APRIL 1957 / 35c

AIR FORCE

• The Magazine of AMERICAN AIRPOWER / Published by the Air Force Association

THE JET AGE

Community Relations

GEN. THOMAS D. WHITE, USAF

MILTON W. ARNOLD

DR. LESLIE A. BRYAN

GEN. JOSEPH T. McNARNEY, USAF (RET.)

HON. JAMES T. PYLE

Manpower and Education

DR. DETLEV W. BRONK

LT. GEN. CLARENCE S. IRVINE, USAF

GEN. ORVAL R. COOK, USAF (RET.)

DR. EDWARD TELLER

Flow of Information

PHILIP K. ALLEN

HON. JOHN MOSS

DR. LOUIS RIDENOUR

GEN. JOHN E. HULL, USA (RET.)

A Special Report on AFA's Second National Jet Age Conference

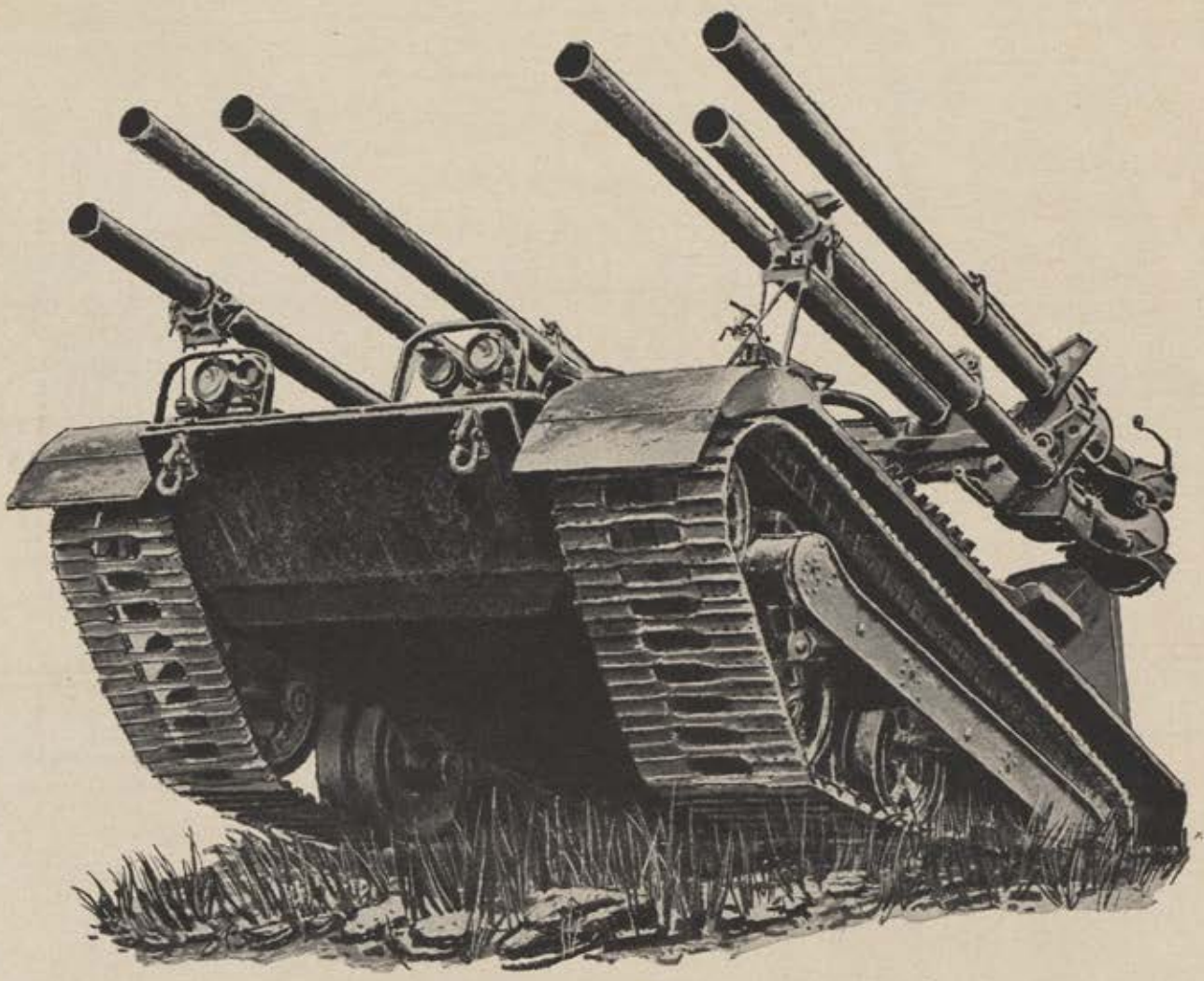
DOUGLAS DC-8 jet airliners will fly on blue-ribbon routes in the U.S. and overseas. This transport is one of more than 40 types of turbine-powered aircraft using Hamilton Standard equipment. Superior engineering, research, development, and experience stand behind Hamilton Standard's leadership in production for outstanding aircraft—jet or propeller driven.

WHEREVER MAN FLIES

HAMILTON STANDARD

Propellers • Starters • Air Conditioning Systems • Fuel Controls • Valves • Pumps

HAMILTON STANDARD, WINDSOR LOCKS, CONNECTICUT



"ONTOS"! land-bound fighter with airplane-type fuel cells

Low, lean and lethal — this is the "Ontos," new land combat vehicle of the U. S. Marine Corps, with more firepower than any other in history.

Highly maneuverable, it is a hit-run weapon which relies upon its low silhouette to get in, strike and get out fast.

This low silhouette is made possible, in part, through an airplane-type fuel cell — built by Goodyear Aviation Products—which is "tunneled" so that the vehicle's drive shaft runs right through it.

By utilizing bladder cells and aircraft-type fittings to replace conventional rigid metal-tank construction — fuel-tank bounce, vibration and corrosion problems are eliminated.

Produced by Allis-Chalmers at its La Porte, Indiana, Works, the Ontos gets its name from the Greek for "the Thing." And what a thing it is: a multi-purpose combat vehicle that does the work of twelve — a feat made possible partly by aeronautical pioneering.

Goodyear Aviation Products Division is a leader in the field of fuel cells, for aircraft, boats, guided missiles and vehicles. For full information, write: Goodyear, Aviation Products Division, Dept. D-1712, Akron 16, Ohio, and Los Angeles 54, California.

GOODYEAR
AVIATION
PRODUCTS

Lockheed C-130's paradrop 29,000 pound loads on-a-dime, in seconds

LOCKHEED'S C—130 HERCULES, NEW PROPJET "STRONGMAN" OF TACTICAL AIR COMMAND'S 18TH AIR FORCE, CAN AIRLIFT MORE FIGHTING MEN AND EQUIPMENT FARTHER, FASTER, AND AT LOWER COST THAN ANY COMBAT CARGO CARRIER NOW IN SERVICE.

