

Looking more closely at this record, we see that the real problem and threat is not their present status, *but in their momentum.*

The threat of world domination in Hitler's *Mein Kampf* was no clearer when it first appeared than the threat that is implicit in possession of a completely modern technology for the ever-increasing masses of the Russian people who, until

twenty-five years ago, were living in the atmosphere of the Dark Ages.

It hasn't been much over twenty-five years since Russia was offering triple salaries and careers of ease to engineers and skilled craftsmen who would migrate from America and show them how to build dams, fabricate plumbing systems, and operate the simplest kind of factories.

Yet in that quarter century—in a single generation—Russia has managed to absorb the whole technology of western civilization and move on ahead in significant areas. They have their share of geniuses.

A tremendous momentum—regimented scholastic effort—was created for which the West has no ready counterpart. Nothing can take us back suddenly to the invention of the steam engine and then permit us to actually experience, in rapid sequence, all of the history of modern science. Nothing can give us the advantage of exploring thousands of theories with the assurance that each has already been confirmed empirically—and with the actual hardware proof before us.

If this were possible, the effect would be an inspiration of such breadth and power as to draw invention from the mind of the dullest student.

We would proceed step by step through the conception and construction of the first blast furnace as if it were getting its first coke tomorrow. We would participate in designing the first harvester, the first standardized machine parts, the first volume production assembly line. We would watch with the Curies for the first glow of radium, and join with Newton in the perfection of calculus, with Kepler and Archimedes standing by as contemporaries.

Somehow, we must reveal more imaginatively the glamor that will draw young minds into science at an earlier age. By some new handling of the exciting history of science and by making certain that ability and ambition are encouraged, we can match or improve the thrills and triumphs that the Russians have found in their "catching up" process. For now, in terms of momentum and national dedication, it is we who must "catch up."

I don't believe the answer is in scholarships alone although these occasionally save a promising talent that would otherwise go without further development.

Part of the answer is public backing for ample school plants in all corners of the country, financed under conditions that make federal control of education an entirely separate controversy at the policy level, and not a qualification for brick and

mortar. Let's make sure of the food before we bicker over the flavoring. This isn't centralization; it is simply unity of purpose.

Most of all, we need higher salaries, exemplary salaries, for the people who have the special talent and training to teach. We cannot depend only upon those whose call is so strong that they would starve to fulfill it. Here as elsewhere we will, in general, get only what we pay for.

May I suggest that to meet the Russian challenge, we might go further than we have in establishing incentive for the real inventors and innovators.

The Russians have the built-in advantages which accrue from a low-standard economy in which the special social and economic privileges granted their professional people give comforts which would not loom large in the eyes of their Western world counterparts.

In addition, however, major accomplishments are rewarded in very tangible fashion and I would like to advocate a similar practice. Sir George Edwards, managing director of Vickers-Armstrong and president of the Royal Aeronautical Society, points out that Tupolev and other Russian aircraft designers have received from the state large tax-free grants. . . .

To the best of my knowledge, the only comparable award in recent years made in this country was the \$100,000 which the Congress voted



William F. Friedman, the modest civilian cryptographer who broke the Japanese "purple" code during the last war.

I would propose that the federal government consider the establishment of an awards system, possibly patterned after the Nobel prizes, but preferably recognizing more categories germane to the space age. An equivalent of the \$9 million with which the Nobel prizes were endowed is surely not beyond the means of the government, which is to say, the American people.

I have a deep conviction that those people are wrong who think that this heavy emphasis on the sciences is dangerous and may produce ethical blindness, ignorance of human values, and brutish materialism.

Historically, learning in the physical sciences and learning in the humanities have seldom proceeded independently.

A revived thirst for knowledge, such as we have the opportunity now to foster as a national duty, will not be confined to technical matters.

It will merge into a revitalized respect for all learning, and finally for wisdom itself. It is this very formula—this certainty of eager migration from one field of knowledge to another—that mass psychologists tell us may eventually subvert the Russian technical community and turn them against their masters.

The Russians have learned the processes of scientific inquiry. They have the trained technicians—and the occasional genius—to continue this inquiry at a fast rate. They, too, will have their scientific breakthroughs in such exotic fields as antigravity, weather control, controlled hydrogen fusion, and spaceflight; and mingled with these pursuits that have recognizable military significance, they are not neglecting pure research, which by definition rejects arbitrary direction.

We are engaged in a contest of total technologies or societies, testing whether in the long run learning itself can best be furthered by free men or by police state slaves.

A recognized superiority in modern science, which could snowball out of the present situation, would put Russia in a position to dictate a radically different way of life to a "world of satellites," perhaps without striking a blow.

This leaves us no alternative to an all-out educational mobilization. Our situation is not fundamentally different from that of the Romans when they discovered that the Visigoths had armed themselves with swords, shields, and spears, and were about to sack the Empire.

Weapons are often different in form but never in purpose. Whole civilizations have died before when they underestimated the elemental forces and momentum that can arise overnight in some hinterland.

I am not one to minimize the difficulties ahead. A backward look over more than forty years in the aircraft industry enforces the conviction that while the future may hold many "improbables," there will be very few "impossibles."

The scientist of today must know—and be able to practice—technologies literally unknown a very few years ago. We speak a language new to mankind. Selected at random, consider: space age; nose cone; countdown; launching complex; thermonuclear; fallout; mushroom cloud; weapon system; lunar probe. Here we have the terminology of today, words and expressions which did not even exist twenty years ago.

Whether the bulk of our people will be skeptical or optimistic as we continue the exploration of space, I cannot say. There is a tendency to shrug off the efforts of our men and women of science with a "So what?" I am confident that such an unrealistic attitude will in no degree discourage the men and women of science who are engaged in learning the cosmic alphabet, the syntax of space, the grammar of the spheres.

Since the day of Daedalus and Icarus, man has been drawn toward the stars. Historically, the failure of Icarus is perhaps better remembered than the success of his father. To me, they should be held in equal esteem, for I honor the courage of the experimenters over the failure of the experiment. May their courage never wane.—END



Mr. Douglas, Chairman of the Board of the Douglas Aircraft Co., Inc., Santa Monica, Calif., delivered these remarks at the 1958 Medal Day Meeting of the Franklin Institute, Philadelphia, Pa., in acceptance of the Franklin Medal. The Franklin Institute, named for Benjamin Franklin, was founded in 1826 to further the study and promotion of mechanical arts and applied science. The oldest organization of its kind in the country, it annually presents awards for distinguished scientific achievement. In past years the Franklin Medal has gone to such men as Edison, Orville Wright, Marconi, and Albert Einstein. Mr. Douglas' remarks were originally published in the Journal of the Franklin Institute for December 1958 and are digested here with special permission.

It can be done . . .

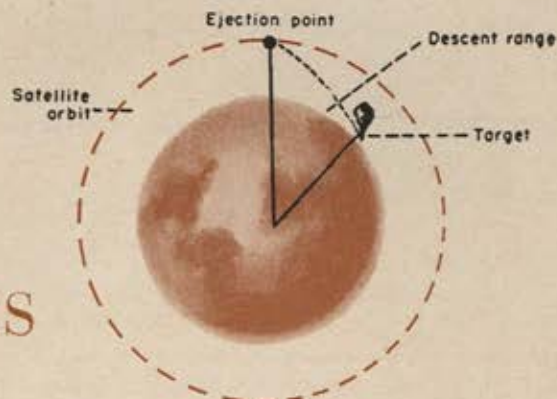
BOMBING FROM SATELLITES

Some observers—discussing strategic bombing from space vehicles—have pooh-poohed the idea, saying that anything “dropped” from a satellite would simply continue to move along in orbit with the space vehicle, unless it were ejected rearward. The precision of guidance involved in such a maneuver, they asserted, would be far more of a problem than a surface-to-surface ballistic missile launch. This negative argument was seriously questioned in the recently released “Space Handbook,” prepared for the House space committee by the RAND Corporation. The report said in essence that with exact knowledge of the satellite’s location in relation to its target, bombing is highly feasible. The RAND discussion follows:

THE feasibility of delivering devices from a satellite to the earth’s surface implies the possibility of bombing from a satellite, note of which has been taken in both the United States and USSR.

The extent of the propulsion installation required on the satellite to eject the warhead depends upon the distance to be covered by the warhead during its descent phase. If the warhead is to descend essentially straight down from directly above the target, the propulsion requirement is very severe, indeed. However, the problem quickly becomes an entirely reasonable one if distances of several thousands of miles are allowed for accomplishing descent. If the descent range is, for example, 5,500 nautical miles, descent from a 300-mile orbit can be accomplished by reducing warhead velocity by less than 1,000 feet per second. This is the approximate speed of a projectile from a 75-millimeter field gun, with reduced charge, to cover about 7,000 yards.

Some additional propulsion capacity would be needed to deflect the warhead to the right or left, since a prospective target will rarely lie directly under the satellite orbit path.



For unmanned satellites, the ejection operation can be initiated and controlled directly from a ground radar station in sight of the ejection point; or, alternatively, ejection and descent guidance could be carried out on a fully automatic basis in the satellite at any time after receipt of a general signal from the ground to proceed to the attack. The accuracy of fully automatic delivery would depend upon the performance of internal equipment, as well as upon orbit data acquired from time to time from ground installations. A critical factor is the need for very precise knowledge of attitude direction references in space. For example, an error of one one-hundredth degree in azimuth reference will cause a strike error of one nautical mile for a 5,500-nautical-mile descent range.

For such a bombing system, satellite launchings could be conducted long in advance of a war, with any desired degree of leisure in a completely peaceful environment. Propellants used in the launching rockets could be chosen for maximum payload performance, and launchings could be conducted from one or a few sites located favorably with respect to weather, population density, convenience to production and supply sources.

These features of convenience must be balanced against the fact that the rather extensive installation in a bombing satellite on orbit must operate reliably for some long period, if the replacement rate is to be held to a supportable level. Development of space-vehicle equipment with a very long reliable life is a basic necessity for a great many astronautics activities—working life spans of the order of a year or more would be representative of the requirements for interplanetary flights, various satellite missions, etc.

Bombs could also be delivered from manned satellites; for such a case, the guidance operation could include direct line-of-sight steering of the bomb-carrying missile to the target—even a moving target.—END

CONGRESSIONAL SPACE COMMITTEES

Watchdogs and Fact-Finders

CONGRESS, fulfilling its day-to-day role as the voice of the people, is playing an increasingly vocal part in the national space effort. Its mission—in keeping with the political axiom that the legislature proposes and the executive disposes—is fact-finding through investigation and staff research, and the preparation of legislation to meet the challenges of the new age.

On both Senate and House sides, for the past several years, legislators have listened to parades of military and scientific witnesses, many of whom were warning, as the nation basked in the prosperity of the first Eisenhower term in office, that only heavily stepped-up technological advance could keep us on a par with the Soviet Union and support effective US deterrence.

Forecasts of Things to Come

In those pre-Sputnik years the word “space” was rarely used or even thought of. However, reports such as the one issued after the Symington Airpower Hearings of 1956 (AIR FORCE, February '57) make prophetic reading in the light of present assertions that we are considering acceptable in the early 1960s a US numerical inferiority in operational missiles.

But, as pointed out above, the most that worried legislators could do then (as now) was to call expert witnesses, assemble fact and opinion, release reports to the public, take issue with defense and science policies of the executive, and vote appropriations that they could not force to be spent.

But not until Sputnik I shocked the nation did the attitudes and decisions that led to what AIR FORCE Magazine called a “Technological Pearl Harbor” come under close congressional scrutiny.

The most far-reaching investigation was under the aegis of the Senate Preparedness Subcommittee, chaired by Majority Leader Senator Lyndon Johnson, Democrat from Texas. The subcommittee disputed the relative unconcern of the Administration in the face of the Soviet triumph, brought to the fore a now almost universal admission of error in low budgeting US participation in the International Geophysical Year and separation of the satellite effort from the missile effort under way in the military services.

The Demand for Change

Witnesses at all the hearings during those post-Sputnik months almost unanimously endorsed sweeping changes in the government's program to meet the Soviet military, technological, and propaganda challenges.

One important idea that began to emerge in the testimony before Senate and House subcommittees after Sputnik was the need for some sort of centralized approach to the space effort. The problem

For a rundown of the membership of the present Senate Standing Committee on Aeronautical and Space Sciences, with biographical notes and photographs, see the next two pages of SPACE DIGEST.



Chmn. Johnson
D.—Tex.

LYNDON B. JOHNSON (D., Tex.), Senate majority leader, devotes major attention to state of the military. Also sits on Armed Services and Appropriations Committees. Elected congressman in 1937, served five terms, entered Senate in 1948. Born Stonewall, Tex., 1908. B.S., Southwest Texas State College, San Marcos, Tex. Married, two daughters.



Anderson
D.—N. M.

CLINTON P. ANDERSON (D., N. M.), whose forte is agriculture, came to Washington after successive periods as newspaperman, insurance man, welfare administrator. Served in Congress 1941-45, Secretary of Agriculture 1945-48, in Senate since. Born Centerville, S. D., 1895. Studied at Dakota Wesleyan, Univ. of Michigan. Married, two daughters.



Cannon
D.—Nev.

HOWARD W. CANNON (D., Nev.), a newcomer to Senate, was wartime Air Corps pilot, belongs to AFA's Las Vegas Squadron. Holds DFC, Air Medal, Purple Heart, Croix de Guerre. Reserve colonel. Formerly Las Vegas city attorney. Born St. George, Utah, 1912. B.S. Arizona State, LL.B. Arizona Law School. Married, one son, one daughter.



Dodd
D.—Conn.

THOMAS J. DODD (D., Conn.), another freshman senator, was FBI man, wartime Justice Dept. counter-spy, Nuremberg trials counsel. Congressman 1952-56. On House Foreign Affairs Committee, did studies of Mideast, Russia, Red China. Born Norwich, Conn., 1907. Ph.B. Providence College, LL.B. Yale Law School. Married, four sons, two daughters.



Symington
D.—Mo.

STUART SYMINGTON (D., Mo.), first Secretary of the Air Force. Asst. Secy. of War for Air 1946-47; chairman, Nat'l Security Resources Board 1950-51; administrator, Reconstruction Finance Corp. 1951-52. Former president, Emerson Electric Mfg. Co. On Armed Services Committee. Army 2d lieutenant, first war. Born Amherst, Mass., 1901. A.B. Yale. Married, two sons.



Young
D.—Ohio

STEPHEN M. YOUNG (D., Ohio), a first-year senator, served four congressional terms between 1932 and 1950. Ohio Assemblyman, district attorney, state official. In Army in both wars, discharged as lt. col. in 1945 after service in North Africa, Italy. Holds Bronze Star. Born Norwalk, Ohio, 1891. Attended Kenyon College, LL.B. Western Reserve. Widower, one son, one daughter.



Bridges
R.—N. H.

STYLES BRIDGES (R., N. H.), Senate's ranking Republican, also on Appropriations, Armed Services Committees. Fiscally conservative, advocates strong military services. Governor of New Hampshire, 1934-36, came to Senate in 1936. One of key senators informed of wartime atom project. Born West Pembroke, Me., 1898. A.B. Univ. of Maine. Married, three sons.



Case
R.—N. J.

CLIFFORD P. CASE (R., N. J.), a leading "new Republican," sat from 1945-53 in House, elected to Senate in 1954. New York lawyer; New Jersey legislator; president, Fund for the Republic, 1953-54. Born Franklin Park, N. J., 1904. A.B. Rutgers Univ., LL.B. Columbia Univ. Law School. Married, two daughters, one son, three grandchildren.



Kerr
D.—Okla.

ROBERT S. KERR (D., Okla.), millionaire oilman, Oklahoma governor 1943-47, senator since 1948. Chairman Kerr-McGee Oil Industries, Okla. City. Artillery 2d lieutenant in France in first war. Attended Oklahoma Baptist Univ., East Central Teachers College, Univ. of Oklahoma. Born Ada, Oklahoma Territory, 1896. Married, three sons, one daughter, nine grandchildren.



Magnuson
D.—Wash.

WARREN G. MAGNUSON (D., Wash.) Entered Senate in 1944 after serving as aircraft carrier officer in Pacific during World War II. Elected congressman 1937, left for Navy during second term. Primary concerns are reclamation, conservation. Also serves on Appropriations Committee. Born Moorhead, Minn., 1905. LL.B. Univ. of Washington. Unmarried.



Russell
D.—Ga.

RICHARD B. RUSSELL (D., Ga.), twenty-six-year veteran of Upper House, is chairman of Armed Services Committee. Second-ranking member Appropriations Committee. Leader of traditional Deep South Senators. Youngest governor in Georgia's history, 1931-33. Politically, fiscally conservative. Born Winder, Ga., 1897. LL.B. Univ. of Georgia. Unmarried.



Stennis
D.—Miss.

JOHN C. STENNIS (D., Miss.), in Senate since 1947, served nineteen-year apprenticeship in state politics. Was state representative, district attorney, circuit judge. Also on key Appropriations, Armed Services Committees. Born Kemper County, Miss., 1901. B.S. Mississippi State College, LL.B. Univ. of Virginia Law School. Married, one son, one daughter.



Javits
R.—N. Y.

JACOB K. JAVITS (R., N. Y.), Congressman from 1947-54, elected senator in 1956, also belongs to party's "liberal" wing. Special assistant in Army's Chemical Warfare Service before war, chemical warfare officer in war, discharged as lieutenant colonel. Partner, New York law firm. Born New York City, 1904. LL.B. New York Univ. Married, two daughters, one son.



Smith
R.—Me.

MRS. MARGARET CHASE SMITH (R., Me.) is only woman ever to serve in both Houses. Congresswoman from 1940-49, senator since. Committees include Armed Services, Appropriations, belonged House Naval, Armed Services Committees. Lieutenant colonel, AFRes., often champion of Reserve legislation, cited by number of Reserve groups. Born Skowhegan, Me., 1897. Widow.



Wiley
R.—Wis.

ALEXANDER WILEY (R., Wis.) was U.N. delegate, 1952-53, represented US at international economic, political conferences. Top Republican on Foreign Affairs Committee. In Senate since 1938, previously attorney, businessman. Born Chippewa Falls, Wis., 1884. LL.B. Univ. of Wisconsin. Married, three daughters, one son.

STAFF

Col. Kenneth BeLieu—Staff Director

Max Lehrer—Assistant

Glenn Wilson—Chief Clerk

Dr. Everard H. Smith—Counsel

Mrs. Eileen Galloway—Special Consultant



what is sound?

Just an annoyance?
A symphonic note?
Is it harmful?
How can it be put to use?
Waste energy?
What are its psychological
and physiological results?
What is a phonon?

A precise definition of sound is important to Allison because energy conversion is our business and sound is a form of energy. We convert the energy of sound to destroy materials, to nondestructively peer into material, to join materials without applying heat from an arc or a torch, and for myriad other applications.

Using the knowledge obtained from our inquiries, Allison is applying its systems engineering concept to new research projects. In this effort we complement our own capabilities by drawing upon the intellectual and physical resources of General Motors Corporation, its Divisions, and other individuals and organizations. Thus we increase the effectiveness with which we accomplish our mission — exploring the needs of advanced propulsion and weapons systems.

Energy conversion is our business



Division of General Motors,
Indianapolis, Indiana

As readers noted in the artist's representation of the National Space Effort published in the February issue of SPACE DIGEST, the list of components and relationships is legion.

This month's profile of the congressional role in the national space effort is the first of a con-

templated series. In future months SPACE DIGEST will attempt to explain the roles of other agencies, civilian and military, which are playing important parts in the complex process of trying to solve space age problems in a democratic context.

—THE EDITORS

of creating a stepped-up space technology for generally scientific (and propaganda) purposes without disrupting the existing military capability was lengthily discussed.

By February 1958 on the Senate side and in March on the House side, Congress acted to provide for continuing legislative review of the nation's space effort and organization. The Senate created a Special Committee on Space and Astronautics with members drawn from the Armed Services, Appropriations, Foreign Relations, Interstate and Foreign Commerce, and Government Operations Committees, and the Joint Committee on Atomic Energy. Its chairman was Senator Johnson, and its mission during the Eighty-fifth Congress was the hearing of expert witnesses called to aid the Senate in its preparation of the upper house version of the act that eventually created the National Aeronautics and Space Administration (NASA).

The House concurrently set up its 1958 Select Committee on Astronautics and Space Exploration, chaired by Majority Leader Representative John McCormack, Democrat from Massachusetts, and held its own hearings on various approaches to the creation of the proposed new space agency.

Differences in the Senate and House bills were ironed out in conference by July 16 last year. The agreed-on bill went to the President and was signed on July 29 as Public Law 568.

Permanent Committees Established

In the same month of 1958 both houses acted to create permanent committees (*see pages 78-79 and pages 82-83 for photographs and biographies of the members of these two committees*) to replace the temporary committees. On the Senate side—and now operative—is the Standing Committee on Aeronautical and Space Sciences.

Under ground rules established in Senate Resolution 327, the new committee's jurisdiction includes matters related to the NASA and other aeronautical and space activities except those primarily connected with weapon system developments or military operations. Although purely military developments are out of its bailiwick,

the committee is authorized to review, survey, and prepare reports on all US agencies in the field, including the military. Chairman of the Standing Senate Committee is Senator Johnson. In cooperation and joint session with the already existing Preparedness Subcommittee, space committee members have already embarked on 1959 investigations of our military and scientific posture. As the Senate hearings began, speculation was common that one item to be examined closely would be the present organization of the space effort.

Telling the Public the Space Story

During the final session of the Eighty-fifth Congress, the old House space committee, under Representative McCormack, distinguished itself on the public-information side, releasing a series of staff- and RAND Corporation-prepared reports on aspects of astronautics ranging from the growing awareness of the need to develop the concepts of international law to include space operations to the feasibility of strategic bombing from space vehicles (*see page 76 of this issue of SPACE DIGEST for the RAND Corporation views on bombing from satellites*).

Now under the chairmanship of Representative Overton Brooks, Democrat from Louisiana, the new Standing House Committee on Science and Astronautics has jurisdiction over astronautical developments and federal scientific agencies, including the National Science Foundation and the Bureau of Standards.

Its self-education visits to missile installations and hearings on the state of our space art and the efficacy of our space-effort organization will help form House views on space technology policies.—END

For a rundown on the membership of the present House Standing Committee on Science and Astronautics, with biographical notes on the members, see the next two pages of SPACE DIGEST.



Chmn. Brooks
D.—La.

Anfuso
D.—N. Y.

Daddario
D.—Conn.

Hall
D.—N. C.

Hechler
D.—W. Va.

Karth
D.—Minn.

King
D.—Utah

OVERTON BROOKS (D. La.), in Congress since 1936, has been a consistent backer of Reserve, armed forces legislation. In field artillery in first war in France, Belgium, Germany. Born East Baton Rouge, La., 1897. LL.B. Louisiana State Univ. Married, one daughter.

VICTOR L. ANFUSO (D., N. Y.) has focused attention on agriculture since elected in 1950. Authored bill to create US Science Academy. In OSS during war. Born Gagliano Catelferrato, Sicily, Italy, 1905. LL.B. Brooklyn Law School. Married, three sons, two daughters.

EMILIO Q. DADDARIO (D., Conn.), a House freshman, was mayor of Middletown, Conn., local judge. In wartime OSS, recalled as major in Korean War. Once pro football player. Born Newton Centre, Mass., 1918. A.B. Wesleyan, LL.B. Univ. of Connecticut. Married, three sons.

DAVID M. HALL (D., N. C.), another newcomer, is a paraplegic, has been confined to wheelchair for twenty-

five years. Served in state legislature. County attorney, law firm partner. Born Sylva, N. C., 1918. LL.B. Univ. of North Carolina. Married, three daughters.

KEN HECHLER (D., W. Va.), also a first term, was Truman's research director, helped FDR prepare papers. Lt. col., Army Reserve. Landed at Normandy. Born Roslyn, N. Y., 1914. A.B. Swarthmore, M.A., Ph. D. Columbia. Was political-science teacher. Unmarried.

JOSEPH E. KARTH (D., Minn.), another freshman, sat in state legislature 1950-58. President local labor union; international representative, oil, chemical, and atomic workers' union. Born New Brighton, Minn., 1922. Attended Univ. of Nebraska. Married, two sons.

DAVID S. KING (D., Utah), Mormon church worker, law teacher, son of former senator, is also in his first term. Local attorney, business director. Born Salt Lake City, Utah, 1917. A.B. Univ. of Utah, LL.B. Georgetown Univ. Married, five sons, one daughter.



Teague
D.—Tex.

Wolf
D.—Iowa

Bass
R.—N. H.

Baumhart
R.—Ohio

Chenoweth
R.—Colo.

Fulton
R.—Pa.

McDonough
R.—Calif.

OLIN E. TEAGUE (D., Tex.), wartime infantry hero, in House since 1946. Chairman, Veterans Affairs Committee. Discharged as colonel, wounded, decorations include Silver, Bronze Star and Croix de Guerre. Born Woodward, Okla., 1910. B.S. Texas A & M. Married, two sons, one daughter.

LEONARD G. WOLF (D., Iowa), new in the House, owns a farm supply company. Traveled extensively in 1957, has lectured since. Navy veteran, World War II. Born Dane County, Wis., 1925. B.S. Univ. of Wisconsin. Married, one son, two daughters.

PERKINS BASS (R., N. H.), lawyer, banker, has been in House since 1954. AF intelligence officer in China in war, wears Bronze Star. Former state legislator. Born East Walpole, Mass., 1912. A.B. Dartmouth, LL.B. Harvard. Married, three sons, two daughters.

A. D. BAUMHART, JR. (R., Ohio), a naval veteran, is in his fourth House term. Previously state legislator, glass

firm publicity man, executive director, Republican Nat'l Comm. Born Vermilion, Ohio, 1908. A.B., M.A. Univ. of Ohio. Married, one son.

J. EDGAR CHENOWETH (R., Colo.), in the House since 1940, actively sponsored Colorado Springs as site of AF Academy, chaired its Board of Visitors. Was local lawyer, district attorney, judge. Born Trinidad, Colo., 1897. Married, three sons, two daughters.

JAMES G. FULTON (R., Pa.), a naval veteran, is a lawyer, owns a farm and a small newspaper chain, has been in the House since 1945. On Foreign Affairs Committee. Born Pittsburgh, Pa., 1903. A.B. Pennsylvania State, LL.B. Harvard. Unmarried.

GORDON L. McDONOUGH (R., Calif.), in his eighth term in the House, previously was chairman of the Los Angeles County War Council. Initially a chemist. Leader of California congressmen. Born Buffalo, N. Y., 1895. Married, five sons, two daughters.



McCormack
D.—Mass.

Miller
D.—Calif.

Mitchell
D.—Ga.

Moeller
D.—Ohio

Quigley
D.—Pa.

Roush
D.—Ind.

Sisk
D.—Calif.

JOHN W. MCCORMACK (D., Mass.), majority leader, is in his thirty-third year in the House. Previously six years in state legislature. Headed space committee last session. Army veteran of first war. Born Boston, Mass., 1891. Boston public schools. Married, no children.

GEORGE P. MILLER (D., Calif.) has sat in House since 1944. Previously state official, legislator. Served on House Armed Services Committee. Field artillery lieutenant in first war. Born San Francisco, Calif., 1891. B.S. St. Mary's, Calif. Married, one daughter.

ERWIN MITCHELL (D., Ga.), beginning his second House term, is Air Force veteran of World War II and Korea, wears Air Medal. Member Veterans Affairs Committee. Born Dalton, Ga., 1924. LL.B. Univ. of Georgia. Married, two sons, one daughter.

WALTER H. MOELLER (D., Ohio), has been a Lutheran minister for twenty-two years. Pastor, farm owner, college instructor. Born Indianapolis, Ind., 1910. Or-

ained Concordia Seminary, Ill.; A.B. Defiance College, Ohio; M.S. Univ. of Indiana. Married, one daughter.

JAMES M. QUIGLEY (D., Pa.) is a House returnee, having served in the 1954-56 session. Navy Pacific war veteran. Also member Veterans Affairs Committee. Born Mt. Carmel, Pa., 1918. A.B. Villanova Univ., LL.B. Dickinson. Married, four daughters, one son.

J. EDWARD ROUSH (D., Ind.), new to the House, is an Army veteran of World War II and Korea. Served in the state legislature and was county attorney and private lawyer. Born Huntington, Ind., 1920. A.B. Huntington College, LL.B. Univ. of Indiana. Married, two sons, one daughter.

B. F. SISK (D., Calif.), in his third term, worked as a civilian flight dispatcher for the Air Force in the war. Farmer, tire distribution company sales manager. Born Montague, Tex., 1910. Attended Abilene Christian College, Abilene, Tex. Married, two daughters.



Martin
R.—Mass.

Osmers
R.—N. J.

Riehlman
R.—N. Y.

Van Pelt
R.—Wis.

JOSEPH W. MARTIN (R., Mass.), recently-replaced long-time leader of House Republicans, has held his seat since 1924. Previously local newspaperman, publisher, state legislator from 1912-17, businessman. Became major national party leader in early 1930s, presided over five successive conventions. Born North Attleboro, Mass., 1884. Attended state public schools. Unmarried.

FRANK C. OSMERS, JR. (R., N. J.), was a combat infantry major during the war, wears Bronze Star, sits on Armed Services Committee. Businessman, magazine and newspaper publisher. Served two terms before war, now in fifth since. Mayor, town councilman, New Jersey state legislator. Born Leonia, N. J., 1907. Attended Williams College, Mass. Married, one son, one daughter.

R. WALTER RIEHLMAN (R., N. Y.), a small businessman and banker, has been in Congress since 1946. President local bank, wholesale bakery. Earlier ran general store, served as postmaster. Town supervisor, county clerk, member draft board previous to election to House. Born Otisco, N. Y., 1899. Attended Central City Business School, Syracuse, N. Y. Married, one son, one daughter.

WILLIAM K. VAN PELT (R., Wis.) has been in Congress since 1951. He owns and operates a fuel company in Fond du Lac, Wis., has long been active in state politics, states his main aims in Washington are to reduce taxes, oppose Communism and Socialism. Sits also on Merchant Marine and Fisheries Committee. Born Glenbeulah, Wis., 1905. Attended Wisconsin public schools. Married, one son, one daughter.

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Raymond Wilcove—Staff Consultant

Dr. Charles Sheldon—Technical Director

Spencer Beresford—Special Counsel

Philip Yeager—Staff Consultant

J. A. Moran—Legal Consultant

Harney S. Bogan, Jr.—Legal Consultant

Jean Cameron—Assistant Clerk

Mary Myron—Secretary

Speaking of SPACE



First Titan Launched

The USAF's newest intercontinental ballistic missile, the Martin SM-68 Titan, was launched from the Atlantic Missile Range, Cape Canaveral, Fla., on February 6. The two-stage, ninety-foot rocket performed successfully in a short-range test of the ground-support equipment, the launch-sequence controls, and the first-stage engine. For this initial flight the second stage was inactive. Several thousand gallons of water were carried in place of fuel. The 110-ton Titan, which had failed to launch in two previous attempts, was reported to have landed near the impact area, 220 miles from the launching site.

The Titan is designed for a range estimated as high as 9,000 miles, at speeds up to 17,000 miles an hour. Present USAF plans call for outfitting eleven Titan squadrons in the next few years, as part of the retaliatory force of the Strategic Air Command. They will be launched from underground installations as protection against enemy attack.

Fantasy or Reality?

Man may set his foot upon the lunar dust in seven to ten years. He will travel to Venus in ten years. A soft landing can be made on Mars in three years. Mail may become as quick as the telephone.

These were some of the predictions made by fifty-six of the world's top space experts in answer to a House Committee on Astronautics and Space Exploration query on man's achievements in space in the next decade. The House report, "The Next Ten Years in Space, 1959-1969," the sixth compiled by the committee staff, is fascinating testimony of the imagination, courage, and foresight of the scientists, military leaders, industrialists, and government men who lead our ventures into unknown space.

Some of the estimates:

Dr. Herbert York: *Men will travel to the moon and land upon its arid crust in as few as seven years, probably preceded by trips around the moon and complete mapping of its hidden far side.*

Dr. Lloyd Berkner: *The space satellite will extend our present monochromatic view of the universe to include the full range of radiations and of spectral distribution over this whole range.*

Brig. Gen. Homer A. Boushey, USAF: *Military*

manned space vehicles will be ready for defensive and offensive missions by 1967. We will have a manned lunar base for military and scientific purposes by 1969.

Arthur C. Clarke, author: *The communications satellite will be the most important step forward in the next ten years. The struggle between the USSR and the western world for the uncommitted peoples of Asia may be decided by television satellites beamed into the villages of Asia and Africa.*

Krafft Ehrlicke, Convair: *By the end of the next ten years man will have sufficient information to decide for or against a permanent lunar base and will begin to look to the planets Venus and Mars as his goals for the decade to come.*

Alexander Kartveli, Republic Aviation: *We will have a manned earth satellite by 1960, an instrumented planetary soft landing by 1963, a space station for staging to the moon and planets by 1968, and a moon base by 1970-1975.*

T. Keith Glennan, NASA: *Lunar and planetary probes will enable mapping of these areas within the next ten years; soft landings of instrumental payloads will be attempted on the moon, Mars, and Venus, and it is possible that samples of the moon's surface may be brought back for analysis.*

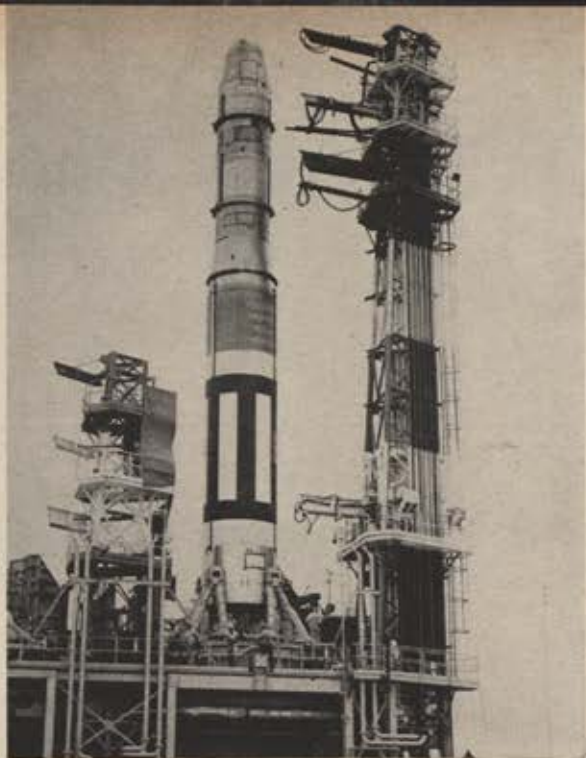
Dr. Glauco Partel, Italian Rocket Association, Rome, Italy: *Reconnaissance satellites will be in operation, both manned and unmanned; satellites will be used to disturb and jam enemy ICBMs; man will land on Mars and Venus before landing on the moon, because of easier landing conditions and less severe temperatures.*

Dr. William Pickering, Jet Propulsion Lab: *Experimental models of remotely controlled celestial observatories will be placed in orbit.*

Professor Eugen Sanger, Director of Institute of Jet Propulsion Physics, Technical University of Stuttgart, Germany: *The first interplanetary phase of manned spaceflight will begin about 1970, as man truly enters the cosmic age.*

Soviet Seven-Year Plan

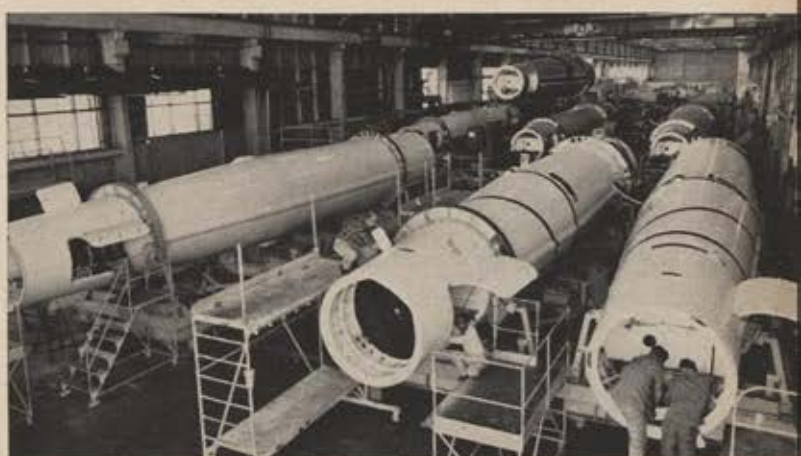
"The grandiose plans for the solution of the principal economic problem of the USSR and the building of communism in our country disclosed in the theses of Comrade N. S. Khrushchev's report at the



Ninety-foot Titan, built by Martin, powered by Aerojet-General two-stage liquid rocket engine.



First Titan, launched from Cape Canaveral on February 6, completed 220-mile trans-ocean flight.



Above, from drawing board to deployment in thirty months is the story of the Douglas Thor IRBM.

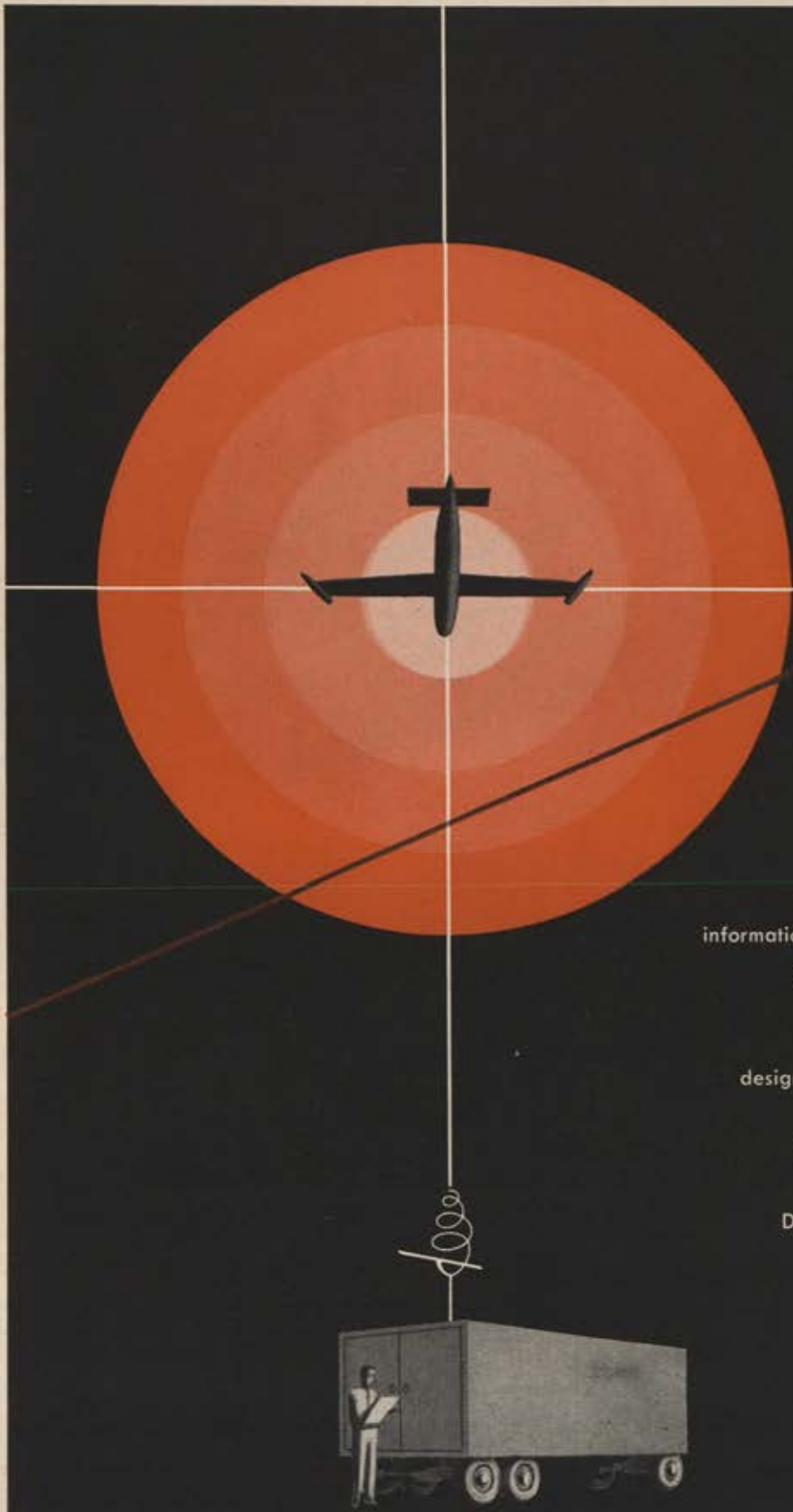
XXI Congress of the Communist Party of the Soviet Union call upon all persons who are active in Soviet science and technology to perform new acts of heroism."