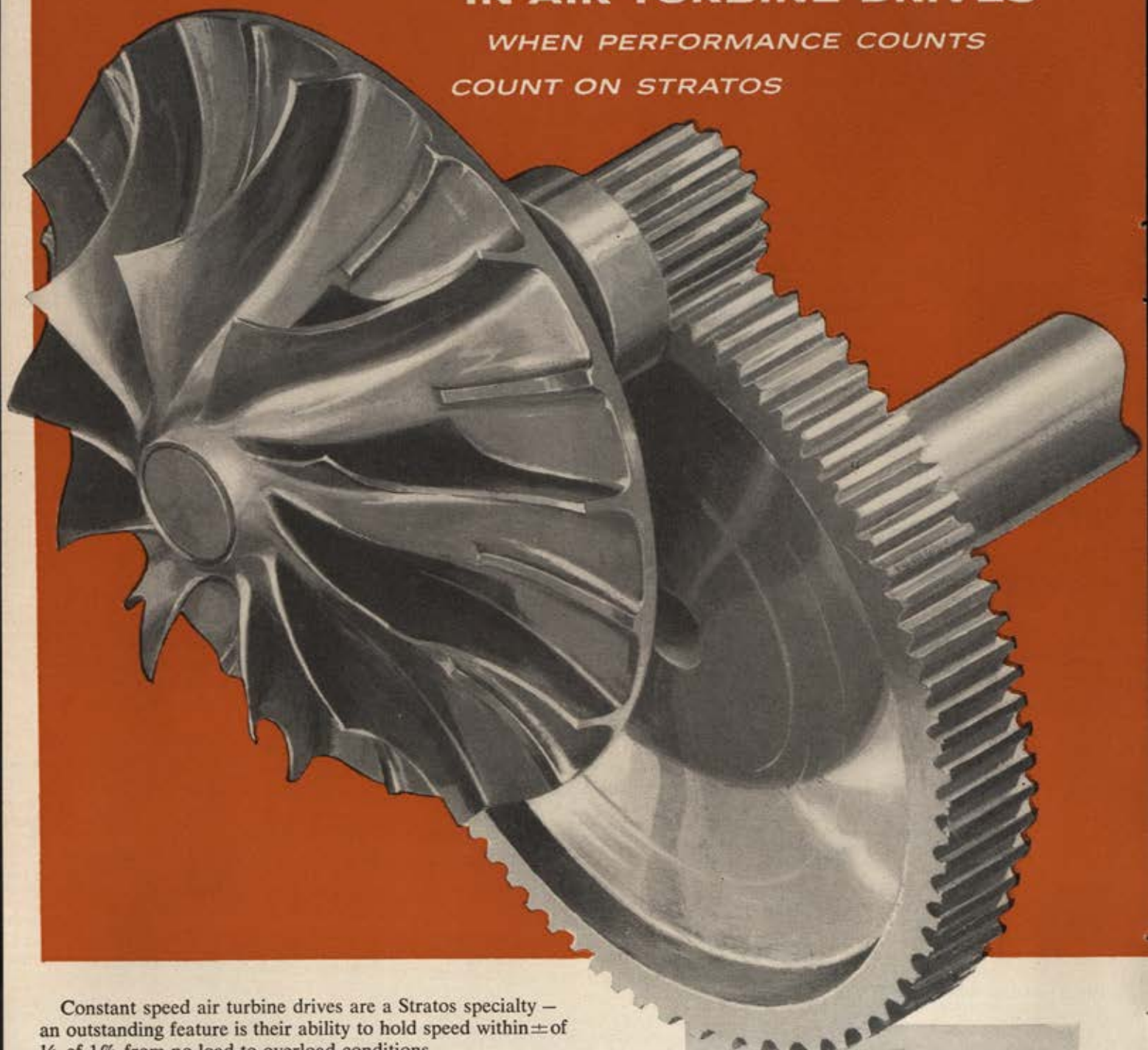
LOCKHEED *means leadership*

LOCKHEED GEORGIA DIVISION: *(U.S. Air Force Plant No. 6, Marietta, and Georgia Nuclear Laboratory, Dawsonville)* PROPJET C-130 HERCULES COMBAT CARGO CARRIER • B-47 MODERNIZATION • NUCLEAR-POWERED AIRCRAFT RESEARCH & DEVELOPMENT

IN AIR TURBINE DRIVES

WHEN PERFORMANCE COUNTS

COUNT ON STRATOS



Constant speed air turbine drives are a Stratos specialty – an outstanding feature is their ability to hold speed within ± of ¼ of 1% from no load to overload conditions.

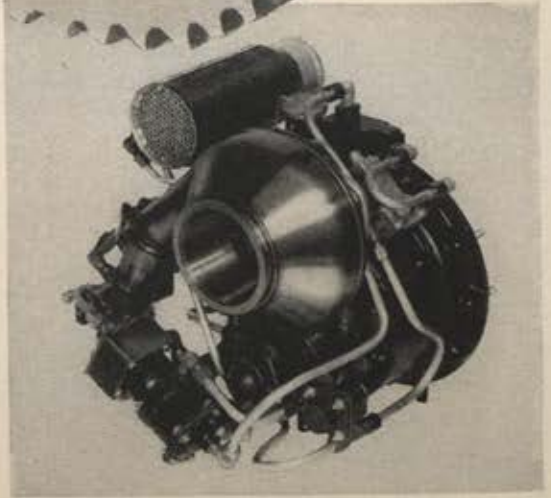
Particularly significant are the safety precautions designed into these rugged units. Besides an inherently sound design, each model incorporates an integral overspeed protection system – independent of the governing system – which shuts down the turbine mechanically. Overspeed trips are of several types – some resettable in flight – so that the best arrangement for each installation can be selected.

For additional information on Stratos' line of air turbine drives, write to:

STRATOS

A DIVISION OF FAIRCHILD ENGINE & AIRPLANE CORPORATION

Main Plant: Bay Shore, L. I., N. Y.
West Coast Office: 1355 Westwood Blvd., Los Angeles, Calif.
Western Branch: 1800 Rosecrans Ave. Manhattan Beach, Calif.



Model TP25-1, for driving a 15 kva alternator

AIR FORCE

THE MAGAZINE OF AMERICAN AIRPOWER

Volume 40, No. 4 • *April 1957*

Features

Departments

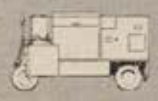
STAFF

AIR FORCE Magazine is published monthly by the Air Force Association, Printed in U.S.A. Re-entered as second class matter, December 11, 1947, at the post office at Dayton, Ohio, under the act of March 3, 1879. **EDITORIAL CORRESPONDENCE AND SUBSCRIPTION** should be addressed to Air Force Association, Mills Building, Washington 6, D. C. Telephone, STerling 3-2305. Publisher assumes no responsibility for unsolicited material. **CHANGE OF ADDRESS:** Send old address *and* new address (with zone number, if any) to Mills Building, Washington 6, D. C. Allow six weeks for change of address. **SUBSCRIPTION RATES:** $4.00 per year, $5.00 per year foreign. Single copy, 35 cents. Association membership includes one-year subscription: $5.00 per year (Cadet, Service, and Associate membership also available). **ADVERTISING CORRESPONDENCE** should be addressed to Sanford A. Wolf, Advertising Director, 18 E. 41st St., New York 17, N. Y. (MUrray Hill 3-7635). Midwest office: Urben Farley & Company, 120 S. LaSalle St., Chicago 3, Ill. (FInancial 6-3074). West Coast office: Hugh K. Myers, Manager, 685 S. Carondelet St., Los Angeles, Calif. (DUnkirk 2-6858). **TRADEMARK** registered by the Air Force Association.

INDEX TO ADVERTISERS

CAPABILITIES . . . Manpower, Tools and Experience

The Lockheed T2V-1 "Seastar"

BEECH BUILDS	
	MA-3 MULTI-PURPOSE VEHICLES
	C-26, MD-3 POWER UNITS
	TANK-WING-MAJOR SUBASSEMBLY SUBCONTRACT PRODUCTION
	BEECHCRAFT T-34 TRAINERS
	BEECHCRAFT L-23 TRANSPORTS
	4-PLACE BEECHCRAFT BONANZA
	6-PLACE BEECHCRAFT TWIN-BONANZA
	8-PLACE BEECHCRAFT SUPER 18

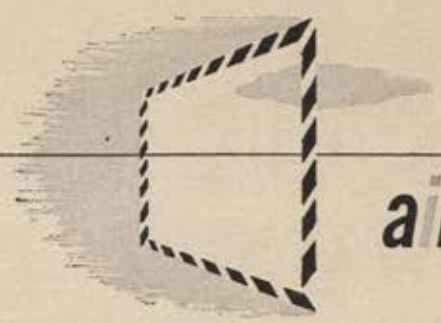
Since early in 1951 Beech Aircraft Corporation has been building wings for Lockheed's famous T-33 jet trainer. To date, more than 5,000 sets of T-33 wings have been produced along with hundreds of additional wings for Lockheed's F-94C "Starfire" and T2V-1 "Seastar." As further evidence of this continuingly successful subcontract relationship, Beechcraft is now producing the aft fuselage section of Lockheed's new F-104 "Starfighter", the world's fastest fighter airplane.

You'll also find other major components and famous names on Beechcraft's subcontract production lines . . . canopies and windshields for Convair's F-102 delta wing fighter . . . fuel tanks for Republic's F-84F fighter-bomber . . . and major sub-assemblies for McDonnell's F-101 supersonic fighter. We're proud of the trust and confidence these outstanding companies have placed in Beech craftsmanship.

Beech Aircraft Corporation has five major plants with 1¾-million square feet of plant area and more than 7,000 skilled employees . . . *with capabilities.* Beechcraft's manpower, tools and experience can be put to work to solve research, development or production problems. Whatever your needs, telephone or write Beechcraft's Contract Administration Division today.

Beechcraft

BEECH AIRCRAFT CORPORATION, WICHITA, KANSAS, U. S. A.



air mail

Coming of Age

Gentlemen: As Minnesota Wing Commander of AFA and individually may I express to you a most deserving "well done" for another highly successful Jet Age Conference. All in attendance—the civic, educational, and business leaders of America, the personnel of the Air Force, the officers and members of AFA units throughout the country who were present, will agree the Conference was an outstanding affair. The clockwork precision with which the program was conducted and the high caliber and wide knowledge of aviation problems of the panel members and participants indicated that extended planning had been done and preparations made. As occurred last year, no doubt the Conference will again serve as the stimulus for similar meetings this year in communities throughout America by groups and individuals interested in the progress and growth of aviation in this the jet age of aviation.

Upon seeing the number of persons present and hearing the remarks of the panel members and conference participants and thinking back of all the achievements of the Air Force Association in this past decade, as a charter member of AFA I could not help feeling that AFA has more than justified its founding and existence. I think even its founders and Gen. H. H. Arnold, who was its inspiration, never dreamed that AFA in one short decade would make such growth, achieve such public prestige, and become of outstanding service to the people of America. Air Force Association has truly come of age and can feel proud.

Because of the brick-bats, often unjustified, thrown your way, at this time for a job "well-done" may I extend my compliments.

William G. Kohlan
Minneapolis, Minn.

Lawyers and Atomic Energy

Gentlemen: The article "The Nature of Nuclear Warfare," written by Dr. Edward Teller, in the January issue of Air Force, is one of the most enlightening that you have published in a long while. You no doubt have noticed the review it received in *Time* Magazine during the middle of January.

I would like to send copies to each of the members of the Atomic Energy Committee of the San Francisco Bar Association, on which committee I have served for the past three years and am presently serving once more.

Although the basic research of the committee concerns problems of a legal nature arising in connection with the development and use of atomic energy, nonetheless this topical story by Dr. Teller, I believe, would be of keen interest to these other lawyers. It might well also influence them into an association with AFA.

Thos. F. Stack
San Francisco, Calif.

Then What Happened?

Gentlemen: Reference the article "The Man Who Gave Ivan the Bird," by Lt. Col. Howard Jarrell [February '57 issue]—just finished reading same and found it most interesting. As an aircraft commander of an F-13A [Boeing B-29, long-range photo reconnaissance] I nearly had the same experience, but made Iwo Jima instead. Hope Colonel Jarrell writes another article on his winter at Tashkent and return home to the United States. Would be a good follow-through.

A splendid story, Colonel. Let's have the rest!

D. U. Woodfield
Port Jefferson, N. Y.

Lower Them Flaps, Chum

Gentlemen: Undoubtedly your magazine is widely read, and your Association's ideals are one hundred percent. Your magazine contains the latest concept of the air age, jet and rocket propulsion techniques and ICBM, plus navigational aids such as TACAN and LORAN, sound barrier, thermal barrier, human barrier, psychological barrier, and all the high-falooting scientific mumbo-jumbo that would put a $64,000 quiz aspirant in the lower ten percent of his class.

Frankly, this low creature, whose ceiling is 10,000 feet, traveling at a terrifying speed of 135 miles per hour indicated, only dares to look at the pretty pictures and full-page ads in color.