These are the words of Soviet Academician Alexander Nesmeyanov, President of the USSR Academy of Sciences, in an article in *Pravda*, December 1, 1958. Thermonuclear energy, space vehicles, computers, automation, chemistry, prospecting, medicine,

and biology and the social sciences were among the areas requiring the attention of inspired Soviet scientists. Perhaps less "grandiose" than expected in the space area was Nesmeyanov's call for "the development of new means of astronomical research both with the help of new powerful political and radio technical instruments and with the help of space rockets and artificial satellites which permit carrying the instruments beyond the earth's atmosphere."

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for
miss-distance
detection

FIRETRAC
firing error
trajectory recorder
and computer



Aerojet's FIRETRAC is a highly accurate system for measuring the relative trajectory, velocity, and miss-distance of a missile with respect to a target drone at which it is fired. This information permits rapid evaluation of missiles, guidance systems, fire control systems, and training operations. FIRETRAC configurations have been designed for the following drones: F6F, F9F, QF-80, KDA (Q-2), KDB, and QB-47. Installations for drones of other types can be provided as required. Designed and developed for the Navy's Bureau of Aeronautics, FIRETRAC is a product of Aerojet's Ordnance Engineering Division at Frederick, Md.

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SPEAKING OF SPACE

National Science Policy

Dr. Lloyd V. Berkner, president of Associated Universities, vice president of the special committee on the International Geophysical Year, past president of the International Council of Scientific Unions, president of the International Scientific Radio Union, and chairman of the Space Science Board of the National Academy of Sciences, made several cogent suggestions for the future of American science in a lecture at Johns Hopkins University.

"Hardly one year ago the Russian Sputnik made us acutely conscious of our neglect of science in many important respects. The Russian success in a field where America should easily have led has forced a reappraisal of American attitudes and actions. . . ." Although impressive post-Sputnik measures have been taken, "the drastic nature of the remedies serves to emphasize the depth of our intellectual deterioration as an organized social group in the pre-Sputnik days. While we were preoccupied in our national 'witchhunt' for spies, we were seriously damaging our effort to produce anything worthwhile to spy on. During our extreme penchant for secrecy, we lost sight of the fact that our defense must be built of men and machines, of steel and concrete, and of ideas that are understood and applied; it cannot be made by pieces of paper stamped classified and locked away from sight of competent men who could use ideas for our benefit and safety."

The fusing of the creative effort of the universities, the national laboratories, the scientific institutes, the industrial laboratories, and government-sponsored scientific activities could best be organized and furthered, Dr. Berkner strongly recommends, by the establishment of a new federal Department of Science and Technology, to function close to the cabinet level.

"Am Frozen, Will Travel"?

We detect a cool breeze blowing toward prospective space travelers. *Aeronautics*, January 1959, reports on a paper given jointly by A. S. Parkes and Audrey U. Smith at the National Institute for Medical Research at Mill Hill, England, called "Space Transport of Life in the Dried or Frozen State," in which they discuss the biological problems of transporting spores, seeds, or human tourists. Since there are well known examples of spores and seeds remaining viable for hundreds or even thousands of years under highly adverse conditions, and since many lower forms of animal life sustain anabiosis at low temperatures without damage, the authors suggest that long-term suspended animation of warm-

blooded animals may be a practical aspect of space exploration. "To carry a proportion of the crew of a spaceship in a state of suspended animation would reduce oxygen and food requirements, and would ensure replacements for the animate members who on the longer journeys might begin to suffer from old age, if nothing worse."

And Dr. John Lyman, associate professor of psychology and engineering at the University of California, Los Angeles, is ready for volunteers who wouldn't mind being quick frozen to test some of these speculations. According to the January-March *Astronautical Review*, Dr. Lyman feels that an old New England legend may be basically true. The story is that when crops were poor and food scarce in New England, older people were frozen by lowering their metabolism. They hibernated comfortably during the winter and were thawed out in the spring. Dr. Lyman extrapolates that spaceman Rip Van Winkles could travel at -40 to -300 degrees and could be thawed out at the end of a 1,000-year intergalactic trip.

Who's Where

Professor Theodore von Karman has accepted the Victor Emmanuel visiting professorship at Cornell University for the spring term, 1959.

GEORGE "MOON" MEYERS—By Jack Tippit



"That's nothing compared to the earth coming up over the moon craters!"

SPEAKING OF SPACE



Left, Dr. Hubertus Strughold, first among space doctors, the 1958 winner of the Dr. John J. Jeffries Award of the IAS, for his "outstanding contributions in space and aviation medicine."

Far left, Robert Goddard, 1882-1945, was posthumously awarded the first Louis W. Hill Space Transportation Award for fundamental research on behalf of the welfare of mankind.

Lt. Col. David G. Simons, who soared to the edge of space in a free balloon flight as part of the USAF program for evaluating the hazards of primary cosmic radiation, is now head of the Department of Bioastronautics at the USAF School of Aviation Medicine at Randolph AFB, Tex.

Sir John Cockcroft, one of Britain's most distinguished scientists, has been named the first head of Churchill College, currently being established at Cambridge University, England. Sir Winston suggested the founding of a college to produce highly trained scientists and technologists. Sir John is head of research for Britain's Atomic Energy Authority.

First Annual Space Report

President Eisenhower forwarded a report on US aeronautics and space activities to Congress last month—"Year One of the Space Age." The organization of the National Aeronautics and Space Administration, the National Aeronautics and Space Council, the DoD's Advanced Research Projects Agency, and the coordinating Civil-Military Liaison Committee were listed as key advances in the national space program. Among other contributors to the space effort: the National Science Foundation, a nonoperating agency responsible for the support through grants of general purpose basic research; the National Academy of Science Space Science Board, established to study immediate and long-range problems and the international aspects of both.

The year 1958 planning for investigations of the near areas of space included research into the atmosphere, ionosphere, energetic particles, electric and magnetic fields, gravitational fields, and astronomy.

"The report makes clear," said Mr. Eisenhower,

"that the nation has the knowledge, the skill, and the will to move ahead swiftly and surely in these rapidly developing areas of technology."

Nineteenth Atlas Fired

The Air Force blasted the nineteenth Atlas SM-65 intercontinental ballistic missile over 4,000 miles of the Atlantic Ocean from Cape Canaveral, Fla., on January 28. Second in the Atlas C series, a lighter-weight model, the eighty-foot rocket's engines burned for about six-and-a-half minutes before it started its ballistic trajectory over the test range.



"Are you man or mouse?"

Drawing by Dana Fradon, © 1958 The New Yorker Magazine, Inc.



TEAM POWER

New weapon in the Air Force arsenal

The mightiest of air powers, the United States Air Force, has added a new kind of weapon to its arsenal—*teamwork* of private industry.

Defense of the free world requires unprecedented scientific achievements—new weapons systems so advanced they demand the specialized capabilities of many organizations.

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In the Crystal Ball

From the January 1, 1959, USSR *Izvestia*: The Soviet Union will have a space station circling the earth 21,000 miles above the equator by New Year's Day, 1966. Other predictions: The Soviets will have a secret plant harnessing the power of the hydrogen bomb, intercontinental ballistic rockets for mail delivery, plastics harder than diamonds.

From the Dresden, Germany, *Saechsische Zeitung*, May 3, 1958, this glimpse into the future: "For the year 2,000 Russian scientists plan to ignite an artificial sun, diameter several hundred meters, in an artificial magnetic field of the Arctic sky. It will provide twice as much warmth as the real sun and will be used for a slow melting of the polar ice."

Missile-Tracking Ship

The S.S. *American Mariner*, newly converted to a floating laboratory, has sailed on a semisecret mission to track missiles fired from the Atlantic Missile Range at Cape Canaveral, Fla. The ship was fitted with electronic equipment to provide the most precise data yet collected at sea to supplement the ground-station missile measurements. Sponsored by ARPA and the Army Ordnance Missile Command, Huntsville, Ala., the ship was modified and refitted by the Radio Corporation of America's Defense Electronic Products Division. Fifty-two civilian scientists, engineers, and technicians will operate the missile-measurement ship over its tracking range from the Florida coast to Ascension Island, halfway between Brazil and the African coast.

Speech Briefs:

Maj. Gen. Ben I. Funk, Commander, Ballistic Missiles Center, AMC, to the Purchasing Agents Association of Los Angeles, Calif., January 8: "... it costs money to get the best possible product for any given task. ... We cannot afford anything less than the best. Our annual expenditures for the ballistic missiles program of the Air Force approach \$2 billion. But, when you consider

that we are buying peace and freedom for us, our children, and the generations to come, you will realize that the price we are paying is cheap."

Lt. Gen. Clarence S. Irvine, DCS/Materiel, USAF, to the Northrop T-38 Suppliers Symposium, Los Angeles, Calif., January 19: "Industry must develop and produce the high-performance weapon systems necessary to maintain a superior aerospace power for whatever length of time necessary until a permanent lasting world peace is assured. The AF does not fabricate its own components or assemble them into a complete operational system. Therefore, it is directly dependent on industry's output to keep pace with or to stay ahead of the Soviet Union. ... The companies that have enough interest and enthusiasm for Air Force hardware, who have initiative not to wait for subsidies before going ahead on their own, and who have enough confidence in their ingenuity and skill to take calculated risks—these are in a much more favorable position for increased AF business."

Deputy Secretary of Defense Donald Quarles, on the program for developing a nuclear-propelled aircraft, February 6: "The present program gives high-priority support to two alternative attacks on the fundamental propulsion problems. Progress along these lines, while impressive, has encountered substantial obstacles. It has been paced by science and technology rather than by funding. ... The program assumes that as soon as there is a valid basis for passing from the present propulsion development phase to a weapon system development phase, this will be done."

"It is conceded that the Soviets might choose the more spectacular early flight course. If they do so at this time by building a plane of such low flight performance as to be militarily useless, we can take some satisfaction in the fact that they will have wasted some of their resources."

27th IAS Annual Meeting

Dr. Charles S. Draper, head of the Department of Aeronautics and Astronautics of MIT, and Sir George Edwards, managing director of Vick-

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SPEAKING OF SPACE

ers-Armstrongs, Ltd., were named honorary fellows of the twenty-seventh annual meeting of the Institute of the Aeronautical Sciences in New York, January 27. At the IAS symposium on aerospace technology, Maj. Gen. Donald Keirn, Assistant DCS/Development, Hq. USAF, disclosed that the USAF has made forty-seven flight tests with a B-36 nuclear test plane. General Kiern anticipates the successful development of nuclear rocket engines and predicts almost complete reliance on them for future space travel. As a further motivation for space travel, he suggested that intelligent beings existing somewhere in space may be sending out signals that are currently obscured by our atmosphere. If so, a space station outside of our atmosphere could pick up these low-energy signals.

Scientific Information

Available from the National Science Foundation, Science Information Service, Washington 25, D. C.: A new series of reports listing the sources of unpublished, unclassified scientific information in federal agencies.

Soviet Satellite Tracking

Despite Soviet claims to have a complicated system of satellite-tracking radar stations, the best US intelligence indicates that, if the network is actually a large one, it probably includes optical as well as radar stations. The organization of visual observation stations, begun before the first Sputnik was launched, reached sixty-six by September 1957, located mainly at universities and astronomical observatories. Some of these stations have been experimenting with 35-mm. cameras and aerial photography cameras modified for tracking.

The stations are constantly being refined and a few may actually have radar-tracking equipment. US conclusions are that, despite the Soviet implications, the great number of tracking stations is not a reality. Actually, their emphasis is probably on precision and refinement of a few stations and on training highly qualified observers for these posts.

—MICHAEL B. MILLER

A SCIENTIST



I BELIEVE that faith plays an essential role in science just as it clearly does in religion. I further believe that there are elements of perfection in religion that do not have counterparts in science. It is the purpose to develop here these two statements of belief—the first rather briefly, since many scientists agree on this point, and the second in somewhat more detail, since scientists tend to be shocked at a claim that religion is in any sense superior to science.

What do I mean by "faith"? The dictionary says, "the act or state of accepting unquestioningly the existence, power, etc., of a supreme being and the reality of a divine order."

I do not understand the inclusion here of the word "unquestioningly," for *acceptance* seems to me a process necessarily preceded by questioning. But, in any event, I use the word faith to refer to beliefs held so deeply, so completely, and so without reservation that one is prepared to base his life on these beliefs, even though they cannot be justified by so-called rational proof. I do not at all imply that an element of "faith" is to be established by virtue of external authority, and I most certainly do not refer to formal and formally imposed ecclesiastical dogmas. Faith is something I accept, not something which is forced upon me. Faith arises, I believe, in various and almost unanalyzable ways. Partly it arises by virtue of inner mystical experiences to which can probably be fairly applied the word "revelation." In large part, however, it develops and is sustained by actual experience.

Now, in science, is any role played by this kind of faith? The dictionary definition gives the proper beginning of the answer when it says that faith is a belief in the existence of a divine order. For the great underlying, and essentially unprovable, assumption on which all of science is based is that nature is orderly. A second great dictum of scientific faith is that the order of nature is dis-

PONDERS FAITH

WARREN WEAVER

coverable by man. A third great element of the scientific faith of Western science, and one which many accept without realizing that they do so, and without realizing that there are alternative possibilities, is the assumption that the whole quantitative time-space-mass-energy set of concepts which has been developed with the Greco-Judaic system is capable of capturing the variety and subtlety of nature. Fourthly, science assumes that logic is to be trusted as a mental tool. I hope that the reader is curious about the idea that anyone needs faith to believe in logic, for I will be saying more about this point.

Fifthly, although scientific thought has never been able to construct any generally acceptable basis for probability theory, and although we realize that science can in general make no quantitative statements about the external world other than probability statements, science proceeds on the calm faith that its statements do nevertheless have meaning and beauty. (Science, of course, has the added comfort that its statements clearly have utility.)

Sixthly, in the last thirty-five years or so it has come to be realized that—speaking of course in terms of detailed and ultimate accuracy—science actually has no capacity to deal directly with the external world. We now know that when we observe any object—an electron, a molecule, a flatiron, or a star—the process of observation inescapably affects the thing observed. It will not be misleading to say that what happens is a little like asking questions of an exceedingly delicate and sick person through a crack in the door to his room in the hospital. You call in, "How are you?" He answers, "OK." But if he is very weak indeed, the effort of making that answer may result in his death, so that the reply completely and automatically invalidates its own meaning.

When a physicist asks an electron, "Where are you?" the electron replies; but the effort of replying always moves the electron—and unpredictably

—into a new location so that the answer is automatically invalidated. With large-scale objects, like the flatiron or the star, the effect is normally very small indeed, and for that reason most of us live out our lives, dealing with ordinary objects, without noticing, or having to notice, this effect. But it is a large effect when one deals with electrons, neutrons, and the other ultimate particles; and remember that every object in our universe is, after all, made up of these particles; so if they elude description, then in a very real ultimate sense, everything does. And this effect can be of great consequence in the case of large-scale objects, as in nuclear events that lead by a chain process to very large-scale explosions. So the shocking fact is that science simply does not have detailed and precise access to what we ordinarily call the external world. Thus here again science is not "dealing with hard facts" as so many suppose, but is rather playing a subtle game with nature, all based on an unproved and unprovable faith that this procedure is meaningful and rewarding.

I think it neither necessary nor appropriate that I spend any considerable time speaking of religious faith. But may I merely call your attention to the close parallelism between some of the items of scientific faith I have just mentioned and items of religious faith. Where the scientist has faith that nature is orderly, the religionist has faith that God is good. Where the scientist believes that the order of nature is discoverable to man, the religionist believes that the moral nature of the universe is discoverable to man—some would wish to say, has been revealed to man. Where the scientist has faith that his Western system of scientific thought is capable of dealing with nature, the religionist has faith that the moral concepts of the great religions—and for us particularly the concepts of Christianity—are capable of dealing with the ethical and moral problems of man. None of these propositions can, in any formal logical sense, be "proved." But in both sets of cases, these

are the kinds of belief—the articles of faith—that men are prepared to live by.

Now, to pass to another aspect of this subject, I claim that it can suggestively, and I think convincingly, be argued that religion enjoys a certain superiority over science, in that religion has attained an actual identification with perfection, whereas science has to content itself with a never-ending, and hence never-realized, approach to perfection.

I want to say at once that, in stating that religion has had experience with finality and perfection, I do not at all wish to question the reality or the desirability of progress in religious thinking. I do not hold with those fundamentalists who think that the last *i* was dotted and the last *t* crossed centuries ago. The religion of the New Testament is to me a distinctly purer and finer doctrine than the religion of the Old Testament. As science reveals more and more of the complicated and orderly beauty of nature, our religion should become richer and richer. Scholarly study of the history of man's record of religious thought and experience does in fact reveal flaws in our previous understanding and does result in real change—real progress—in our interpretation of religious ideas.

So far, then, one can say that both science and religion are dynamic activities, both advancing toward deeper and better understanding. But I think that there is nevertheless a real difference in the two situations and that in the comparison, religion comes out on top.

I will offer three interrelated arguments: First, that scientific thinking always expands out to face an ever larger area of unsolved questions, whereas religion closes in, more and more securely, on an

inner core of truth; second, that as the external successes of science grow, it becomes more and more clear that there are unavoidable and inescapable imperfections in the underlying structure of science; and third, that there is a quality of permanence to religious thought which is not to be found in science.

First, then, which—science or religion—is really gaining in its assault on the totality of the unsolved? As science learns one answer, it is characteristically true that it also learns several new questions. It is as though science were working in a great forest of ignorance, making an ever larger circular clearing within which, not to insist on the pun, things are clear. The cleared circle is ever expanding—there is continuous progress in clearing away further ignorance. But as that circle becomes larger and larger, the circumference of contact with ignorance also gets longer and longer. Science learns more and more. But there is an ultimate sense in which it does not gain; for the volume of the appreciated but not understood keeps getting larger. We keep, in science, getting a more and more sophisticated view of our essential ignorance.

I do not think that a similar or comparable thing happens in advancing religious thought. It is almost as if the progress in religious thought were centripetal, aimed toward decreasing a central core of ignorance, rather than centrifugal, aimed out into the limitless unknown. In religious thought we progress toward known and recognizable goals; whereas in scientific thought we have really no way whatsoever to guess where we are heading.

Next, let us look briefly at the logical structure of scientific thought. If there is any aspect of science which is universally considered as basic, and which is usually considered to be unassailable, it is the logical nature of scientific reasoning. The relentless, austere precision of logic is, in fact, often held up to shame by those who admittedly proceed, at least in part, through more emotional and intuitive modes of thought. But what is the situation, if one looks far within and says, "I do not in the least question the magnificent practical usefulness of this logical technique, but I am asking whether or not it is, in any ultimate sense and at its core, impregnable."

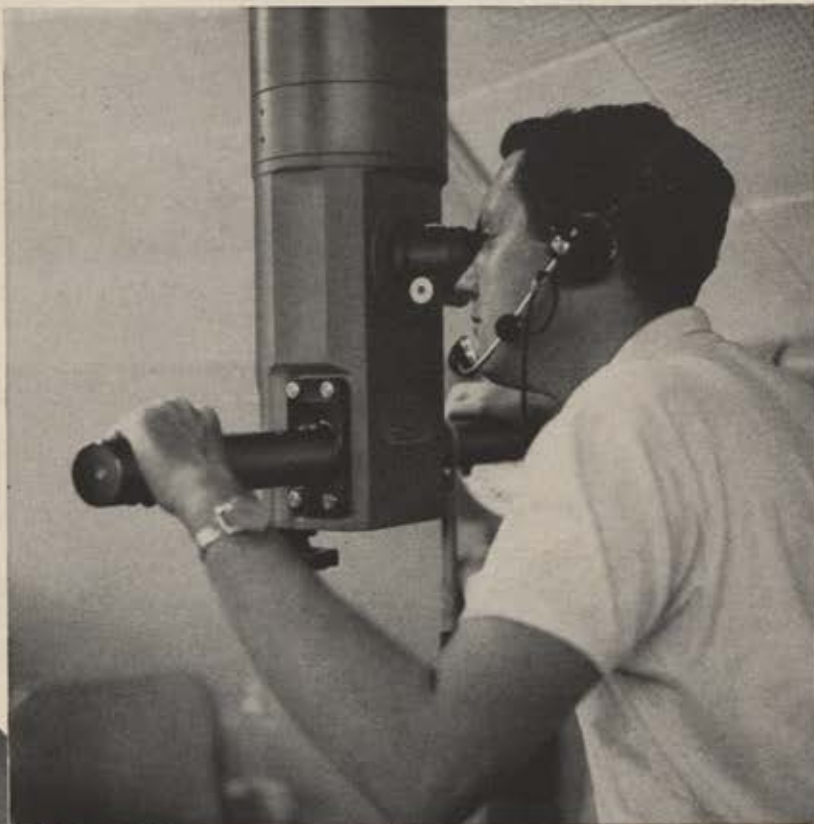
We remember that there are two great divisions of logic—deductive and inductive. In deductive logic one starts by making a certain number of pure assumptions—technically speaking, he adopts the postulates of the system under examination.