I have never been permitted to get nearer than 500 feet to a jet plane and know I'd sprout goose pimples if allowed to touch one. I eat and sleep flying, the bird kind that is. I gobble up all reading material in *Flying* Magazine, and devour every word written by Gill Robb Wilson. He's my kind of airman who speaks the language I understand.

Of course, I know AFA's objectives are intelligent, honest, and patriotic. But, Governor Stevenson had the same objectives.

I wonder if AFA would dare step across to the other side of the tracks to meet and talk with a few guys like myself. There's no gold braid or scrambled eggs on this side, but if the seeds of aviation were sown in the rich bottom land as well as the high ground, the harvest would produce a welcome crop of airmen instead of ducktail haircuts and Elvis Presley morons.

About the five-buck membership, gladly. But talk to me boy. I see your vapor trail at 40,000 feet but can't hear a word you're saying over the noise of my eighty-five hp Continental at 1,500 feet.

Harvey T. Youwer
Chicago, Ill.

• *We read you, loud and clear.—The Editors.*

Why Aren't Facilities Available?

Gentlemen: The editor's remark of "The meat of the report, however, is all here. Study it carefully," from the February 1957 issue of Air Force regarding the Symington findings did not include one remark about the Air Reserve's participation in the assigned mission of the Air Force. This could hardly be an oversight in determining the purpose of the Board "to examine into the condition and progress of the Department of the Air Force and ascertain if present policies, legislative authority, and appropriations are adequate to main-

(Continued on page 11)

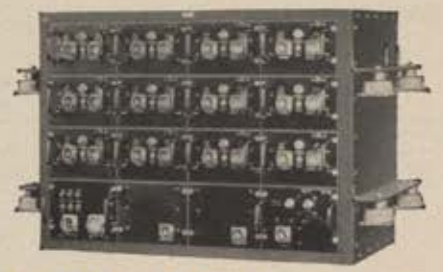
VERSATILITY

TDI MINIATURE TELEMETRIC RECEIVING SYSTEMS

Miniature and mobile, here's a telemetric receiving system designed for a host of military and civilian applications . . . airborne, ground or marine!

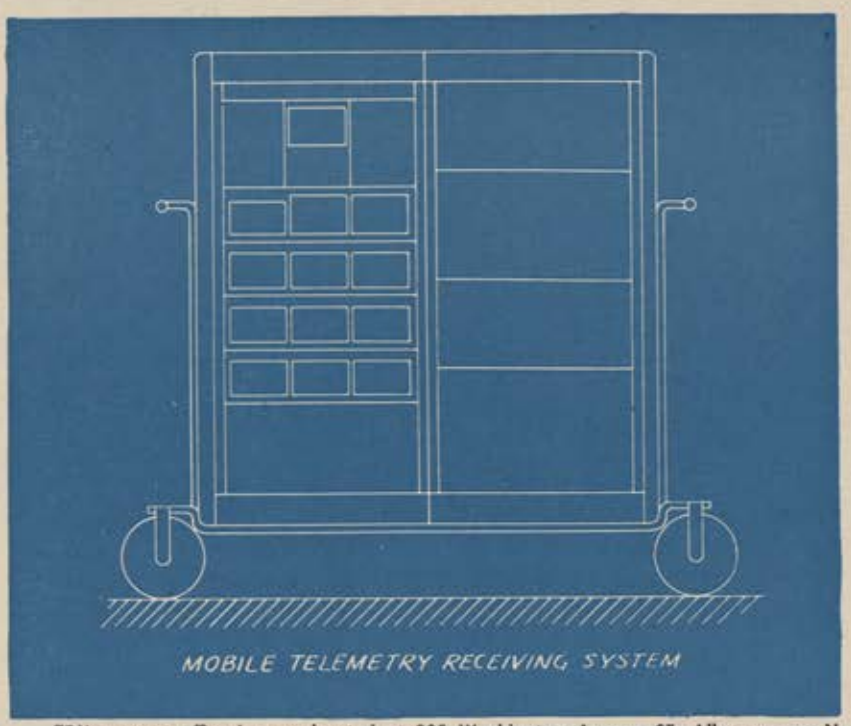
For missile checkout, flight tracking experimental aircraft and missiles, the TDI systems are highly effective, even under the most severe field service conditions. They operate ideally with tape recording, oscillographic, photographic and similar types of recording equipment . . . and this rugged equipment can be installed in jeeps, autos and trailers.

Design-wise, these systems achieve substantial reductions in weight, size and power consumption—yet a high degree of accuracy, exceptional stability and simplicity of operation are maintained.



TDI 12-Channel Receiver. Modular construction permits wide flexibility of arrangement and actual form factor of receiving equipment. Packages or combinations in any number from one to eighteen units can be arranged in various mounting styles.

TDI Type 2701A 4-Channel Receiver. Use as flexibly as 12-channel unit—split-up in combinations to suit your particular receiving requirements. Ideal for flight line checkout.



MOBILE TELEMETRY RECEIVING SYSTEM

← Telemetering on wheels! New portable test cart enables users to perform wide variety of telemetering functions in previously inaccessible locations, with greater efficiency and accuracy than ever before.

Technical bulletins on miniature receiving systems and other TDI products available on request.

TDI's newest office is now located at 305 Washington Avenue SE, Albuquerque, New Mexico