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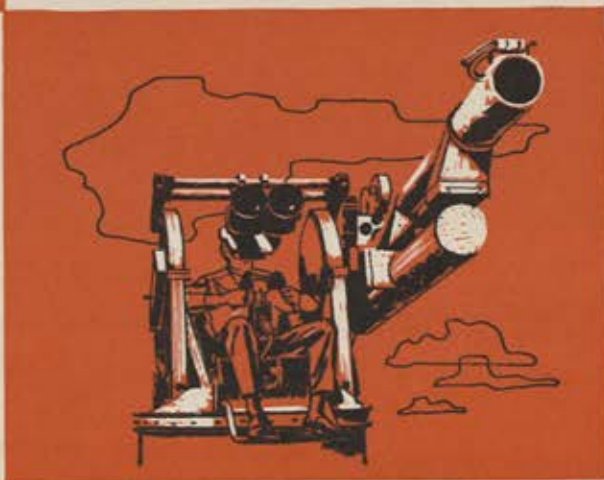
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Then, with the addition of a certain accepted vocabulary of signs, certain assumed formation rules for combining the signs, and certain assumed transformation rules for deriving new formulas from old ones—with this assumed machinery one then proceeds to—to do what?

Of course, all he can possibly do is to unroll, in all its lovely and unsuspected complexity, the truths—or more properly, the formally correct relationships—which were inherent in what he originally assumed. This procedure is, of course, quite powerless to create truths—it can only reveal previously and unconsciously assumed truth.

But this is not the limitation of deductive logic which I wish to emphasize. I wish rather to speak of shocking discoveries concerning deductive logic which have been recently made by an amazing genius named Kurt Godel.

Let me start by quoting from a recent paper by Nagel and Newman on Godel's work:

"The axiomatic method invented by the Greeks has always been regarded as the strongest foundation for erecting systems of mathematical thinking. . . . Until recent times the only branch of mathematics that was considered by most students to be established on sound axiomatic foundations was geometry. But within the past two centuries powerful and rigorous systems of axioms have been developed for other branches of mathematics. . . . Mathematicians came to hope and believe that the whole realm of mathematical reasoning could be brought into order by way of the axiomatic method.

"Godel's paper put an end to this hope. He confronted mathematicians with proof that the axiomatic method has certain inherent limitations which rule out any possibility that even the ordinary arithmetic of whole numbers can ever be fully systematized by its means. What is more, his proofs brought the astounding and melancholy revelation that it is impossible to establish the logical consistency of any complex deductive system except by assuming principles of reasoning whose own internal consistency is as open to question as that of the system itself."

Indeed, Godel obtained two results, each of which is of the most massive importance. He proved first of all that it is impossible—theoretically impossible, not just unreasonably difficult—to prove the consistency of any set of postulates which is, so to speak, rich enough in content to be interesting. The question, "Is there an inner flaw in this system?" is a question which is simply unanswerable.



Secondly, he proved that any such deductive logical system inevitably has a further great limitation. Such a system is essentially incomplete. Within the system it is always possible to ask questions which are undecidable. . . .

If deductive logic has serious and built-in limitations, how about inductive logic? This is the branch of reasoning which examines all the observed cases recorded in the evidence and seeks to induce therefrom general laws. This is the way in which the mind of man attempts to reach universals by the study of particulars.

Over 200 years ago David Hume bluntly denied the propriety of inductive logic. Ever since, certain skeptics have urged the necessity of practicing induction without pretending that it has any rational foundation; certain deductionists have vainly tried to prove Hume wrong; certain philosophers have optimistically hoped that a mild and friendly attitude toward such words as "rational" and "reasonable" could of itself sanction their application to statements referring to future and hence unexamined cases; and certain scientists have felt that it is vaguely sensible to suppose that future phenomena would conform to past regularities.

Deep and troublesome questions are involved here. Consider, just for a moment, the question: When and why does a single piece of past evidence give useful information about a future situation? If one takes a single piece of copper and determines that it conducts electricity, then it seems sensible to suppose that all other future pieces of copper will also conduct electricity. But if we pick out a man at random and determine that his name is John, this does not at all lend credence to the idea that all other men are named John. The first of these seems to lead to a "lawlike statement," and the second to an "unlawlike" one; but no one, so far as I know, has ever been able to give workable form to this distinction.

In fact, in spite of many attempts to make in-

duction intellectually tolerable, the matter remains a mess. If you think I exaggerate, may I urge you to examine an article by Israel Scheffler in *Science* in which he summarizes recent work of N. Goodman.

He points out that the attitude of scientists toward induction, just referred to, has seemed to some to justify the claim that "in principle, we have our answer to the challenge of induction."

But Dr. Scheffler goes on to say:

"It is this sanguine estimate which has been thoroughly upset by Goodman's researches. . . . Appearing at a time when logicians had been making considerable progress in analyzing other aspects of scientific method, these results came as a shock. Goodman's investigations, it seemed, had sufficed to undermine all the usual formulas concerning the most basic concepts of the logic of science, but his repeated and ingenious efforts to supply a positive alternative had all turned out to be fruitless. In the philosophic discussions that followed, every attempt was made to skirt Goodman's disheartening results. They were declared unimportant for the practicing scientist. The initial questions were asserted to be insoluble, hence worthless. Many papers, on the other hand, proposed what seemed perfectly obvious solutions that turned out to be question-begging. Only a few authors fully recognized the seriousness of the situation for the philosophy of science. . . ."

Let us look at the simplified case of the way in which one piece of evidence can be used in making inductions. . . .

A given piece of copper is tested, and it is found to conduct electricity. This item of evidence supports the statement: "All specimens of copper conduct electricity," but it also and equally logically supports the statement: "All specimens of copper are either such that they have been previously examined and have been found to conduct electricity, or are such that they have not yet been examined and do not conduct." And by invoking exactly the same logical machinery in the two instances, the former statement leads to the conclusion: "A new and untried piece of copper will conduct electricity," whereas the latter, with precisely equal cogency, leads to the conclusion: "A new and untried piece of copper will not conduct electricity." The ability of induction to deal with a future case thus collapses; and since this is the only useful aspect of induction, we are faced by total collapse.

Thus I must report to you that discouraging news has leaked out of the citadel of logic. The

external walls appear as formidable as ever; but at the very center of the supposedly solid fortress of logical thinking, all is confusion. As practical tools, no one doubts the continuing value of the armaments. But in terms of ultimate and inner strength, the revelations are astounding indeed. The ultimate basis of both types of logical thinking is infected, at the very core, with imperfection.

Finally, I would argue that there is a different texture of finality to religious thought. Let me illustrate. I believe that fifty years ago essentially every well trained scientist would have said that the principle of conservation of mass, and the principle of conservation of energy, were both perfect and doubtless unchangeable. Fifty (or 500 for that matter) years ago there were persons who believed that the basic principles of the Sermon on the Mount were perfect and unchangeable. Now the two scientific principles I have mentioned have been discarded. To be sure they have joined to form a broader new principle, but the fact remains that each, considered separately, simply is known today to be untrue. The newspapers of the past months have told us of the recent collapse of another scientific principle—that of parity. One confidently expects further really revolutionary changes in our present scientific conceptions of time, space, mass, continuity vs. discreteness, etc., which will simplify and unify the present almost intolerable confusion in modern atomic physics.

But although I hope that there will be ever deeper understanding, ever more realistic interpretation in modern-day terms, ever more clarifying light from all sectors of modern scholarship, I find it impossible to contemplate any fundamental change in or improvement on the basic principles of the teaching of Christ. Which, then, science or religion, has the harder inner core?



Dr. Weaver is vice president for the natural and medical sciences, Rockefeller Foundation. A top-flight mathematician, Dr. Weaver has served on the faculties of the California Institute of Technology, the University of Wisconsin, and the University of Chicago. He has also been a consultant to the Department of Defense and to the various services. He is coauthor of two books. He served in the Air Service in World War I and has been with the Rockefeller Foundation since 1932. This article appeared originally in The Saturday Review's issue of January 3, 1959, and is reprinted here with special permission.



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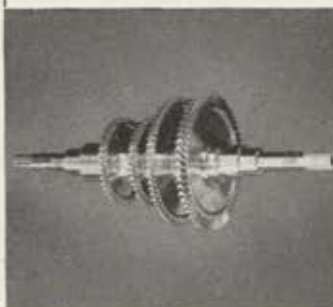
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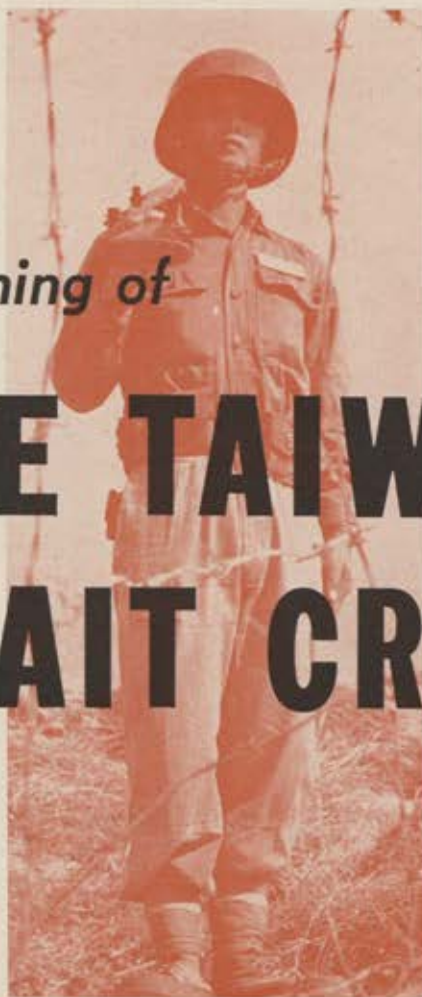
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The Meaning of **THE TAIWAN STRAIT CRISIS**

Gen. Laurence S. Kuter

COMMANDER IN CHIEF, PACIFIC AIR FORCES



EARLY last August Chinese Nationalist reconnaissance pilots flying their RF-84s brought word to Gen. Wang Shu-ming, Chief of the General Staff of the Republic of China, that the Communist Air Force had occupied Chenghai and Liencheng, two airfields in Fukien Province opposite Taiwan. There were indications that other fields in the same area soon would be filled with MIGs. The Communists clearly were on the move again in the Far East.

General Wang communicated this report at once to Maj. Gen. Fred Dean, USAF, Commander of Air Task Force 13 on Taiwan, who in turn passed the word to Headquarters PACAF at Hickam and to Headquarters USAF. Radio Peiping soon was on the air with an announcement that Quemoy and Matsu, the footholds held by President Chiang Kai-shek's forces near the mainland, would be assaulted as a prelude to the conquest of Taiwan.

Thus, if you could believe Mao Tse-tung, the government of the Republic of China (GRC), America's ally and a keystone of opposition in Asia to Communist expansion, was in trouble. Of equal concern was the fact that the United States, pledged to the defense of Taiwan, could be drawn into a most complex politico-military situation.

The Taiwan Strait crisis, while it may not yet have

ended, can be analyzed in three phases: (1) Chicoms aggressions; (2) US and GRC responses; (3) Relaxation of tensions.

The period of Communist aggression actually originated earlier than 1958. The Chicoms carried out military attacks in the Strait ten years ago. Taiwan, always a thorn in the side of Mao, has been subjected to a barrage of propaganda and of political maneuvering since 1949 when President Chiang's forces retreated to the island.

Later in 1949 the Chinese Nationalists under Gen. Hu Lien repulsed 15,000 Chicoms who assaulted Quemoy. Six years later in 1954 Chou En-lai said: "It is imperative to liberate Taiwan and liquidate the traitorous Chiang Kai-shek group." In September 1954 the Chicoms began an artillery barrage of Quemoy, stepping up the firings to a high of about 5,000 rounds a day.

In the 1958 campaign the Chinese Communist Air Force quickly followed up their August occupancy of Chenghai and Liencheng by reconnaissance of Quemoy, only minutes away from their bases. At this juncture there were three intelligence viewpoints:

- Quemoy would be subjected to artillery bombardment from Amoy, Tateng, Weitou, and Chingyang. Princi-

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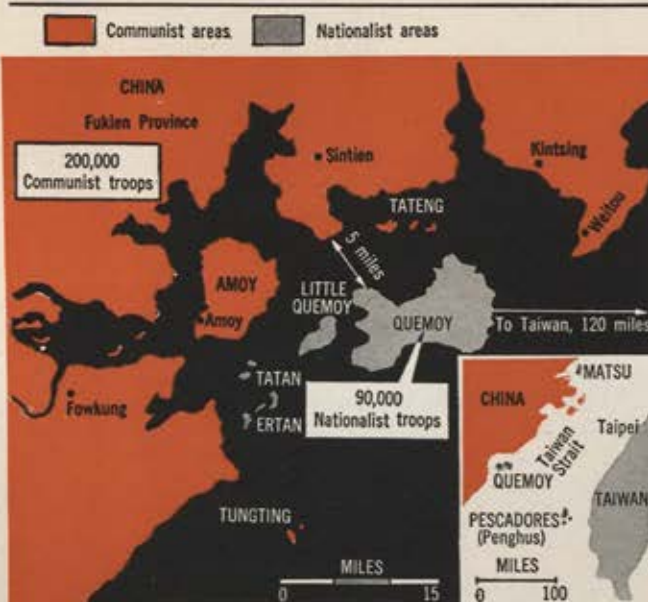
THE TAIWAN STRAIT CRISIS

pal targets on the Nationalist-held island were well within range of the Communist 152-mm. and 122-mm. guns. The shelling would be followed by air attacks to soften up the defenses prior to a full-scale amphibious assault across the five to seven miles of open water.

- An effort would be made to interdict Quemoy by air attack and some artillery. In such an effort to starve out President Chiang's forces the all-important supply lines to Taiwan would be cut by air attack. This accomplished, the Chicoms hoped that it would only be necessary to pause and graciously allow the withdrawing Nationalists a safe passage. Here the belief was that the US would not guarantee the convoys to Quemoy and probably would hold President Chiang's Air Force in check.

- The Communists would pour on a heavy artillery barrage coupled with a similar effort in the propaganda field, hoping that the US advisers and policy makers would declare Quemoy untenable and withdraw the 90,000 troops to Taiwan. No airpower would be employed in order to avoid retaliation by the Chinats against the mainland fields or "hot pursuit" by the USAF.

The military considerations which bore on these alternate courses were about as follows: An amphibious assault looked dangerous. The Chinese Nationalists were well entrenched on the hilly islands with every approach covered from concrete emplacements. Beaches were mined and barricaded. President Chiang's forces were itching for a fight and probably could have held and at the same time inflicted heavy losses on the Communists. In this event a primary Chicom objective, to gain prestige in Asia, would be defeated and they would lose face. Similarly, the interdiction of Quemoy by artillery coupled with the use of airpower over the Strait had disadvantages and was not too inviting. It might have given Gen. Chen Chia-shang's well trained, eager, and ready Nationalist Air Force an opportunity for a "turkey shoot." This could open up the war into a major conflict which neither the Chinese Communists nor the Soviets wanted. Also, as a result of some early brushes with the Chinat Air Force, the Chicoms were not too confident of the capabilities of their MIG squadrons.



Above, the Chinese stage for a recurring cold-war drama. Determined US, Nationalist response broke Communists' artillery blockade of Quemoy, smaller islands last year. Crisis "may not yet have ended" but its "lesson" is clear.

The third alternate course, a heavy barrage on the key points on the sixty-square-mile island, was the one adopted by Mao and Gen. Su Yü, Chief of Staff of the Peoples Liberation Army. Su Yü, long an advocate of attack in the Taiwan area, banked on the US assessing the risks in the tricky Strait as too great. American policy makers, he reasoned, would ask President Chiang to pull back his forces to the Penghus or even Taiwan. It was, as one observer pointed out, "a plan of intimidation, very neat and simple. No air. No assault. Not too much risk. Just shells." This was the one to be followed.

On August 18 the Chicom aggression started with 100 shells fired at Quemoy and threatening overflights conducted by the MIG-17s. However, no bombs were dropped. On August 23 they stepped this up to 50,000 rounds. Quemoy was ripped by 300 guns firing an average of about 165 rounds each. The following day 40,000 more rounds were fired. And in the next five days an average of about 10,000 rounds was delivered. On August 28 they predicted dire events, warning the Nationalists "to withdraw" and stating that "a landing is imminent."

Three days later the big card was played when the Soviet Union announced that it would give Communist China "the necessary moral and material aid in the just struggle for the liberation of Taiwan." "He who threatens China," *Pravda* announced, "must not forget that he is threatening the Soviet people also, since the Soviet people are linked to China by unbreakable ties. Any aggression by the United States in the Far East will unavoidably bring about an exacerbation of the whole international situation and lead to spreading the war." The threat appeared to be growing and, with the USSR statement, appeared especially formidable and worrisome to Vice Adm. Roland N. Smoot, Commander of the Taiwan Defense Command; to Maj. Gen. Thomas Moorman, Commander of the Thirteenth Air Force; and to American Ambassador Everett Drumright. Unless President Chiang was advised by the US to withdraw, and followed up by a withdrawal, it appeared that a general war might develop in Asia. The period of Communist aggression had reached its climax. The next move was up to the US.

The reply was not long in coming. The second phase of the Taiwan Strait crisis, the period of American response, opened on August 29 when a fighter-interceptor squadron equipped with F-86Ds was moved from Okinawa to Taiwan. The transfer of the F-86Ds was completed eight hours after the directive was dispatched from Headquarters PACAF in Honolulu.

The next day the first units of Tactical Air Command's Composite Air Strike Force (CASF), a squadron of F-100 supersonic fighter-bombers and accompanying tankers, and a squadron of C-130 Hercules transports, were ordered to Taiwan. It was to be a flight of 7,000 miles for the single-place fighter-bombers. Inflight refuelings would be required on the longer hops. MATS was directed to provide logistics backup. The transfer of the first F-100s from California to Taiwan was accomplished in five days. The first C-130s were in place at Clark, in the Philippines, sixty hours after departure from Hamilton, AFB, Calif.

In the following week the US stiffened further, showing no signs of encouraging President Chiang to withdraw. Secretary of the Army Wilber Brucker, who happened to be in the Far East on an inspection tour, warned the Communists not to underestimate American intentions. The aircraft carrier *Essex*, which had been in Mediterranean waters with the Sixth Fleet, was moving toward the Taiwan Strait accompanied by four destroyers. The *Midway*, which had been in the eastern Pacific, also was en route

to join Adm. Wallace Beakley's Seventh Fleet which soon would have six carriers. Other naval reinforcements including the cruiser *Los Angeles* brought the total of combatant ships up to fifty-three. Advance elements of the First Marine Air Wing from Iwakuni, Japan, were ordered to Taiwan.

The Air Force CASF under Brig. Gen. A. P. Tacon was enlarged. It now included squadrons of F-100s, B-57s, and McDonnell F-101 Voodoos; a reconnaissance task force of RF-101s, KB-50s, and C-130 Hercules transports; and a combat-control unit with accompanying radar, communications equipment, and personnel. The first elements were beginning to pass through Hickam at Honolulu.

In addition a unit of Lockheed F-104 Starfighters, fastest operational aircraft possessed by the US, was ordered to Taiwan from Continental Air Defense Command (see *"Starfighters on Formosa," January '59 AIR FORCE*). The Mach 2 Starfighters, which had not been seen in the Far East before, were loaded into MATS C-124 Globemasters along with pilots, ground-support equipment, and crew chiefs. The first of the F-104s was on the way one day after the movement order was dispatched.

With the Tactical Air Command squadrons as well as the Navy's carrier squadrons moving toward Taiwan the Chicoms, while continuing their aggressive moves, held their air carefully in check. Heavy torpedo boat attacks were launched against the Nationalist effort to resupply Quemoy. On the night of September 1 the biggest surface engagement so far took place when the Nationalist Navy hit back at the Chicoms, claiming eleven of the torpedo boats destroyed.

The military moves well under way, the American position was further defined by a formal statement authorized by President Eisenhower on September 4 and issued by Secretary of State Dulles. The Communists were warned that American forces were ready to defend the offshore islands if a Red attack endangered Taiwan. No consideration was being given to evacuation of the islands, Mr. Dulles said. The Secretary of State added that "naked use" of armed force by the Chinese Communists "to achieve territorial ambitions would pose an issue far transcending the offshore islands and even the security of Taiwan. It would forecast a widespread use of force in the Far East which would endanger vital free world positions and the security of the United States," the Secretary said.

Immediately afterward it was announced in Washington that the Seventh Fleet was conveying supplies to within three miles of Quemoy. The American line was becoming increasingly firm. One week later President Eisenhower's "No-Far-East-Munich" speech capped the series of American pronouncements. In his speech the President said: "There is not going to be any appeasement."

The cold war cycle now had completed a turn. The Communists had challenged with heavy shellings and heavier threats. The US had replied by augmenting its very considerable forces on station in the Far East. The President had announced US policy: No appeasement.

What next?

On September 8, four days before the President spoke, the artillery shellings had gone up again to 50,000 rounds, the same figure with which they launched the aggression. On September 11, just before the President's speech, the firings hit a new high of 60,000 rounds. After the President's speech and with strong Air Force and naval augmentation now in the Taiwan area the shellings fell sharply to an average of about 6,000 rounds a day for the twenty-five days up to October 7 when the cease fire was announced.

It was now apparent to the Communists that no cheap victories could be achieved in the Taiwan Strait. The amphibious assault plan was out. Furthermore the Communist leaders had no intention of allowing the MIG squadrons to tangle with the US Air Force's F-104s and F-100s, both equipped with Sidewinders, or with either the Navy's F11F or the Marines' F4D, none of which is to be taken lightly in air-to-air combat.

As the artillery barrage failed and simultaneously as American intentions became firm and clearly understood, the Taiwan Strait situation eased.

In this period of relaxation, during twelve days of which there were no firings, the Chinats moved tens of thousands of tons of supplies to Quemoy. With this stockpile established on the island all hopes the Chicoms entertained of starving out President Chiang's garrisons were gone.

A senseless pattern of sporadic firing followed. This can be attributed to the abiding fear possessed by the Chicoms leaders that someone somewhere would label their efforts in the Strait as weak and ineffective. The objective of these "on-again-off-again" firings was more to bolster Chicom assurances of their own prowess than it was to interdict President Chiang's supplies which now stood at record highs.

After several days of erratic shooting, or no shooting at all, the Chicoms fired a near record 40,000 rounds on November 3.

Whether this heavy shelling was pointed at President Chiang's diversions on Quemoy or was a parting few shots fired to influence the American voters about to go to the polls is still a subject of friendly debate among US officers who gather at day's end at the Grand Hotel or at the Friends of China Club in Taipei.

For a further and somewhat more incisive look at the Taiwan Strait crisis, let's examine the four battles—Air, Shells, Supply, and Words.

The Air Battle

The Air Battle is best illustrated by an engagement that took place September 19 in the narrow waters of the Strait when four Commie torpedo boats went out to intercept two Chinat LSTs engaged in the resupply of Quemoy. As the torpedo boats approached the convoy, they were hit by Chinat Sabrejets. The attacking pilots claimed three of the four boats.

Two waves of MIGs then appeared, apparently a little late for their rendezvous with the boats, and found themselves in a fight with the F-86s. Five MIGs were claimed, and the rest returned to the mainland. There were no Chinat losses.

Five days later thirty-two Sabrejets encountered around 100 MIGs over the Strait. According to a Chinat spokesman the Communists were trying to draw the Sabrejets over the mainland in a "tricky maneuver to influence public opinion as well as the United Nations." But the Chinat pilots stayed over the water fighting the MIGs up and down the Strait from Wenchow to Swatow. When it was over, they claimed eleven destroyed for the biggest day of the Taiwan Strait crisis. This brought the total destroyed by September 24 up to twenty-five.

How can this tremendous disparity between the Communist MIGs and the Chinat Sabrejets be explained? The MIG-17s are reported to have a capability of 60,000 feet and can fly 635 knots with afterburner. The Sabres operate at a top altitude of 48,000 feet and at 600 knots.

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THE TAIWAN STRAIT CRISIS

First of all the Chinat pilots are among the most experienced in the world. Many have over 1,400 hours in the F-86 alone. They are eager, skillful, and their tactics are good.

The Communist pilots on the other hand, according to the Chinats, appeared inexperienced and indecisive. In one case a returning Sabre pilot was heard to say: "I should not even claim that one as a kill. He just sat there." Chicom gunnery was not very good, and there was little if any teamwork.

As an American observer said after talking to a group of Chinats just back from the Strait: "Superior equipment will not always effect a balance against experience plus the tiger spirit. We learned this one in Korea, and we see it again in the Strait."

Shortly after the "big day" of September 24 Radio Peiping announced that the Chinats were using the Sidewinder. Soon afterward a picture of what was called a Sidewinder appeared in Chinese Communist papers. From the tone of the Peiping statement, which promised "punishment for this criminal action," it was apparent that they did not like the heat-seeking, air-to-air missile and that they were hurt.

Another factor influencing the air war was the US Air Force F-104 which appeared over Taipei to bolster the air defenses of Taiwan. The Mach 2 fighter made a tremendous impression on both sides of Taiwan Strait.

When the air over the Strait finally calmed, thirty-one MIGs had gone down. Two Sabres were reported lost. The Chicom effort to draw the Chinats and, hopefully, the US over the mainland, label this as an aggression, and then blast over Radio Peiping that an invasion had occurred and had failed. Simultaneously as the Commies lost the Air Battle, the shellings fell off sharply. Soon the cease fire was announced.

The Battle of Shells

The shelling of the Quemoy complex, Big and Little Quemoy and the two extremely small islands of Ertan and Tatan, will go down in the annals of military history as one of the most intense and longest sustained artillery bombardments ever directed against a single military objective.

The Communists started firing on August 23 from approximately 300 well stocked artillery positions. All of the relatively small Quemoy complex could be brought under fire.

This was the major military effort in the Taiwan Strait crisis. The Chicoms hoped through the use of artillery either to cause a direct withdrawal of President Chiang's troops or, in combination with their psychological offensive, to force Gen. Hu Lien's six nationalist divisions to surrender. Either would have been a decisive victory for the Peoples Republic and would have been a serious setback in Asia for the free world.

It appeared on occasion during the bombardment that the Chicom effort was pointed at "softening up" the Quemoy defenses prior to an invasion attempt. On August 23 they fired 50,000 rounds, and on August 24, 35,000 rounds. Again on September 8, 50,000 rounds hit Quemoy, and three days later 60,000 rounds were fired. These intense rates of fire caused serious disruption, especially to the supply effort. It appeared to many that Radio Peiping's announcement that a landing would take place could be taken at face value and that the Chicoms were about to jump off, using a miscellaneous assortment of craft including junks in an invasion effort across the narrow



Author Kuter (left) and USAF Chief of Staff Gen. Thomas White talk with pilots during Pacific inspection tour.

waters. Tateng Island or Amoy seemed to be the logical launch points. The well entrenched Chinats zeroed in their own guns on the open water and waited.

But there was no invasion, the Chicoms apparently remembering well the severe losses they took in the 1949 debacle. Mao, it would appear, had no intention of allowing a 1958 repetition. There were too many bystanders in Asia watching the outcome; the impact of such a setback would be too far-reaching.

Among the favorite targets hit during the 1958 shelling of Quemoy were the two landing strips used by the Chinat Air Force for the movement of personnel and critically needed supplies. Landing beaches, command posts, and Chinat gun positions were raked over at will by the Chicom gunners. Virtually all of Quemoy's sixty square miles was covered. Little Quemoy, only six square miles, Tatan with ninety-six acres and Ertan with forty acres, received similarly intense shellings.

The cautious Chinats, waiting for an invasion effort and conserving their ammunition, initially were heavily outgunned. However, following President Eisenhower's "No Munich" statement and with US forces augmented, the Chicom firings dropped off in mid-September. The invasion apparently was not to be launched. At this point the Chinats reached into their carefully hoarded ammunition reserves and stepped up their counterbattery fire.

The crisis now had lessened. Between September 13 and October 6 the Chicom firings fell to an average of around 6,000 rounds a day. This was not a sufficient rate in anyone's book to achieve interdiction of Quemoy.

On October 7 the cease fire was announced. A slight flurry took place between October 20 and October 23. The difficult to discern on-again-off-again pattern then developed with the Communists apparently endeavoring to appear as humanitarians on even days while they played the barbarians' role on odd days.

The pattern of Communist firings throughout the Quemoy crisis can only be described as erratic. The major artillery effort was concentrated from August 23 to September 11. After that the rate of fire was sporadic and never posed a serious threat to Quemoy's defenders.

Considering the intensity of the shelling directed at Quemoy, the casualties were relatively low. At the time of the cease fire the Chinats announced that 1,000 military personnel had been killed or wounded. A total of eighty



Lockheed F-104 Starfighter, at Mach 2 USAF's fastest operational airplane, was major factor in resolving crisis, "made a tremendous impression" on both Nationalists and the Communists. Here, newly arrived, one sits on Taiwan airfield.

civilians were killed and 220 wounded. The low-casualty rate among civilians can be attributed to the fact that many of the people of Quemoy lived underground during most of the conflict. There was little serious damage inflicted on the well prepared Nationalist defenses. Morale of the troops on Quemoy, many of whom were Taiwanese and were not motivated by a desire to return to the mainland, remained high throughout the artillery bombardment.

In the cease-fire period the Chinat resupply effort went on without interruption. At the close of the Battle of Shells Quemoy stood better defended, better equipped, and better stocked than at the start of the Communist aggression.

The Battle of Supply

Interdiction of Quemoy by artillery fire offered the Chicom a course of action with built-in safeguards. A successful interdiction effort could force the surrender or withdrawal of the Chinat garrison and yet involved little risk of a major war. They had confidence that the fire from their 300 gun positions could cut the supply lines from Taiwan and achieve their objectives without the necessity of employing their numerically superior Air Force or their limited naval force. There was a further possibility that the US would assess the risks of a war as too great and would encourage President Chiang's withdrawal even though the interdiction effort had not in itself achieved its goals.

At the start it appeared that the Chicom might be able to sever successfully the GRC supply lines. However, in retrospect their initial successes can be attributed more to weaknesses in Chinat technique than to the artillery effort. Chinat attempts to carry out the resupply in their traditional easy-going fashion proved to be entirely inadequate. LSTs, during the phase, used only limited sections of the Quemoy beach which had been prepared for their operation and which had long since been zeroed in by Chicom artillery. After arrival, the LSTs would sometimes wait for an hour or longer before a confused, time-consuming, hand-unloading operation commenced. When the inevitable shelling started, there was a headlong flight for cover while the supply ships attempted to withdraw from the area. This procedure would be repeated the following day with tremendous piles of supplies exposed on the beachhead adding to the congestion and confusion. It became apparent even to the Chinats that both their

unloading discipline as well as their system were faulty.

These initial failures created some anxiety and tended to exaggerate the Chinat claims of a "critical" shortage on Quemoy. Initially daily minimum resupply requirements were established at 700 tons. This later was reduced by Taiwan Defense Command to 300 tons and later was cut to the more realistic figure of 200 tons.

No adequate inventory of supplies on Quemoy existed, although there were many more tons cached away than Quemoy's defenders admitted to or knew about. Faced with the prospect of a long pull, it became apparent to all that improved methods of resupplying Quemoy were essential. US technical aid and advice were solicited and resulted in greatly improved techniques. Chinat underwater demolition teams started to work on opening additional beach areas in order to allow greater dispersion for the supply vessels.

By September 15 the new Chinat tactics were paying off. Small amphibious LVTs (Landing Vehicles, Tracked) poured out of the LSTs and fanned out for the shore carrying loads beyond the critical beach area. The LSTs once empty of their loads pulled away out of range of the Chicom gunners. The operation was completed the following day with the LVTs making a rendezvous with empty "mother" ships. As interesting as the LVT operation appears, the results were limited—each of the "ducks" carrying only about two and one-half tons. One LST carried about twenty-five of the LVTs—total load, sixty-seven and one-half tons.

An even more successful operation involved additional use of the LCMs carried in LSDs. The greater payload capacity of the LCMs allowed the daily average to be raised to a little over 300 tons, more than enough to meet the minimum supply requirements.

Concurrent with the stepped-up efforts to resupply Quemoy by sea there was a slow but steady improvement in air delivery by Chinese Nationalist Air Force C-46s. Resupply of Quemoy by air, particularly of critically needed items, grew to become an effective complement to the surface resupply. Again there was a gradual gain in efficiency brought about by US technical advice and assistance.

At the very outset of air operations it was necessary to abandon the usual technique of landing, parking, and off-loading the supplies. Chicom gunners kept the strip under a steady barrage. Night air drops from the C-46s

(Continued on following page)



Chinat Marines charge ashore on Taiwan during exercise with US forces while mainland guns boomed their loudest.



Nationalist tanks rumble onto the beach in a realistic amphibious operation for Taiwan's grim-faced fighters.



US Army surveillance team views intact installation on shell-battered, stubbornly defended island of Quemoy.

were initiated, and in a short time the tonnage figures rose. A protective Combat Air Patrol (CAP) was flown over these resupply aircraft by US Marine pilots.

By the last week in September the Chinese Nationalist Air Force was dropping one-third of the average 200-ton daily resupply to Quemoy. On October 2 the CNAF demonstrated the capability of more than meeting Quemoy's daily minimum of 200 tons. Now not only could Quemoy be resupplied by sea lanes, but the CNAF had demonstrated that it could deliver sizable tonnages as well.

The Battle of Supply had been lost by the Communists. One tactic remained. Should they use their Air Force against President Chiang's resupply lines? In this decision Mao Tse-tung had a voice, and it was in the negative.

On the fourth of October, only a short time after the Chinese Nationalist Air Force had demonstrated its resupply capability, the Chinese Communists announced the cease fire.

The Battle of Words

The Taiwan Strait crisis once again demonstrated the Communist tactic of integrating psychological and military objectives. This is the well established pattern of Communist cold-war strategy.

The Chicom "Battle of Words" appeared to have three main propaganda objectives, with other minor objectives as possible by-products.

The basic objectives were to:

- Set the stage for an eventual "peaceful liberation" of Taiwan by destroying the morale of the government of the Republic of China;
- Cast the United States in the roll of the aggressor; and

- Use the "threat of American aggression" as a whip to stimulate greater mass efforts to achieve domestic, political, and economic goals.

Minor psychological objectives appear to have been as follows:

- Show up the United States as a "paper tiger" to the peoples of Asia;
- Destroy or weaken the trend toward the two-China concept; and
- Establish claim of sovereignty over coastal waters up to a twelve-mile limit.

In pursuing these objectives the Chicoms unleashed the full force of their propaganda machine. Radio Peiping kept up a vicious, steady stream of vitriolic blasts against the United States. These outpourings claimed that Taiwan and the offshore islands rightfully belonged to the Peoples Republic, that the mere presence of US forces on Taiwan and in the Strait was, in fact, an act of military aggression.

To build and keep tensions high, both for external and internal consumption, Peiping initiated an unprecedented series of specific charges of US aggressive actions. Over forty such charges were made, each accompanied by vague threats against the US. These charges were designed primarily for domestic consumption as part of an intensified "Hate America" campaign, geared to induce greater economic productive efforts and provide a diversion from the resentments being created within China resulting from the commune program. Highlighting this propaganda effort was the charge that the Chinats were using poison gas shells against the mainland. Similar charges of inhumane warfare were noted after the very successful introduction of Sidewinder missiles into the air battle.

Paralleling the propaganda campaign against the United States

(Continued on page 111)

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Three top figures in the USAF effort that helped keep the Reds at bay. Left to right: Maj. Gen. Fred Dean, Commander, Air Task Force 13; Maj. Gen. Thomas Moorman, Commander, 13th Air Force; Brig. Gen. A. P. Tacan, Commander, CASF.

Top naval commanders greet Chiang Kai-shek aboard the aircraft carrier *Midway* in the troubled Taiwan Strait.

States, the Chicoms launched an all-out effort to weaken the resistance of the GRC defenders on the offshore islands. Every trick in the propaganda book was used to this end. Loud-speakers were directed at the island defenders, stressing that their cause was hopeless—they were cut off—and offering highly inducive surrender terms. Artillery-fired propaganda leaflets were extensively employed against all Chinat-held offshore positions during the entire period of tension, coordinated with the loud-speaker effort.

A somewhat more sophisticated campaign was aimed at driving a wedge between the higher echelons of the GRC and the US. This campaign capitalized on the impending US elections and stressed the theme that there was no popular support for the US policy of aiding the GRC. Another aspect of this campaign was an attempt to convince the GRC and the people of Asia that the US could not be counted upon to come to the aid of its allies. Some effort was also directed toward the fanning of hostility between Americans and Chinese both on Taiwan and the offshore islands on an individual basis.

Still another subtle attempt to weaken the GRC was a concerted, well directed letter campaign. Numerous letters were received by high GRC officials, delivered through Hong Kong, ostensibly by intermediaries of the Peiping regime. These letters offered attractive terms for top Chinat officials if they would but join their "brethren" on the mainland. Offers of titles, high positions, retirement in luxury, etc., were all spelled out.

An interesting aspect of the Battle of Words was the evident shift of emphasis of the Chicom propaganda campaign to coincide with the risks of a major war. Prior to the firm indication of US determination to withstand Communist aggression, the Chicoms together with the Soviets employed threats of direct USSR military action in retaliation against US forces should the US attack the mainland. As the US position became more firm, and with the buildup of the Chinat-US military posture, Peiping and Moscow, fearful that the conflict might get out of hand, suddenly began stressing that the entire issue was purely a civil war between warring Chinese factions and that the United States had no right to interfere in a strictly domestic affair.

To climax the Battle of Words the Chicoms initiated one of the most unique propaganda tricks in military history. A cease fire was announced for the purpose of permitting the beleaguered garrisons to be resupplied. This obviously was an attempt to show the world that the blockade had *not*, in fact, been broken by the success

of the combined US-Chinat resupply efforts. Peiping claimed their decision was based on humane considerations for the cut-off garrisons. In an attempt to maintain this position of benevolency the Chicoms adopted the tactic of announcing that they would continue shelling on the odd numbered days of the month, while permitting unrestricted resupply on the even numbered days of the month. This campaign continued and showed no evidence of change by the start of the new year.

In summary, the Chicom Battle of Words again points up the Communist employment of propaganda as a tactical weapon in the cold war. Little or no concern is given to the obvious transparency and superficiality of their propaganda themes. These they play with great dexterity, shifting from one major theme to another depending upon their immediate tactical goals. In the Taiwan crisis they experienced no difficulty in dramatically shifting from a threatening attitude toward the US to a conciliatory theme that the conflict was merely a local issue to be resolved between "Chinese Brothers." Another example of their dexterity was the shift from their avowed threats to "liberate" Taiwan and the offshore islands by military means to a position of resolving their differences by discussions and amalgamation.

While there may have been some tactical advantages that accrued to the Communists from their campaign of words over the Strait issue, basically the real success of the propaganda effort is inextricably linked to the success of the over-all venture. There is, of course, the related influence of a backwash that tends to set in when loudly blasted intentions fail to materialize, for one reason or another. As the shellings dribbled off to sporadic firings on odd days and as the Chinese Nationalist garrisons received heavy supplies on even days, Moscow and Peiping must have assessed this key facet of the Taiwan Strait crisis as something less than a glowing success.

Lessons of Taiwan

It would be useful if out of the experience we gained in Taiwan we could develop a dependable document of Lessons Learned to guide us in future brushes with the Communists. But the nature of the conflict with Communism is such that no specific book of rules can be written.

For the Communists pick not only the time and place but the type of brushfire that they will ignite. They coolly mix their political, military, and psychological efforts

(Continued on following page)



Wide World Photos, Inc.

Chinat troops, vehicles massed on Quemoy beach during resupply operation after Communists declared cease fire.

into whatever formula they feel will best serve their aggressive designs. It is never easy to predict where the next pressures will be applied.

Nevertheless, we can make a few observations on the basis of this Taiwan Strait crisis.

One of the most effective all-around deterrents to Communist aggression is found in the indigenous military forces of the Asian countries. These Army, Navy, and Air Force units testify strongly to the determination of free people to remain free. They are the perfect counterargument to Radio Peiping's blasts of "American Imperialism" in the Far East. Taiwan Strait provides a good illustration of the military effectiveness of these forces. In addition to their psychological value, which is very considerable, the Republic of China's Army, Navy, and Air Force that tangled with the Chinese Communists in September and October 1958 gave an excellent account of themselves. Chinese Air Force pilots were overwhelmingly successful in their air-to-air engagements with the MIG squadrons. Communist naval elements that ventured into the Strait hoping to cut President Chiang's supply lines came back with bloody noses. And the divisions on Quemoy showed no signs of budging under one of the heaviest artillery barrages in history. Stubbornly dug in, with morale consistently high, they provided both a military challenge to the Reds and a refutation of Peiping's claims to leadership of the whole Chinese people.