- TELEMETERING
- MISSILE GUIDANCE
- GROUND ELECTRONICS SYSTEMS
- AIRBORNE ELECTRONICS SYSTEMS

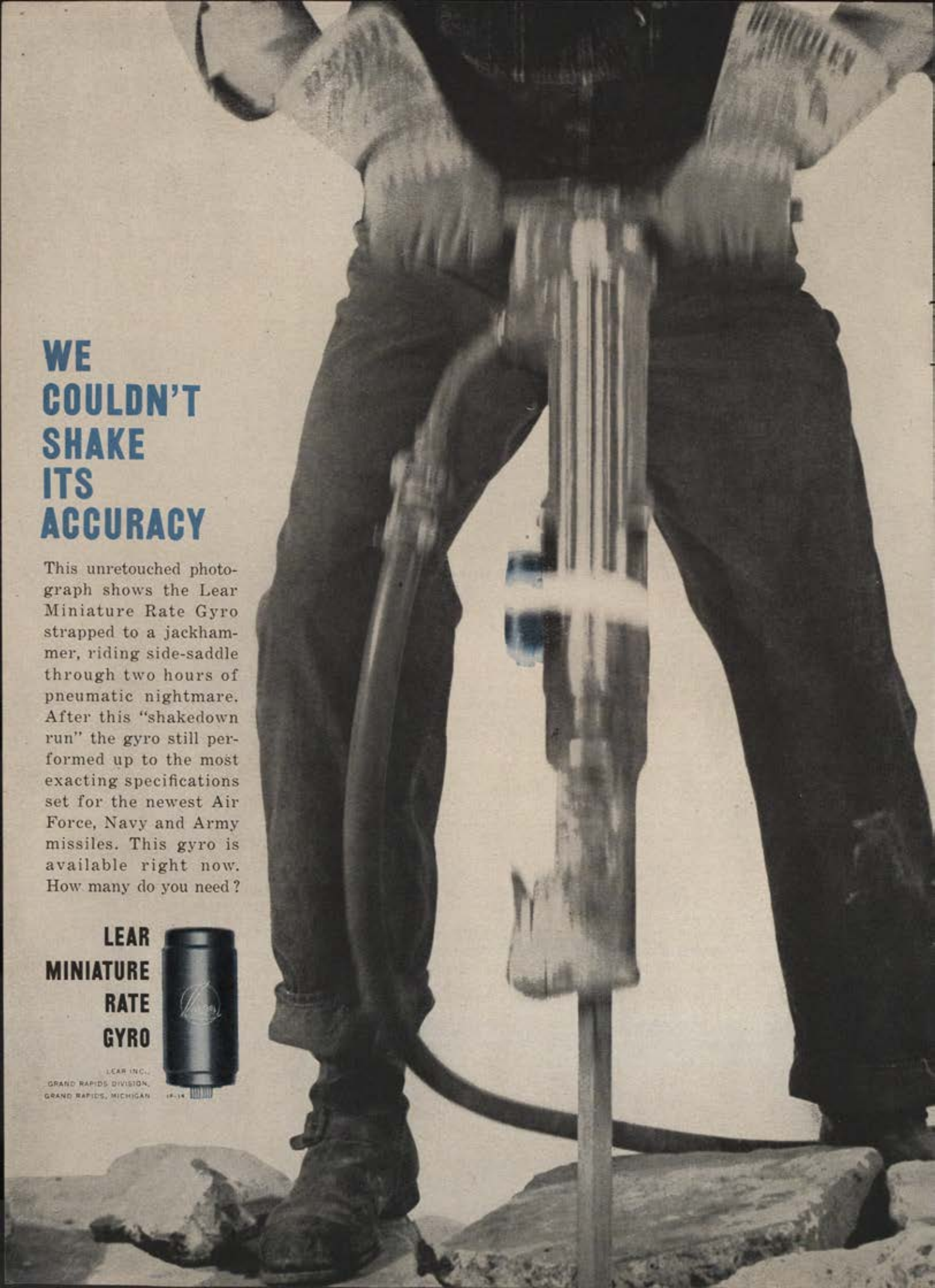
TELE-DYNAMICS INC.

A Raymond Rosen Corporation

32ND AND WALNUT STREETS, PHILADELPHIA 4, PENNSYLVANIA

Western Regional Office: 15016 Ventura Blvd., Sherman Oaks, Los Angeles, California

Formerly, Raymond Rosen Engineering Products, Inc.



WE COULDN'T SHAKE ITS ACCURACY

This unretouched photograph shows the Lear Miniature Rate Gyro strapped to a jackhammer, riding side-saddle through two hours of pneumatic nightmare. After this "shakedown run" the gyro still performed up to the most exacting specifications set for the newest Air Force, Navy and Army missiles. This gyro is available right now. How many do you need?

LEAR MINIATURE RATE GYRO

LEAR INC.
GRAND RAPIDS DIVISION
GRAND RAPIDS, MICHIGAN

LP-14

tain a force capable of carrying out its assigned mission."

The opening sentences of "The Conclusions" state in part that there will be less time for mobilization and the importance of forces in being have increased to a point where they are now indispensable. With this very thought in mind, there exists in the Los Angeles area a tremendous resource or "stockpile" of rated personnel who cannot participate in the Ready Reserve. They are willing and anxious to retain their qualifications. However, the facilities are not available; to wit, only one Ready Reserve Combat Wing is assigned in this vast area.

At the present time we are using World War II Douglas B-26s and scheduled to change over to C-46s in mid-1957 as a Troop Carrier Wing. This is considered progress? The ANG has been using F-86As for some time. At least they have moved into the Korean era of assigned aircraft.

Why can't the Reserve program be stabilized, or progress into the type mission it will perform with modern aircraft? In the very heart of the aircraft industry, this seems appalling to the civilian population. I am continually asked why we still use obsolete aircraft when millions of their dollars are being spent on modern ships. Possibly the answer to these questions and many more should be published in the leading newspapers, not just magazines such as AIR FORCE. This is their Air Force as well as the military's, be it Regular or Reserve.

I agree one hundred percent with the "Recommendation" that the American people be given more of the truth about the relative strength of the US as against the Communists as well as the truth and the whole truth about the Air Force Reserve.

Keep up the good reporting.

Maj. George P. Floyd, AF Res.
Long Beach, Calif.

Civilian Jobs in AF

Gentlemen: The Air Force is seeking qualified persons for some of its top-level civilian positions. These openings are as follows:

Supervisory Physical Science Administrator, $12,900 a year, Cambridge Research Center, Mass.

Technical Director (Communications and Electronics), $12,900 a year; Technical Director (Aeronautics and Propulsion), $12,900 a year; Technical Director (Guidance and Control), $12,900 a year, Baltimore, Md.

Interested persons may communicate with the Air Research and Development Command, P. O. Box 1395, Baltimore, Md.

In addition, Keesler AFB, Miss., has an urgent need for twenty-five Training Instructors (Communications Radar Equipment Maintenance), $4,525 a year. Persons wishing to apply may write the undersigned at AFPCP, Rm. 1323 T-T, Department of the Air Force, Washington 25, D. C.

Carl T. Sieg
Washington, D. C.

A Good Story and a Demotion

Gentlemen: Not since portions of Bill Bridgeman's story, *The Lonely Sky*, have I read anything as powerfully moving as "The Last Flight of the X-2," in your March number. Clay Blair's narrative moves as swiftly and dramatically as the experimental craft he writes about.

That story alone should dispel all doubts anyone might have about an Air Force tradition.

One question: how many letters have you received pointing out that Chuck Yeager's a lieutenant colonel? At least he was when I wrote a story on him at last year's gunnery meet.

Don O'Brien
Dayton, Ohio

● *Only one—yours—so you win the Eagle-Eye Trophy this month. This "demotion" was our doing, not Clay Blair's, even though we knew better. —The Editors.*

Food for Thought

Gentlemen: Now that civil defense is again in the news, I suggest a way to feed the survivors of an atomic attack.

Process and can the government food surplus now in storage. Store it in places safe from atomic attack and immediately available for use. Let the civil defense people be responsible for these supplies.

This plan has other advantages. It would eliminate the expense necessary to protect the raw foodstuffs from theft, fire, moisture, and insects. It would not compete with private enterprise in the market. It would strengthen the CD organization. The food would be available with a minimum of manpower, transportation, processing, and delay. It would be available without lengthy processing, restoration of utilities, long distance transport, large-scale effort, disastrous delay.

R. E. Ream
Greenville, Ohio

Celebrating the

GOLDEN ANNIVERSARY

of the United States Air Force

1907

USAF

1957

1957

Air Force Association CONVENTION

and Airpower Panorama

WASHINGTON, D. C.

July 30 through August 4

THE 1957 Air Force Association Convention and Airpower Panorama will mark the most historic milestone in military aviation—the Golden Anniversary of the United States Air Force. From its humble origin on August 1, 1907, as the Aviation Section of the Signal Corps, US Army, the Air Force has become the world leader in airpower. AFA is proud to be the official sponsor of this observance, and cordially invites all Americans to join in this tribute to the US Air Force—Guardian of Freedom.

One full day at the Convention, August 1, will be devoted exclusively to the Anniversary Celebration. The day will include an Air Force Memorial Service at Arlington National Cemetery; the first-day issue of an

Air Force commemorative US postage stamp; an Anniversary Banquet at noon, saluting Air Force pioneers, aces, and award winners; and Anniversary Balls that evening, each with a special reunion theme, representing wartime theaters. In addition, several Convention events will highlight the Anniversary.

This is by far AFA's largest, and promises to be the best, Convention in its eleven-year history. For Reservists and Guardsmen, there is a seminar, a reception, and an awards dinner. For industry, there are briefings and a luncheon. For everyone, there are luncheons and dinners, an airpower symposium, business sessions, receptions, entertainment, and reunions. It is *the* aviation event to attend in 1957. It is a *must* for you.

Don't forget to make your hotel reservations now. The Sheraton-Park Hotel, Convention Headquarters, is almost sold out. The Shoreham Hotel, located across the street, which will be Industry and Military Headquarters, still has nice rooms and suites available.

Program of Events

RESERVE FORCES DAY

Tuesday—July 30:

1:00 PM:	**Reserve Forces Seminar**	Shoreham
5:00 PM:	**Reserve Forces Reception**	Shoreham
6:30 PM:	**Reserve Awards Banquet**	Shoreham

INDUSTRY DAY

Wednesday—July 31:

9:00 AM:	**Industry Briefing**	Shoreham
12:15 PM:	**Industry Luncheon**	Shoreham
2:30 PM:	**Industry Briefing**	Shoreham

CONVENTION & ANNIVERSARY PROGRAM

Wednesday—July 31:

9:30 AM:	**AFA Leaders Meeting**	Sheraton-Park
2:30 PM:	**First AFA Bus. Session**	Sheraton-Park
7:00 PM:	**Panorama Preview Reception**	Armory

Thursday—August 1:

9:00 AM:	**Air Force Memorial Service**	Arlington Cemetery
10:00 AM:	**USAF Stamp Ceremony**	Armory
10:00 AM:	**Panorama Open to Public**	Armory
12:30 PM:	**USAF Anniversary Banquet**	Sheraton-Park
9:00 PM:	**Anniversary Balls**	Several Hotels

Friday—August 2:

9:00 AM:	**Second AFA Bus. Session**	Sheraton-Park
10:00 AM:	**Panorama Open to Public**	Armory
12:30 PM:	**Fashion Luncheon**	Shoreham
12:30 PM:	**Symposium Luncheon**	Sheraton-Park
3:00 PM:	**Airpower Symposium**	Sheraton-Park
7:00 PM:	**Reunion Cocktail-Buffet**	Sheraton-Park

Saturday—August 3:

9:00 AM:	**Third AFA Bus. Session**	Sheraton-Park
10:00 AM:	**Panorama Open to Public**	Armory
2:00 PM:	**Final AFA Bus. Session**	Sheraton-Park
7:00 PM:	**Airpower Awards Banquet**	Sheraton-Park

Sunday—August 4:

9:30 AM:	**Airpower Brunch**	Sheraton-Park

See page 29 for Reservation Form

Golden Anniversary

1907—United States Air Force—1957

AT a reception in his honor at AFA's national Jet Age Conference in Washington, General Twining made the following response to a toast to the Golden Anniversary of the Air Force:

"When you raise your glass to toast this Fiftieth Anniversary, you are paying tribute to the millions of men and women who made all this possible:

"To those who are gone,

"To those still living, who carry on,

"To the Army, our parent service and partner,

"To the Navy that has assisted us in peace and war,

"To the Air industry—the greatest in the world,

"To the devoted band of inventors and scientists who range in time from Wright to Whitcomb,

"To the citizen airmen—who served with us in World Wars I, II, and in Korea,

"To the Reservists and Guardsmen who still serve,

"To the civilian communities that have welcomed us throughout the world,

"To the latest airman who raised his hand and joined our ranks this very afternoon.

"I would hope that all of you here who represent industries and communities throughout the nation will carry on this commemoration during our Anniversary Year.

"I, too, propose a toast—to the members of the Air Force Association who have done so much to promote understanding of airpower and who are doing so much to mark this milestone in our history—to the Air Force Association."

The reception and toast were the formal announcement of the Golden Anniversary Celebration, for which AFA has been named official sponsor. Gen. Carl A. Spaatz, of AFA's Board of Directors, has agreed to serve as General Chairman of the Celebration and also of the 1957 AFA National Convention. Stephen F. Leo and George D. Hardy, both members of the Board of Directors, have been named as Chairmen of the Golden Anniversary Celebration and of the National Convention, respectively.