These forces are organized on American military concepts and trained by US advisers in our procedures and to our standards. They create an all-important basic military environment which in any contingency can work with US units ordered to the area to bolster the indigenous forces. Common supplies, aircraft fuels, and communica-



Wide World Photos, Inc.

Wounded Nationalist soldier is loaded aboard plane for evacuation from Quemoy to Taiwan. Plane brought in food.

tion equipment available on Taiwan bases made it possible for our Tactical Air Command and Continental Air Defense Command aircraft to become operationally ready in a minimum of time after their arrival. MAP investments of many years were justified and paid out in the Strait crisis of 1958.

The final and never-to-be-forgotten lesson of the Strait is that the Communist intentions remain as they have been in the past—eliminate the US, all of our forces and influences from Asia, and gradually blot up the small countries. Their entire propaganda effort is pointed at the single theme of getting the United States out of the Far East, at ridding this tremendous area of US influence, a powerful catalyst that tends to bind the small nations into something approaching an anti-Communist effort. If they are ever successful in this fundamental objective of causing the US withdrawal, the map of the world will be remade in a matter of weeks.

The corollary to this is that we must maintain for the foreseeable future a military position in Asia that permits the free world to react quickly when and if the Communists commit a serious overt act. The US today has powerful forces in being in the Western Pacific. In the Taiwan Strait affair of 1958 our forces demonstrated that they can move quickly to troubled areas to back up indigenous units and that they can be augmented in a matter of days, and sometimes of hours. We did it in September of 1958. We certainly can do it again.

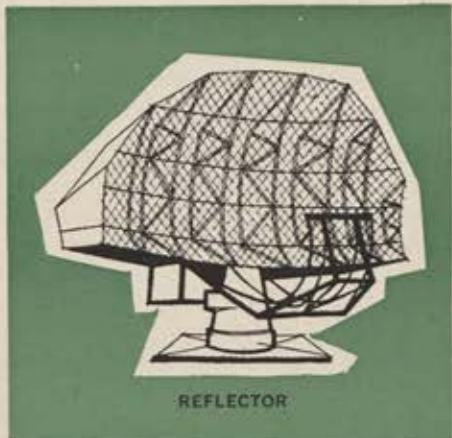
Unlike the forces assembled by the Communists, the airpower of the US Air Force and of the Navy had no aggressive intentions in the Strait. It was there to support an ally, and to make the Communists pause. This is effective deterrence, and it is the basic lesson of Taiwan.—END



The author, Gen. Laurence S. Kuter—here in a crisis meeting with the Chief of the Nationalist Chinese General Staff—is USAF's Commander in Chief, Pacific Air Forces. Gen. Wang Shu-ming, also an airman, and General Kuter met hurriedly last fall, discussed the boiling crisis then under way in the Taiwan Strait. General Kuter was wartime commander of a British-based bombardment wing, Gen. H. H. Arnold's staff assistant for air war plans, and among those who organized the Strategic Air Forces, Pacific. After the war General Kuter completed a term as US representative to the ICAO council, then served, successively, as first commander of MATS, DCS/Personnel at Hq. USAF, commander of the Air University, Maxwell AFB, Ala., from 1953-55 when he assumed his present position. He is author of the book, *Airman at Yalta*, based on a diary he kept at the Big Three Conference. General Kuter is a West Point graduate.



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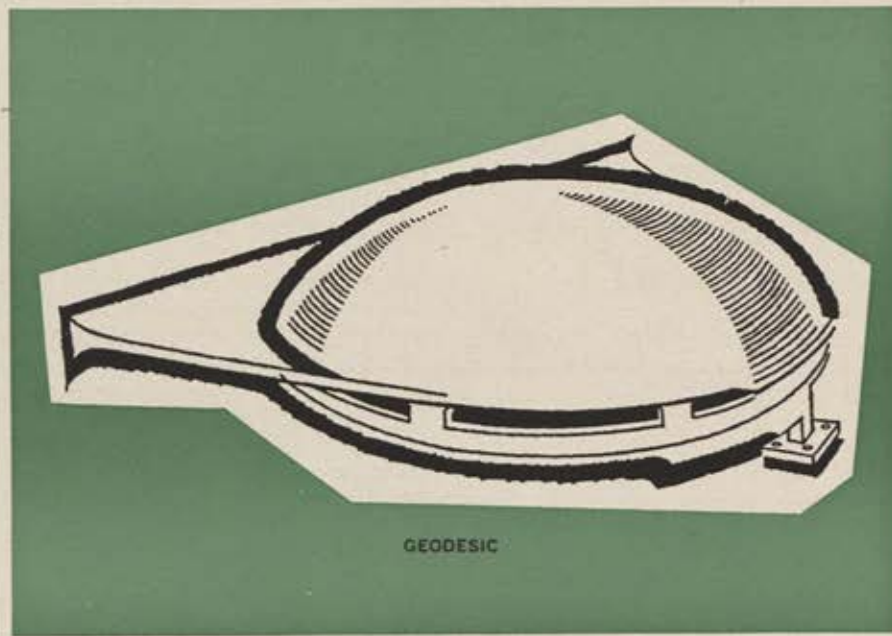
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The READY ROOM

RESERVE AND AIR GUARD NEWS

An analysis of recent temporary promotion lists of active-duty personnel to major and lieutenant colonel makes it clear that, barring a change in USAF grade structure, promotion of field-grade Reservists on active duty will soon be impossible.

Ironically, those easy ROPA promotions, especially on the first couple of rounds, have helped nail shut the door.

Here's the picture. As a result of the Air Force officer augmentation program, half the officers on active duty are now Regulars. A Regular officer must be tendered a permanent promotion when his turn comes, or be forced out. Permanent promotions take precedence in the promotion cycle. There will soon be no field-grade spaces left in the grade structure to be filled by temporary promotions.

The Air Force doesn't recognize ROPA promotions for Reserve personnel on active duty. Reservists cannot qualify for Regular permanent promotions. Without temporary promotions, there's no opportunity for a Reservist to be promoted.

Moreover, the mandatory promotion requirement for qualified Regulars makes it necessary to open up spaces in higher grades to which Regulars can be promoted. Presumably, Reservists will be squeezed out of those upper grades.

One solution to permit Reservists on active duty to progress to top grades along with Regulars would be to have the Air Force recognize a ROPA promotion on the same basis as a Regular promotion. But ROPA promotions have been so generously bestowed that it would be virtually unthinkable for the Air Force to buy that.

If the Reserve forces grade structure is to bear any relationship to that of the Regulars, it appears time for Reservists to insist on promotion standards at least as stringent as those for the Regular Air Force. Unless effective action is taken, there will soon be no opportunity for Reservists on active duty to progress beyond company grades.

• • •

The possibility of expanding airlift capability of the Air Reserve forces will be up for consideration at the twenty-eighth meeting of the Air Reserve Forces Policy Committee in Washington, May 4-6.

Two major factors will be involved. One is that Army spokesmen have

expressed dissatisfaction with the amount of airlift the Air Force can make available in an emergency. The other is that civil airlines are switching to jets and turboprops, dumping on the market large numbers of piston transports.

A number of sources have submitted resolutions to the Policy Committee suggesting that the Reserve forces take over as many of these surplus transports as necessary to meet military requirements.

At its last meeting in October, the Committee called on the Air Force for answers to four main questions. The questions and answers, in substance, were these:

Q. What are the requirements for airlift in war and in peace?

A. While the Air Force stated that these requirements are classified, it's a reasonable guess that appreciable increases in the Air Force's airlift capability would be welcomed by the Army.

Q. When and in what quantities do commercial airlines expect to release piston aircraft?

A. US air carriers plan to dispose of 843 transport aircraft in the next three years. Of course, 556 are four-engined and 287 are twin-engined.

Q. How much are they likely to cost?

A. The current going prices range from almost \$2 million for a Super-G Constellation to \$79,000 for a C-47. DC-6As and Bs go for about \$960,000; a Convair 340 or 440 for \$460,000; a DC-4 for about \$330,000. These prices don't include ground-support equipment.

Q. Can they be converted to cargo use?

A. Yes—for a price.

Price is, as usual, one of the biggest obstacles to be overcome if the Reserve forces are to expand and modernize their airlift capability. Some financial sleight of hand will be necessary to stretch slim Reserve budgets to cover the costs of such aircraft—plus sizable expenditures for maintaining and operating them. To get money for these items, something else has to go.

Nor should the Reserve be seduced into taking these aircraft off the airlines' hands unless there is a sound military requirement for them. Those classified studies will have to be thoroughly reviewed, not only from the standpoint of how many troops are really likely to be needed in a given situation, but also the operational

facilities and logistics that will be available to put them there and to get our planes out again.

USAF is reported to be studying the feasibility of developing additional air transport capability within the Reserve forces, but it indicates that surplus airliners may not fill the need. Instead, it says, the military airlift problem is one of suitable long-range aircraft designed primarily as cargo carriers. Perhaps one high-performance jet transport will prove more valuable militarily than half a dozen obsolescent carriers.

To the Reserve forces, up to their eyeballs in noisy, sluggish C-119s, the airline castoffs are a tempting dish. But the Policy Committee will be governed by reason as well as by appetite. Our guess is that they'll defer this problem for further study.

• • •

Among other matters to go before the ARF Policy Committee:

Thirty-six Additional Flying Drills.

No real objection to this program has developed as yet from any responsible source within the Air Staff, Department of Defense, or in Congress. But because the extra drills are essential to Reserve forces pilots in maintaining combat proficiency, the Committee will very likely express itself on the necessity of retaining this program.

Active-Duty Allowances. The Committee will undoubtedly again support legislation to provide per diem for Reserve forces personnel attending service schools on the same basis as it is now given active-duty personnel. **Rep. Overton Brooks** of Louisiana introduced such a bill in the Eighty-fifth Congress (H.R. 8779).

The Policy Committee will also consider a recommendation that a quarters allowance on fifteen-day training tours be authorized for Reserve airmen in pay grades E-1 through E-4 with less than seven years' service, as it now is for Reserve airmen in higher grades. Active-duty airmen in all grades get it.

ROPA Amendments. Almost everyone wants ROPA amended. The legislative package which contains these amendments was withdrawn early in February from the Bureau of the Budget on recommendation of the Reserve Forces Policy Board in the Department of Defense. The legislation is being rewritten to include the permanent promotion provision for the Air National Guard. The DoD-approved bill should reach Congress sometime in March.

Wearing of Uniform by ART Personnel. Although the Commander of CONAC directed that Air Reserve Technicians would wear the uniform on duty, the US Civil Service Commission pointed out that some employees whose service predates the ART plan are not required to join the Air Reserve and thus are ineligible to wear the Air Force uniform.

Meanwhile, late in January, the Air Force acted on a number of previous recommendations of the Committee.

Separate Budget. It announced that the Committee's recommendation for a separate budget for the Air Reserve was being referred to an *ad hoc* committee for further study and recommendation.

Accidents En Route to and from Training. USAF agreed Air Reserve forces members should be entitled to hospital benefits if injured in accidents occurring en route to or from training exercises, whether or not the members are in pay status.

Grade Determination on Enlistment. USAF concurred in the Committee's recommendation that prior-service personnel be enlisted in the Air Reserve forces in the same grade previously held. Before, some prior-service airmen were required to accept less than their previous grade if they had been out of service for some time. Conversely, some prior-service personnel had contended that added civilian experience in their career fields entitled them to a higher grade on reenlisting.

The entire Air National Guard Council of the Air Force Association, headed by Col. Bob Campbell of California, attended the January 19-23 class of the Air Warfare Systems Orientation Course at the Air University. This course gave the Council members the latest data on concepts and weapons of air warfare.

During the informative and busy week, the Council approved and forwarded to the Air Reserve Forces Policy Committee resolutions on subjects pending before the Policy Committee and recommended legislation to:

- Authorize the President to call Ready Reserves and National Guard personnel to active duty for air defense operations prior to proclamation of a national emergency. (Legislation delegating the President's authority to the NORAD commander for this purpose is now being drafted in the Air Force.)
- Relieve the states of responsibility for property damage or injuries to third parties during National Guard air defense activities on tactical sites under control of the Army or Air Force. This would also relieve the

states of responsibility for loss, damage, or destruction of property issued to the National Guard for use in air defense activities.

Is there a job for the Air Reserve forces in civil defense? This question is being mulled over in the Pentagon and will be the subject of a special briefing to the ARF Policy Committee. Here are some of the arguments:

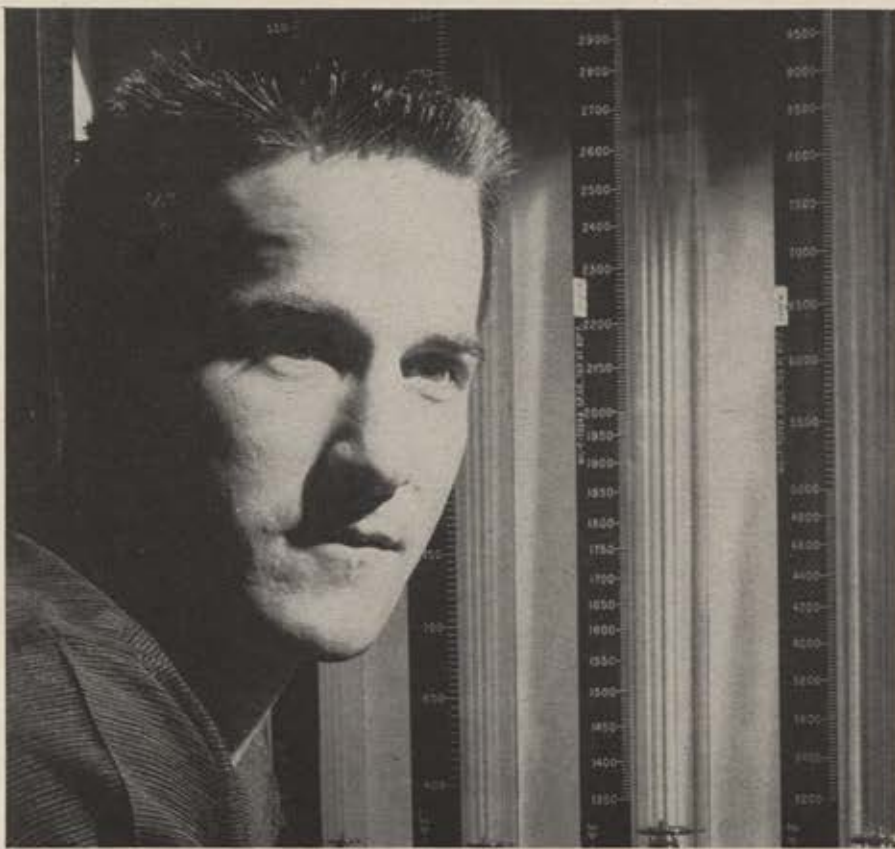
Civil defense has a compelling need for airlift, mainly to evacuate key people from threatened areas before an attack and to bring in assistance and evacuate wounded.

The Air Reserve's troop carriers would be valuable for such missions, as would the Air Guard's aeromedical transport squadrons.

Still, civil defense—as its title notes—is not a military function, although some Air Staff people contend that civil defense will inevitably need military assistance. But they are not at all sure the Air Force is the appropriate service to provide that help.

Perhaps the key consideration is that USAF's Reserve forces now bear essential D-Day roles. If some Reserve forces were diverted, USAF's D-Day capability might be impaired.

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"The Impact of Air Power"

REVIEWED BY STEFAN T. POSSONY

The Impact of Air Power, edited by Eugene M. Emme (Princeton, N. J., D. Van Nostrand Co., Inc., 1959, 914 pp., \$12.50)

THIS distinguished anthology of professional writing comes close to being an airpower book to end all airpower books.

It is more than a handy aid to the busy researcher. It is a true book in itself, very readable and stimulating on a subject of vital import. No sooner had I begun a cursory scan than I became fascinated by the story unfolding from these original writs of military aviation. I finished all 118 documents and the twelve commentaries by Dr. Emme in one sitting.

To my knowledge there is no symposium as skillfully composed, as thoroughly compiled with stirring, thought-provoking prose, as broad in scope and depth.

Through laborious analysis and research lasting ten years, Dr. Emme has managed to put together the significant airpower documents that have rested in scores of scattered sources and library collections. Inevitably this book will become the singular outstanding standard work. It will be consulted regularly by all, for professional or personal interests, on subjects dealing with questions of military aviation and modern world conflict. Dr. Emme's work is *compulsory reading* for all air-conscious individuals.

The author is eminently qualified for the ambitious task he has completed. A close student of the rise and fall of the Luftwaffe, he was for many years professor of international politics at the Air University and played an important role at the Air War College. Scores of American airmen in staff and command positions around the world know and respect Dr. Emme's professional competence.

In Dr. Emme's own words *The Impact of Air Power* "is a comprehensive volume of authoritative readings from a wide range of informed sources which are integrated into a coherent thesis."

The "informed sources" seem to include almost everybody who ever said anything worthwhile about airpower: Churchill, Goering, Roosevelt, Truman, and Eisenhower, among statesmen; Symington, Finletter, and Quarles, among civilian air secretaries; Anderson, Arnold, Bradley, Burke, Chassin, Douhet, Galland, Kenney, Kuter, LeMay, Lindbergh, Mitchell, Montgomery, Partridge, Portal, Power, Radford, Richardson, Rommel, Saundby, Schriever, Slessor, Smith, Spaatz, Tedder, Trenchard, Twining, Vandenberg, Weyland, White, Zhigarev, and Zhukov, among professional soldiers; and Aron, Berkner, Brodie, Cate, Cooper, Dinerstein, Earle, Ehrlicke, Garthoff, Hafstad, Leach, McFarland, Potts, Teller, Van Zandt, and Weinberg, among civilian scientists and writers.

The readings also include a number of official documents, such as excerpts from the US Strategic Bombing Survey, hearings before and findings by congressional committees, and British White Papers on defense. The integration into the "coherent thesis" is performed by the author himself by means of connecting commentaries which are indispensable to an understanding of the original documentation and highly instructive in their own right.

The chapter devoted to Soviet air policy brings together for the first time the works of those few American writers who are specializing in the field of the doctrine of Communist conflict doctrine. Two of these authors, Drs. Garthoff and Dinerstein, are known to members of AFA's Airpower Book Club.

The discussions are not restricted to military aviation as such but embrace—in an article contributed by Kenneth Whiting, an Air University historian—an appreciation of Russia's civil and "para-military" airpower.

Here, Dr. Emme warns, "Soviet actions have repeatedly spoken much louder than words. Whenever the memories . . . grow dim, and hope for world peace and disarmament springs again in the hearts of well intentioned humanitarians, along comes a blood bath in Budapest, another massive nuclear blast detected in the heart of Russia, or a Sputnik. . . . For American policy makers and students of world affairs either to belittle or to magnify the capabilities of Soviet airpower might prove an historic error of catastrophic magnitude."

Discussions of possible future war appropriately are introduced by Dr. Emme's reminder that "war, unfortunately, has been the most durable of social institutions." Those whose thoughts of the future Dr. Emme has assembled include Marshal Montgomery, Generals Twining, White, and Power, General Kenney, Col. R. C. Richardson, a particularly imaginative thinker, and Dr. Edward Teller. Many of the arguments are pitched on the theme that surprise nuclear attack has become the central military factor in a period when "offensive operations have far out-paced defensive capabilities."

Dr. Emme inveighs against "pessimism about the attainment of victory" in a nuclear war. "Such fatalism is a deadly danger. Should a World War III not come, its circumvention will probably result from the creation of a military posture indicating victory in such a war, a potential which would dissuade the would-be aggressor."

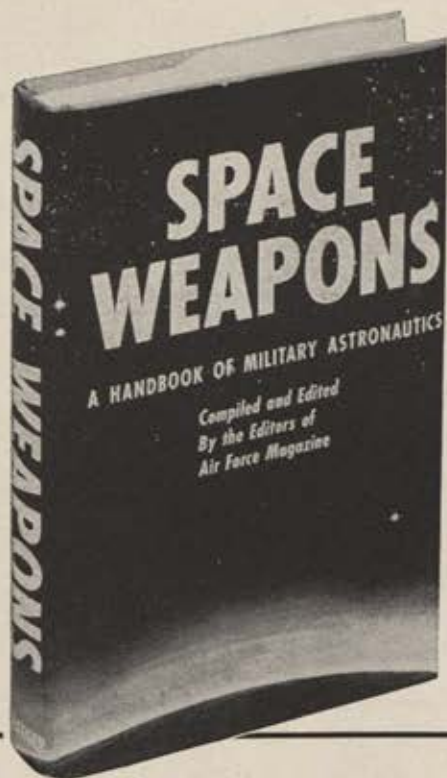
In a concluding survey dealing with astronautics, Dr. Emme reminds us that "men have traditionally underestimated the pace and influence of scientific progress." In the modern world, where the battlefield is about to be extended to the moon, Western man has "the long-range goal of ultimate utopia and a short-range goal of sheer physical survival. . . . The new environment must be conquered and controlled. . . . The price of freedom appears high in terms of investment of material wealth, intellectual labor, and moral courage."

The selections deal in the main with broad aspects of airpower. Specialized problems such as target strategies, combat tactics, force and equipment "mixes," base structures, and a host of vexing concrete questions before the professionals of today had to be excluded. Dr. Emme set out to explain airpower as an instrument of national policy, to provide an insight into the "theories, doctrines, experiences, and observations of airmen" and knowledgeable scholars and statesmen "from the Wrights to Schriever." He succeeded admirably.

The air community should study this work well. It owes Dr. Emme, one of its foremost intellectual leaders, a rousing vote of thanks.—END

The reviewer, Dr. Possony, is an authority on Communism and modern military strategy. He has been a professor of international politics at Georgetown University's graduate school since 1946. The author of Strategic Air Power and A Century of Conflict, he has written extensively for various magazines.

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CONTENTS

Preface
Introduction: Meeting the Challenge
By the End of the Century by *Dr. James H. Doolittle*
Space Control and National Security by *Gen. Thomas D. White*
The Space Frontier by the Editors of *AIR FORCE Magazine*
Springboard into Space
Ballistic Missiles and the SAC Mission by *Gen. Thomas S. Power*
Space Weapons Today and Tomorrow by the *Hon. Richard E. Horner*
Man in Space by *William Leavitt*
Out of This World by *Dr. Hubertus Strughold*
Spacecraft and Spaceflight by *Kraft Ehrlicke*
Choosing Our Space Goals by *Dr. Simon Ramo*
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Hard Facts in the Space Age

Space Weapons: A Handbook of Military Astronautics, by the Editors of AIR FORCE Magazine (Praeger, \$5).

Reviewed by Brig. Gen. Homer A. Boushey, USAF

This title, *Space Weapons*, might mislead the casual book browser. This book is far more than a technical description of hardware of the future. It runs the gamut of Air Force activities and thought in areas of astronautics and spaceflight. This wide scope, plus the imaginative presentation the materials are given by the editors of AIR FORCE Magazine, creates a document of value and interest for both specialist and layman.

Jimmy Doolittle opens the book with a space blueprint for the future, setting the tone and pace for the essays that follow. "Manned spaceflight will be a reality in our time," says General Doolittle, "and far farther frontiers than the moon or Mars and Venus will be before us."

He goes on to warn that we "must be first. If we do not expend the thought, effort, and money required, then another and more progressive nation will."

I would unreservedly say that Doolittle's prophecy is based on hard facts, and history will bear him out. The airman at best has always been a creature of unlimited foresight and unique capability to translate vision into reality. Throughout flight history the airman has guided his technology by consistently emphasizing its unlimited potential.

Because technical advances in the space field are coming in larger steps and more quickly today than in the past, it appears to some that we have entered a new area of operations. This is not true. Space is but an extension of the earth's atmosphere, and present accomplishments are merely an orderly progression, building on the achievements of the past, even as we go ever faster and farther from the earth's surface. This fact emerges in each chapter of *Space Weapons*.

Standing out among the many selections on military astronautics are those written by top Air Force leaders. Gen. Thomas D. White, USAF Chief of Staff, considers space a natural extension of the Air Force's activities within the earth's atmosphere. He develops the doctrine through which the ultimate goal of man in space can be achieved. He goes on to predict that in the near future airmen equipped with broad experience and knowledge gained through operations at lower altitudes will be the ones pioneering the limitless realms of the universe.

Gen. Thomas S. Power, Commander in Chief of the Strategic Air Command, surveys the advent of missiles and their role as an adjunct to manned aircraft in the near future.

Space weapons of today and tomorrow are discussed by Richard E. Horner, Assistant Secretary of the Air Force for Research and Development. Dr. Hubertus Strughold, the "father of space medicine," explores the medical problems of manned spaceflight.

These and other military bylined pieces are complemented by authorities closely tied to the Air Force space program.

Krafft Ehrlicke, from the Astronautics Division of Convair, writing on space vehicles, discusses propulsion system possibilities and capabilities, and Dr. Simon Ramo of Space Technology Laboratories views the political and economic implications of spaceflight and exploration. Man's chances

of survival in space are appraised by William Leavitt of AIR FORCE Magazine.

The harshest reality we face is the need to meet the space challenge posed by the Soviet Union. This is thoroughly probed by the editors of AIR FORCE in an essay which analyzes where we stand in relation to this threat and assays the contribution of the military, civilian scientists, and industry.

A full glossary of aerospace terms and a bibliography of the literature of astronautics and spaceflight contribute to making this volume a well balanced anthology of top professional thought in terms the layman can understand.

About the reviewer: Brig. Gen. Homer A. Boushey, Director of Advanced Technology, DCS/Dev, Hq. USAF, was the first to fly US experimental aircraft on rocket power alone in 1941 JATO tests. He commanded the 412th Fighter Group, the AF's first jet (F-80) organization, and led the first overwater jet flight, a squadron of F-80s, from the Philippines to Okinawa in 1947.

Behind the A-bomb

The Great Decision: The Secret History of the Atomic Bomb, by Michael Amrine (Putnam, \$3.95).

Reviewed by Col. John L. Frisbee

When Harry S. Truman became President on April 12, 1945, there was one problem to which he had not been introduced. He had a general awareness of the scope and magnitude of decisions he would have to make in the closing months of the war and in the postwar world.

It was not until after his first brief Cabinet meeting, however, that Truman learned that production of the atomic bomb was virtually assured. *The Great Decision* is the story of events which culminated in Truman's go-ahead decision on July 24, 1945, for use of the bomb against Japan.

The pattern of consultation and advice leading to Mr. Truman's decision was one which will seem familiar to most military readers—the appointment of an interim committee, the designation of a panel of qualified scientists to assist the committee, consultations with the Joint Chiefs and members of the Cabinet. The author examines each facet of the pattern carefully in the context of contemporary military and political developments and traces meticulously the formation of official thinking in support of military use of the bomb. There appeared never to have been any real question whether the bomb would be used. The high drama centered about the issue of *how* it would be used.

It is to the lasting credit of Mr. Truman that heroic efforts were made to discover a way to shorten the war against Japan by using the bomb in a manner that would be both effective and humanitarian.

The deliberations of independent groups of scientists connected with the Manhattan Project, though bearing only indirectly if at all on the President's decision, are examined along with official consultations on the bomb.

The author's account of the formulation of the Franck Report offers striking proof that scientific competence need be no bar to first-rate political thinking. Dr. Leo Szilard's pre-Hiroshima analysis of the dangers of an atomic age was startlingly prophetic. It could have been written in 1959.

(Continued on following page)

The author closes with several conclusions: There were errors of judgment associated with the ultimatum to Japan eleven days before the first bomb drop in Hiroshima, with the selection of targets and with the second use of the bomb on August 9. Some will agree, some disagree with him. None is likely to question his admission that a post-mortem conducted thirteen years after the fact conveys certain advantages of hindsight to the critic. In any event, the purpose of the book is not to assess blame. The author's objective is to contribute to understanding of the past.

The book also includes several chapters on the training of the 509th Bomb Group, the only unit which has ever dropped a nuclear weapon on a live target. Mr. Amrine also explores briefly the web of espionage surrounding the Manhattan Project. These chapters, though not directly relevant to the main theme of the book, will be particularly interesting to military readers.

Mr. Amrine draws much of his material from the memoirs of World War II leaders. Few official documents associated with the decision to use the bomb have been made available to the public.

This is not a scholarly book. It is rather a readable, sometimes over-dramatized, account of a decision that helped mold the face of the future, though perhaps not to the extent indicated by the author.

The atomic age was *not* born at Hiroshima but several years earlier in laboratories here and abroad. Whether the bomb was dropped or not, the ominous presence of nuclear weapons—at first a US monopoly but soon to be shared with the USSR—could not have been wished away.

The book contains, I believe, defects in organization, emphasis, and literary quality. It is, nevertheless, worthwhile reading especially for those in the military profession.

It underscores the facts that great decisions rest on complex foundations and inevitably create new and dimly foreseen problems; that they invariably are made with imperfect knowledge; and that the execution of a decision demands as much analytical effort as the decision itself. These are lessons which military men should keep always before them. In the words of Secretary of War Stimson, the titan of *The Great Decision*, we must try to take "the long view of history," and that view can best be achieved by those who understand something of the difficult decisions of the past.

About the reviewer: Col. John L. Frisbee is assigned to the Long-Range Objectives Group, Directorate of Plans, Hq. USAF. He is former professor of history at the Air Force Academy, and assistant professor at the US Military Academy. He served in Europe as a World War II fighter pilot and a member of the Air Staff of SHAEF.

The Air Force in Science Fiction

Not in Solitude, by Lt. Col. Kenneth F. Gantz, USAF (Doubleday, \$3.50).

Reviewed by Maj. Stockton B. Shaw, USAF

Good adult science fiction is rare. You can count the titles on both hands, the authors on one.

Lt. Col. Kenneth F. Gantz, editor of the Air University *Quarterly Review*, is a new name to watch in this field.

Not in Solitude, his first, is a suspense novel dealing with the first manned flight to Mars by men of the United States Air Force. For scientific survey and military reconnaissance the giant USAF spacecraft *Far Venture* transports eighty-odd persons, among them a number of world-famous scientists in addition to the Air Force crew and commander. As

the story gets under way, *Far Venture* has reached the red planet without event and is preparing to return to earth. Mars has been unrewarding. The only life on the planet is lichen growth. The only movement is an apparent form of heat lightning above the lichen fields during daylight hours.

Then, a ground party is reported overdue from an exploratory trek. Mysterious messages flash on the ship's radar screen. An attempt is made on the expedition commander's life, and three crewmen are found murdered.

It becomes increasingly clear that a hostile intelligence on Mars is out to prevent the spaceship's return to earth, and the reader is caught in the unusual cross-play of a double plot. While the mysterious "intelligence" turns out to be a lichen-encrusted cliché, familiar to some science-fiction readers, Colonel Gantz adds a unique touch by mixing an earthy "whodunit" sequence with an unusual "whatsit-on-Mars."

Withal, Colonel Gantz's scientifically based approach places the story above most around today. Gantz has something worthwhile to say about the relationship of man toward space travel and the attitudes he must nurture and develop for a successful move to the stars. Colonel Gantz's principal theme is this: From space exploration we can take a renewed appreciation and richer understanding of the planet earth.

Another theme is the dominance of the Air Force crew during stress that can be resolved only by action. The scientists have to stand down for the Air Force doers. Hence much attention also is given to the procedure of Air Force command and execution, as well as to professional USAF spacemanship. In fact, a major fault of the book, as I see it, shallow characterization, may be attributed to the author's intensity of purpose to seriously assay the minds of spacemen.

About the reviewer: Deputy Chief of the Pictorial Branch, USAF Office of Information Services, Hq. USAF, Maj. Stockton B. Shaw works closely with Hollywood producers on Air Force subject films. Major Shaw has acted as Air Force technical adviser on numerous films.

Aerospace Books

Seven Americans share the spotlight in British Wing Commander Norman Macmillan's *Great Airmen: From the Wrights to the Rocket Age* (St. Martin's Press, \$2.95): Wilbur and Orville Wright as the first airmen; Yeager, Bridgeman, Marion Carl, and "Kit" Murray as pioneers of spaceflight; Jimmy Doolittle as the "most versatile" of them all.

The book spans the history of aviation. Chapters chronicle the life and contributions of twenty-four airmen—the author's choice of all-time greats. While the majority are British, others include Frenchmen, Germans, and one Spaniard—Cierva, the father of rotary-wing flight.

Most of Macmillan's heroes are personal friends. Some were his close associates in the RAF, others enemies in combat like the famous Richthofen. He writes about all with deep feeling and understanding, appealing primarily to the young-adult audience but touching the interest of readers of all ages.

• • •

For several years officials of the Air University's squadron officer course (SOC) have polled successive classes for tunes and ballads of the airman at work and play. Top choices of hundreds of SOC students now appear in *Airmen's Songs* (Paragon Press, Montgomery, Ala., \$1.25)—a group of thirty-seven tunes fit for almost any occasion

when airmen get together to share the camaraderie of Air Force life. The songs divide into three distinct classes: traditional national songs, ballads, and Air Force tunes such as "I Wanted Wings," "A Young Aviator," and "Beside a Korean Waterfall."

The book is a paperback, pocket-size, words-only. The accompanying tunes are well known and need no musical score.

• • •

Newest member of the "American Occupational" handbook series is *Jet Pilot*, by Flint DuPre (Research Publishing Co., \$1). This thirty-two page paperback volume packs a multitude of facts, information, and guidance on all phases of a jet pilot's military or civilian career. Mr. DuPre, author of *Air Force Magazine's* popular airman career series of a year or so ago, writes this one for the high school lad.

• • •

Terry Maloney's beautifully illustrated guide to the universe, *Other Worlds in Space* (Sterling, \$2.95), is an introduction to the frontiers of tomorrow written in a pleasing and simple style. There are descriptions of the moon and each of the planets, their composition, relation to each other and to the solar system and the universe. There are chapters on observation instruments and methods, artificial satellites, and space travel and astronomy. Appendices include oft-called-for tabular data on the solar system.

• • •

The Book of Missiles, by Clive E. Davis (Dodd, Mead, \$2.75), belongs in every reading and reference library, home, shop, office, and school. It is one of the most complete general guides on the market today to the rockets and

missiles of all services. Part I discusses the Soviet Sputnik and the beginnings of the conquest of space. Succeeding parts take up the missile age, the operations and missions of air-to-air, air-to-surface, surface-to-air, surface-to-surface missiles and the programs and progress we are making to put man into space. Sub-sections go into areas such as ground-launch research vehicles, missile defense systems, and antisubmarine missiles. Extensive full-page photos of major research, development, experimental, and operational hardware supplement the narrative. This volume provides an interesting over-all view of US missilery.

Books of General Interest

Jane's All the World's Aircraft, edited by Leonard Bridgman, 49th edition (McGraw-Hill, \$30).

Rocket to the Moon, by Erik Bergaust and Seabrook Hull (Van Nostrand, \$5.95).

Technical Volumes

Dynamics of Flight, Stability and Control, by Bernard Etkin (Wiley, \$15).

Fundamentals of Advance Missiles, by Dr. R. S. Dow, USAF (Wiley, \$11.75).

Materials for Rockets and Missiles, by R. G. Frank and W. F. Zimmerman (Macmillan, \$4.50).

The Prediction of Ballistic Missile Trajectories from Radar Observation, by I. I. Shapero (McGraw-Hill, \$7).

Electricity in Aircraft, by F. G. Spreadbury (Macmillan, \$8).

—MAJ. JAMES F. SUNDERMAN

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Listed to the left are the official hotels and rates for Air Force Association's 1959 Convention and Panorama in Miami Beach, Fla., September 3-6. Complete the reservation form below, clip, and mail to the address shown. The hotels are listed in accordance with their dis-

tance from the Auditorium and Exhibition Hall, with the Montmartre the farthest away. Few Miami Beach hotels have single rooms, most are twin rooms (two beds). Rates refer in most cases to single or double occupancy of rooms.

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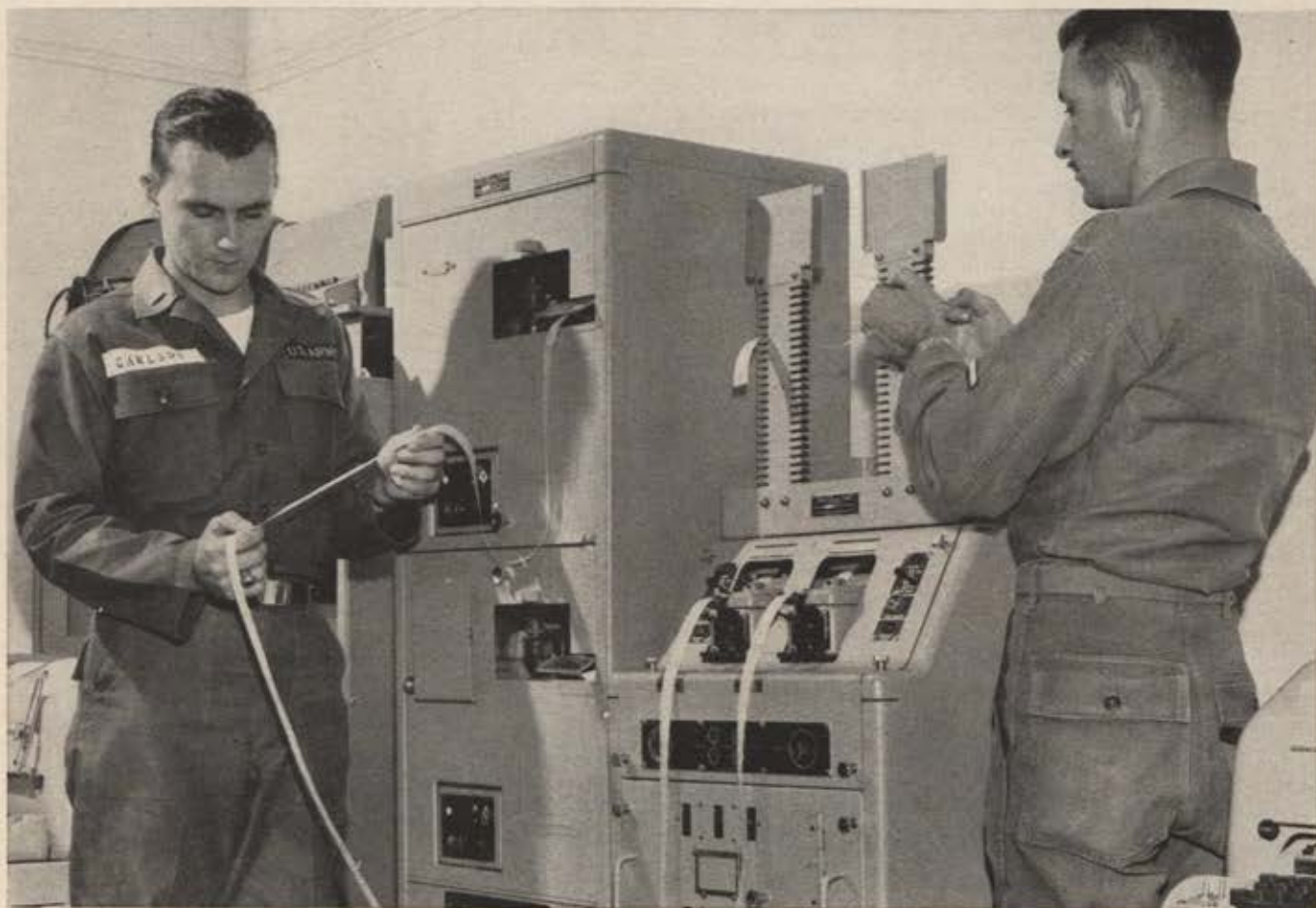
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SQUADRON OF THE MONTH

Cleveland, Ohio, Squadron, Cited for

Outstanding programming, particularly for its initiative in establishing a speaker's bureau for adult airpower education that has made more than sixty presentations before community organizations.

Olmsted Squadron, the pride of Harrisburg, Pa., has staged another of its special programs, this one to pay tribute to a man who served the Air Force well and has been a wonderful friend to AFA—Maj. Gen. George R. Acheson, Commander, Middletown Air Materiel Area, who retired January 31.

Squadron members joined with the Harrisburg Chamber of Commerce in pulling off "Operation Bobcat," a surprise party in General Acheson's honor at the Officers' Club. It was attended by more than 250 of the general's friends.

Joviality was the order of the night. Several "gag" gifts were presented to the general along with the serious ones. Among the former were a giant key to the city, designed to break in half as he accepted it; a leash, collar, and first-aid kit for his bird dog; and a comic vest in bright red. He also received citations from the Chamber of Commerce and the Squadron, a silver cigarette case presented by National Treasurer Jack Gross, and a double-barreled shotgun to use in his South Carolina island retirement home was presented for the Squadron by Steve Yednock, program chairman.

Maj. Gen. Frank Robinson, USAF (Ret.), M/Sgt. Horst Tittel, oldest active-duty USAF airman, and Col. Adolph Cattarius were among the honored guests. Colonel Cattarius was first sergeant of the unit to which General Acheson reported for flight training in 1925.