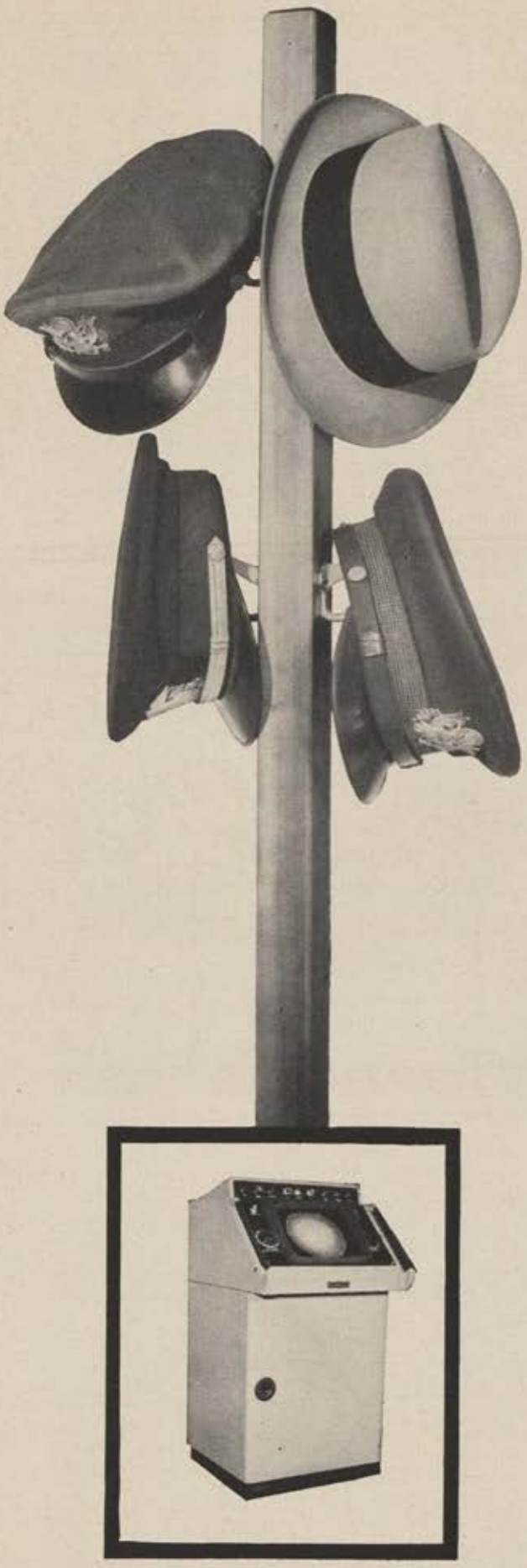
The anniversary period, nationally, will begin May 6, with an Air Force Firepower Demonstration at Eglin Air Force Base, Florida, and will be climaxed on August 1, at AFA's National Convention and Airpower Panorama in Washington, D. C. *(see page 12).*

In addition, local Golden Anniversary celebrations are now being planned in communities and at Air Force installations from coast to coast. AFA National Headquarters is mailing Anniversary Kits to AFA Squadrons, Air Force installations, and other interested organizations and individuals, as a planning aid.

One of the important Anniversary events has already taken place. The Post Office Department has announced that a special stamp, commemorating the Air Force's Golden Anniversary, will be issued on August 1. To obtain a suitable design for the stamp, the National Society of Art Directors sponsored a contest among its members. Winner was Alexander Nagy, jr., chief of the Visual Presentation Branch of the Air Research and Development Command. Nagy was honored on February 20 at a banquet in New York sponsored jointly by AFA and the Society of Art Directors *(see cuts)*. Gen. Thomas D. White, AF Vice Chief of Staff, made the presentation to the winner. Other plaques went to Charles Dickinson of Detroit and Richard Blakemore of Cleveland, second and third place winners, respectively.—END

Winner of the National Society of Art Directors' stamp design contest, Alexander Nagy, Jr., of ARDC, flanked by Roy W. Tillotson, President of NSAD, and Gen. Thomas D. White.

Here is the winning design, picked from a field of more than 1,500 entries. It depicts a B-52 and three F-104s in flight. Plan is for actual stamp to be an air-mail version.



The gray felt belongs to a LEWYT Engineer...

He's been hanging his hat along side those of the military for years. And at some pretty important places too. Like, M.I.T.'s Lincoln Laboratories, for example. Or the Air Force Cambridge Research Center...or the Signal Corps Engineering Laboratory...or any of the major government research centers for that matter. Lewyt engineers have worked with them all in developing the most advanced electronic equipment for the military.

Take Lewyt's Coordinate Data Monitor, for example. Working closely with Air Force Personnel and Lincoln Laboratories...Lewyt engineers helped speed the development of this complex, urgently needed device...carried the project from idea stage to operating prototype IN JUST 7 MONTHS!

Lewyt's skill and resourcefulness in the application of the most advanced electronic techniques are being applied with equal success to other projects in Data Processing and Data Transmission, UHF and VHF communications, Navigation Guidance, Infra-Red and related fields.
Lewyt Manufacturing Corporation, Long Island City 1, N. Y.

Pictured at left: Lewyt's Coordinate Data Monitor, employs new, improved techniques to synchronize rotation of PPI display with that of remote radar antennas.

LEWYT

AIRPOWER IN THE NEWS

■ **AF Chief of Staff Nathan F. Twining** has been reported by news commentators as the man who has been chosen to succeed **Adm. Arthur W. Radford** as **Chairman of the Joint Chiefs of Staff** on completion of Admiral Radford's second term as the nation's top military leader in August. At the same time, **Air Secretary Donald Quarles's** name heads the list of people mentioned by the press in speculation on the **possible successor to Defense Secretary Charles Wilson.** General Twining has served as AF Chief since 1953 when he succeeded the late **Gen. Hoyt S. Vandenberg** (*see* AIR FORCE, June '53).

■ Two distinguished Air Force figures—**former AF Secretary Harold E. Talbott** and **Lt. Gen. Hubert R. Harmon**—have died. Mr. Talbott, 68, suffered a cerebral hemorrhage

At left, Harold E. Talbott, former Air Force Secretary, who died last month. Lt. Gen. Hubert R. Harmon, right, AF Academy's first superintendent, died in February.

early last month while vacationing in Florida. He was AF Secretary from 1953 until his **resignation in August 1953** after a controversy over a conflict between his post as Air Secretary and his connection with a business firm. An aircraft industry pioneer in his home town of Dayton, Ohio, Mr. Talbot was director of aircraft production for the War Production Board in WW II. **During his term as AF Secretary,** he concentrated his efforts on making the Air Force service a **more attractive career.**

Mr. Talbott's career roughly paralleled that of General Harmon, 64, who died of lung cancer at Lackland AFB, Tex., on February 22, after a long illness. A West Point classmate of President Eisenhower's, General Harmon is best remembered as **the leading planner and first Superintendent of the Air Force Academy.** During World War II General Harmon commanded the Thirteenth AF in the South Pacific and later became DCS-/Personnel at Air Force Hq. At President Eisenhower's request, he came **out of retirement in 1953** to be Special Assistant to the AF Chief of Staff, for Air Academy matters, and became Superintendent the following year.

■ **The White House** has approved and forwarded for Senate confirmation an Air Force list nominating three Reserve brigadier generals for promotion to **major general,** and seven Reserve colonels to be **brigadier generals.**

Nominated for two-star ranks are **Brig. Gens. Theron B. Herndon,** Baton Rouge, La.; **John P. Henebry,** Chicago; and **Robert J. Smith,** Dallas.

Nominated for one-star rank are **Cols. Jess Larson,** Washington, D.C.; **John B. Montgomery,** Cincinnati; **Daniel DeBrier,** Atlantic City, N.J.; **Kenneth Stiles,** Phoenix, Ariz.; **John O. Bradshaw,** Indianapolis; **John R. Alison,** Santa Monica, Calif.; and **Ramsay D. Potts, Jr.,** Washington, D.C.; and **James Stewart,** Beverly Hills, Calif.