Serving with Yednock on the program committee were Lt. Col. Charles Stack; Capt. Charles Shields; Gene Simm, Olmsted Squadron Commander; Henry Kenderdine; Bob Foster; Bill Lunsford, a past Squadron Commander; and others (*see cut*).

The January meeting of the Orange County, Calif., Squadron featured the "worst" and "best" navigators in Douglas "Wrong-Way" Corrigan, who attained fame for his flight from New York to California by way of Dublin, Ireland; and Thomas E. Curtis, of

Autonetics Division of North American Aviation, who was project engineer for the autonavigator which guided the atomic submarines under the North Pole.

Mr. Curtis spoke on present and future navigation systems and related experiences as a passenger on the *Nautilus* as it made history.

Ed Hall, Squadron Commander, introduced Curtis and Corrigan.

Pittsburgh Squadron set up an outstanding program last month to spread
(Continued on following page)



Marge Kube, Minneapolis Squadron secretary, presents keys to courtesy car to Gen. John D. Stevenson during recent CADF Commanders Conference in Twin City.



Maj. Gen. George R. Acheson is shown with Olmsted Squadron Cmdr. Gene Simm, left, and Chamber Prexy John Baum.



Clark Specter, Erie, Pa., Commander, accepts Charter from Wing CO Chet Richardson, left, and Director Carl Long.

the word on the role of the Air Force and introduce some of its top personnel. Twelve senior officers from western Pennsylvania were invited "home" to take part in a panel discussion of the Air Force. They included: Col. Francis S. Gabreski; Lt. Col. Francis Kane; Maj. David B. O'Hara; Col. Robert Fancher; Maj. Gen. E. S. Ligon, Jr.; Col. James Hunter; Brig. Gen. William L. Lee; Lt. Col. Joseph Tolbert; Col. William Shomo; Col. A. Heineman; Brig. Gen.

Felix Vidal; and Col. Emma Riley. These officers represented the major AF commands plus some minor ones.

Heading the program's planning committee were Carl Long, AFA Director, and Mrs. Ruth Young, a member of the Squadron. The program was set for February 20, just as this issue of AIR FORCE went to press.

Las Vegas Squadron, host to the World Congress of Flight in April, held its largest meeting to date on

January 26. More than 200 members and friends crowded the Camellia Room of the Thunderbird Hotel to hear AFA's Executive Director James H. Straubel discuss plans for the World Congress. R. Scott Griffith, Squadron Commander, presided at the meeting.

Mr. Straubel was accompanied by Ralph Whitener, AFA Convention and Panorama Director; Bob Strobell, AFA Panorama Manager; and Bill Belanger, AFA Convention Manager. During their stay in Las Vegas, the AFA staff members made arrangements for the housing and exhibit facilities to be used in April. They report that the city is rapidly getting ready to welcome Congress delegates from all over the world.

There is only one effectively operated AFA Group in the entire organization. That one is located in Los Angeles, where a total of twelve active AFA Squadrons makes mandatory the establishment of a level of administration between Squadron and Wing. This fine Group has just reported another most effective program, the annual "Operation Holiday," which this year was hosted by the Air Harbor Squadron under the direction of Commander Walter McHugh and a hard-working committee.

Over 250 area members crowded into the NCO Club at the Air Force Ballistic Missile Division Headquarters a few days before Christmas. They got a rousing head start on holiday celebrating. Bill Scroggins, LA Group Commander, reported the evening was a big success from every standpoint, and the Air Harbor Squadron did a great job.

Latest city to organize an AFA Squadron is Amarillo, Tex., whose Charter was presented on February 1. Commander of the unit is Frank J. Storm, Jr., P.O. Box 1983, who is in the oil business in Amarillo. He headed the organizational drive that resulted in the Squadron's formation. Other officers include Robert E. Hoffman, Vice Commander; Jack Lacy, Secretary; Jesse L. Pate, Jr., Treasurer; and William E. Lee, Antonio Salazar, Jr., Chester Trosky, and Robert A. Ehlers, Councilmen.

We're most happy to welcome this newest group.

AFA President Peter J. Schenk received an honorary cub scout pin from Cub Scout Pack 456, Wheaton, Md., in early February, a feature event of (Continued on page 127)

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an activity the boys labeled "Operation VIP."

The Boy Scouts of America celebrated their forty-ninth anniversary this year. Mr. Schenk was asked to wear his pin during Boy Scout Week.

CROSS COUNTRY . . . Clive Davis of the Sacramento Squadron, program director for the McClatchey Broadcasting Co., which operates a chain of California radio stations, has just sent us a tape-recording he did on the jet-noise and sonic-boom problem. We think it is one of the best presentations we've heard. We're trying to get permission to make copies to distribute to AFA units for local programs . . . Dale Erickson, Rocky Mountain Region V-P and chairman of the 1959 Utah Airpower Symposium, has been in touch with us regarding the program to be held in Salt Lake City, May 14-16. It appears this year's event will compare favorably with past performances and will rate attendance by every AFA leader in the general area. Jim Bonner, last year's general chairman, is program chairman this year. He is, if anything, busier than in 1958 . . . Erickson also reports that he's planning a Regional AFA conference for Cheyenne, Wyo., during which he'll try to get a Squadron organized there . . . Other Squadrons are currently being organized in Birmingham, Ala.; Birmingham, Mich.; Reno, Nev.; and New York City . . . For their Charter Night Dinner the new Jacksonville, Fla., Squadron featured an interesting change of pace. A Navy carrier pilot described his ship's mission to the Near East during the recent crisis in Lebanon. Wing Commander Ted Koschler and V-P Alex Morphonios presented the Charter . . . Mitchel Squadron, N. Y., has announced that its annual Dinner Dance will be held April 3 under the chairmanship of Maj. Gen. Roger Browne, USAF (Ret.).

—GUS DUDA



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WANTED: OLD AIRPLANES

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WHILE the Air Force as a whole moves at supersonic speed toward a rendezvous with tomorrow, a handful of USAF personnel fight a needle-in-a-haystack battle to catch up with yesterday.

Their mission: To collect the planes that have written the history of American airpower through the years—from the Wright brothers to SAC.

Their problem: It's not easy. Old planes, the Air Force Museum has found, are likely to fade away.

Last year, as satellites, missiles, and superbombers began to jam today's aerospace lanes, the men of the museum at Wright-Patterson AFB, near Dayton, Ohio, scored a signal success. They discovered and rebuilt a forty-year-old, dual-wing Jenny, one of the famous family of World War I trainers that made the barnstorming rounds after the war.

Probably the majority of today's top USAF officers learned to fly in Jennies, or Curtiss JN-4s, thousands of which came off the assembly line. But this new acquisition is the Air Force Museum's one and only specimen of the old plane. It was found in a hayloft, offered to the museum by its owner, and eagerly accepted (see cut).

The time-ravaged Jenny was little more than a bare frame and a broken-down engine when it arrived.

The fabric had long since rotted off. The control wires, braces, and other metal parts were badly rusted. The junk pile seemed the Jenny's next stop. But to the museum's experts, it was a rare prize.

In the museum's shop, mechanics went to work. They painstakingly removed all metal fittings. Rotted wood pieces were carefully cut out to preserve as much of the original frame as possible. What was left wasn't much, but it was better than nothing.

The next step was to dig original engineering drawings of the Jenny from the files. In the following weeks the museum men fashioned several hundred bits and pieces of wood needed to complete body and wings. These were fitted together, warped into shape, and fastened as the drawings indicated.

Next step was the fabric covering. The assembled fuselage and wings went to the base fabric shop where fitting, sewing, stretching, and doping were completed.

In the meantime, the engine was completely taken apart, broken parts were remade in the machine shop, and the whole works reassembled and polished to look like new.

The final result was the virtually new Jenny that has assumed its proud and rightful place in a display stretching back over fifty years of US military aviation.

The Jenny's restoration from a seemingly hopeless condition points up the museum's aeronautical face-lifting propensities. But the best artisans in the world cannot renovate planes they do not have.

Some major planes, unfortunately, are missing. Many of these, almost incredibly, are from the recent past. Some were workhorses of World War II.

A "Planes Wanted" list put out recently by museum director Maj. Robert L. Bryant includes the Lockheed P-38 Lightning, Martin B-26 Marauder, Douglas A-20 Havoc, Bell P-39 Airacobra, and Stearman PT-17.

"These entries on my list are in the believe-it-or-not category," Major Bryant explains. "Many hundreds of these planes were rolled off our production lines during the war, but not a single one was kept for historical purposes when the war ended."

The man in charge of tracking down extant remains of these and other practically extinct planes is museum plans officer Capt. Kenneth T. York. Captain York and his staff carry out continuing detective work here and abroad.

"I feel sure that somewhere—in old barns, an overgrown corner of an abandoned airfield, an airplane graveyard—there must be carcasses or skeletons of many old planes that we could restore," Major Bryant says, describing his organization's efforts.

"Every once in awhile someone will tell us that they have heard somebody has one of our wanted planes. Usually we find that the rumor isn't true or we can't trace it to its source."

Actually, despite many frustrations, Bryant, York, and their predecessors have managed to pull together what may be the best-stocked military airplane collection in the world. It numbers some 100 planes at present, up through the B-52 and jet fighters, along with a vast assortment of aerial equipment.

However, only four of the planes, including the rebuilt Jenny, are more than twenty-five years old.

Many of the gaps in the museum parade of planes date to a fire that destroyed an Army Air Corps collection in 1930.

This accounts for the presence on the "wanted" list of such famed

Lt. Col. Carroll V. Glines



Sorry remains of a once-proud Jenny.



Rebuilt, the Jenny gleams on display.



Museum would walk a mile for a Camel.



Priceless . . . a Standard E-1 fighter.

Opposite, an aeronautical lineup out of the past. How many do you remember? They include: 1. Curtiss JN-4 Jenny trainer, 2. British de Havilland DH-4, 3. French Nieuport 28-C, 4. Boeing P-12E, an aerobatic pace-setter, 5. Curtiss P-6E Hawk, 6. Martin B-26 tactical bomber, 7. Martin B-10B, an evolutionary milestone phased out before the war, 8. Bell P-39D, 9. Nazi Germany's Messerschmitt ME-109, 10. Lockheed P-38 Lightning, shown in two-seat, night-fighter configuration.



Extinct now, Stearman PT-17 was schoolroom for many of today's USAF pilots.



Douglas B-18 flew sub patrols in last war, then went the way of old planes.



Douglas A-20 low-altitude bomber, a World War II standby among the missing.



A former enemy, German Focke-Wulf 190 is among top entries on "wanted list."

World War I types as the Standard E-1, Thomas-Morse S-4C, de Havilland DH-4, Sopwith Camel, Nieuport 28, and Spad.

"When the idea of preserving old airplanes was first advanced and the Army Aeronautical Museum was started in 1923, all of these 'name' planes were still flying," Major Bryant notes. "One of each of them was acquired, but the fire destroyed them along with other old-timers."

Major Bryant's list also includes "between-the-wars" planes such as the Martin B-10, Douglas B-18, Curtiss P-6E, Boeing P-12, and Curtiss P-36, as well as the Messerschmitt ME-109, the Focke-Wulf 190, and Mitsubishi Zero among World War II enemy aircraft.

One of the most popular exhibits the museum has on hand required the services of a taxidermist rather than an aircraft mechanic or designer.

"We have here one of the most famous old Air Corps flyers, all stuffed and mounted," top museum civilian Mark C. Sloan tells you. "His name was Stumpy John Silver, a proud, decorated air hero."

Then Sloan continues, "Yes, Stumpy John was one of World War I's most distinguished homing pigeons. He served with valor in France. Lost a leg in combat but lived until 1935 to become one of the world's oldest pigeons."

Stumpy John shares the non-airplane side of the museum with radios, radar sets, bombsights, wind tunnels, guns and bombs, balloons, rocket motors, and an extraordinarily fine model collection.

But the old planes are, of course, the core of the display. Congress won't allow Air Force dollars to be spent on the planes themselves but permits expenditure of funds for transportation and rehabilitation of those in Air Force possession or received as donations.

Major Bryant and his team, working overtime themselves on filling gaps in the museum plane collection, have issued a general word-of-mouth appeal to the aviation world for assistance in locating and obtaining aircraft in the "missing" group.—END

The author, Lt. Col. Carroll V. Glines, is an AMC projects officer at Wright-Patterson AFB and a frequent visitor to the Air Museum of which he writes. He flew some of the planes on the "wanted" list in the last war. Colonel Glines, a career officer, is the author of two books on family relations and a number of magazine pieces.

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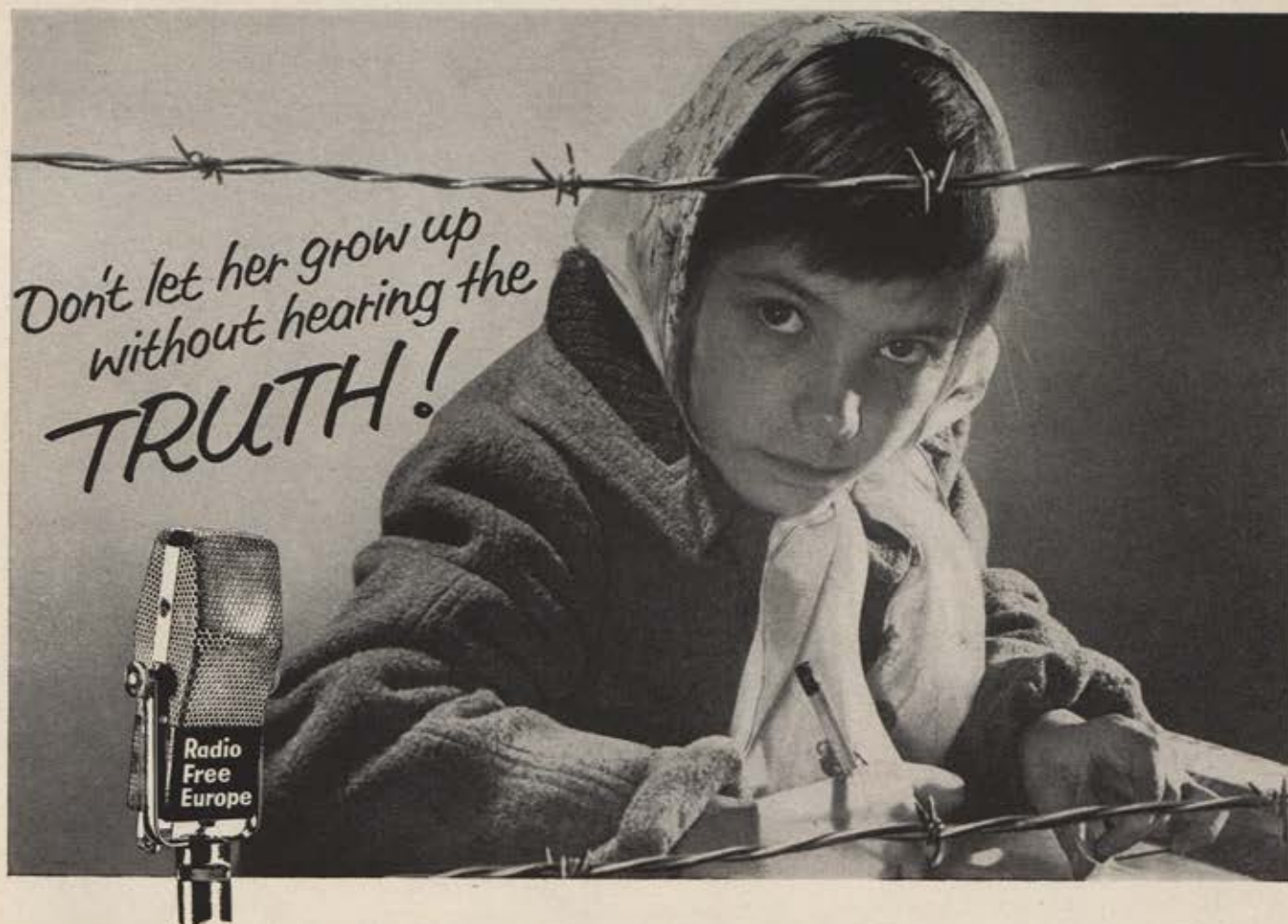
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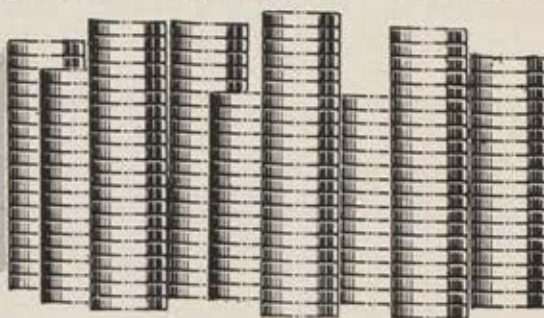


INDEX TO ADVERTISERS

Aerojet-General Corp.	86
Air Transport Assn.	109
Aircraft Radio Corp.	110
Allison Div., General Motors Corp..	80
American Air Filter Co.	60
Arma Div., American Bosch Arma Corp.	Cover 2
AVCO Manufacturing Corp.	98
Avro Aircraft, Ltd.	102
Cessna Aircraft Co.	23
Champion Spark Plug Co.	8 and 9
Continental Motors Corp.	131
Convair, a Div. of General Dynamics Corp.	Cover 4
Douglas Aircraft Co., Inc.	1
Electro Tee Corp.	127
Food Machinery & Chemical Corp..	28
Francis Aviation.	127
General Electric Co., LMED	19
Hoffman Laboratories, Div. of Hoffman Electronics Corp.	89
Huck Manufacturing Co.	15
Hughes Aircraft Co.	36 and 37
International Business Machines Corp., IBM Military Products Div. Cover 3	
International Telephone & Telegraph Corp.	4
Kleinschmidt Div. of Smith-Corona Marchant, Inc.	122
Kollmorgen Optical Corp.	97
Lockheed Aircraft Corp.	12 and 13
Magnavox Co., The, Government & Industrial Div.	7
Marquardt Aircraft Co.	58 and 59
Martin Co., The.	92 and 93
Norair, a Div. of Northrop Corp.	118
North American Aviation, Inc.	26 and 27
Northrop Corp.	20 and 21
RCA Defense Electronics Products, Radio Corp. of America	14
Sierra Engineering Co.	124
Southwest Airmotive Co.	115
Sperry Microwave Electronics Co., Div. of Sperry Rand Corp.	113
Stromberg-Carlson Co.	90 and 91
Texas Instruments, Incorporated ...	35
Thompson Ramo Wooldridge, Inc. ...	101
Westinghouse Electric Corp., Defense Products Group.	2 and 3

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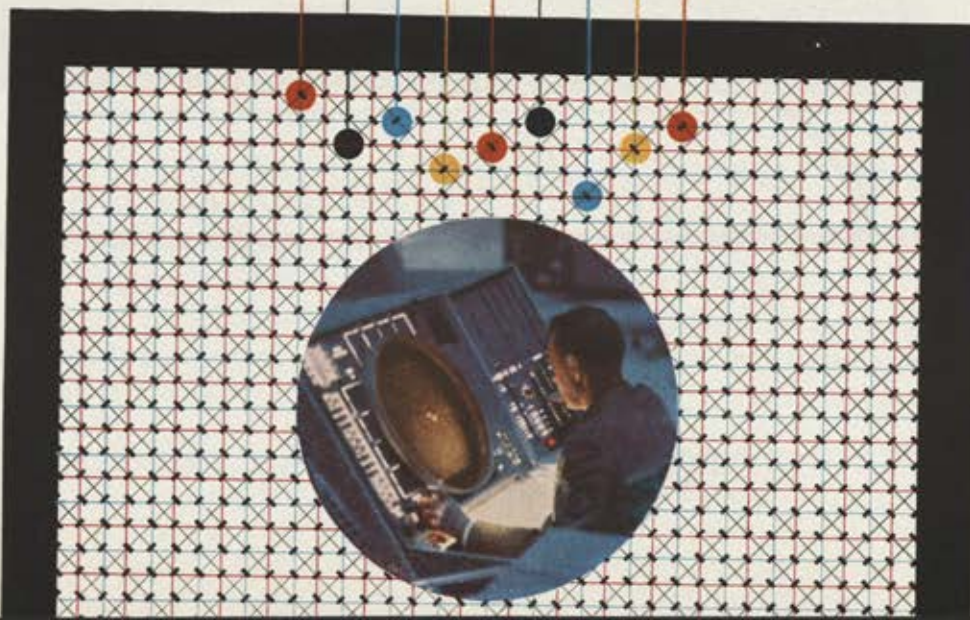
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