■ **AIRCRAFT.** . . . The **Russians** have unveiled a **new turboprop transport,** the Ukraina, said to be able to carry **eighty-four passengers and 3½ tons of cargo** at speeds of **360 mph** and altitudes of between **24,000 and 30,000 feet.** The four-engine plane, designed by **O. K. Antonov,** will become "the standard Soviet commercial airliner," say the Russians. . . . The Air Force has picked the **Republic F-105** over **North American's F-107** as "the next generation" fighter-bomber for the Tactical Air Command. The **Pratt & Whitney J-75** powers the supersonic F-105. . . . Meanwhile, **Republic** has been informally told by the AF of a **cutback** in the **prototype order for the XF-103,** delta-wing interceptor powered by both turbojet and ramjet. The XF-103 project began about six years ago with the first flight scheduled **for late 1958.**

AIRPOWER NOTES. . . . May 18 is **Armed Forces Day** this year. The theme of the 1957 observance is **"Power for Peace,"** the same slogan that has been used since 1954. . . . At press time **the British** were preparing to test their **first hydrogen bomb,** which was to be dropped from a jet bomber flying above 40,000 feet, south of Christmas Island in the Pacific. . . . For the first time in years, lighter-

AFA President John P. Henebry is made an honorary Boy Scout by Cub Scout Stephen McCreedy at ceremony at Jet Age Conference in Washington, D.C., during National Boy Scout Week. Mr. Henebry is the father of a Boy Scout, and young McCreedy's father is an AF master sergeant.

than-air craft were in the news. Last month a **Navy blimp** broke **endurance** and **distance records.** The blimp ZPG-2 flew some 8,000 miles non-stop and stayed aloft over 264 hours without refueling. . . . **AFA Board Chairman Gill Robb Wilson** has been named a member of the Air University's **Board of Visitors,** a thirteen-man panel which reviews the curriculum and management of the AF's professional education system. . . . The last **B-17 Flying Fortress** on active bombing duty with the AF was junked last month. Other B-17s—described by Gen. Hap Arnold as the "guts and backbone of the aerial offensive" in World War II—are still being used as drones for anti-aircraft practice. **Nearly 13,000** were built in World War II. . . . **Brig. Gen. Dale O. Smith,** a frequent contributor to this magazine and the AF's tallest (six feet, seven inches) officer, has been appointed chief of the **US Military Assistance and Advisory Group in Saudi Arabia.**—END

PUTTING *MEANING* INTO DEFENSE

CANADAIR'S CL-28... ON SCHEDULE!

The first CL-28—the largest aircraft ever built in Canada—rolled off the production lines within hours of a schedule set 2½ years before.

Now completing its rigorous pre-flight test program, Canadair's CL-28 has been designed specifically as an anti-submarine aircraft for search and patrol duties with the RCAF's Maritime Air Command.

Canadair's CL-28—known to the RCAF as the CP-107—is a four-engine, very long range, long endurance sub-hunter and killer. It carries the most comprehensive collection of electronic and other detection equipment ever assembled into one aircraft for locating, tracking, and 'fixing' enemy submarines—whether submerged, 'snorting' or on the surface. Once contact is made, torpedoes, depth bombs, and other offensive weapons are released.

Now in quantity production at Canadair's Montreal plants, the CL-28 becomes a major component of the NATO defenses of the Western world.

C-L CANADAIR LIMITED

CANADAIR

LIMITED, MONTREAL, CANADA

• Aircraft • Research and Development
• Guided Missiles • Nuclear Engineering

A Subsidiary of GENERAL DYNAMICS CORPORATION

CA57-UST-3A

SPECIAL MISSILE REPORT

New Chance Vought guided missile

Regulus II

hikes range and strength of U. S. Missile Power

U. S. missile science takes a big forward step with the powerful Vought Regulus II, new Navy supersonic missile.

Jet thunder and fire split the sky as Vought's new supersonic missile *Regulus II* bores through the glowing dawn.

This is the newest addition to U. S. Missile Power...a high-performance "bird" that has outpaced its own timetable and is now flying test and tactical training missions ahead of schedule.

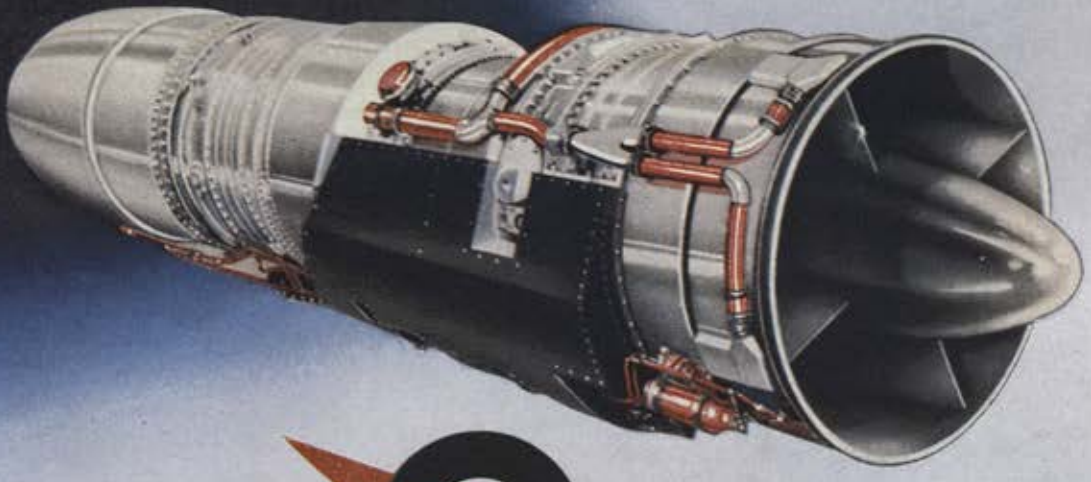
Regulus II combines flexibility and steady reliability with advanced speed, range and striking power to meet the tactical needs of today's nuclear-age Navy. It is a talented missile. It can be carried between continents by long-range submarines and launched against far-inland targets, or stowed aboard a carrier and launched by catapult like any jet bomber. It can operate from cruisers or small surface ships.

Details of the new missile are classified. But with weapons like Vought's *Regulus II* now in the air, Americans can be sure that U. S. Missile Power is the world's best. For both today and tomorrow, this ready power stands as a strong force for peace and as a mighty deterrent to aggression throughout the world's explosive trouble spots.

BUILDERS OF MILITARY AIRCRAFT 40 1917 TO 1957

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS

THE GERMAN AIR FORCE
IS THE MOST RECENT
TO SPECIFY ORENDA...



For a well-defended future...
IROQUOIS,
Orenda's supersonic turbojet.

ORENDA ENGINES LIMITED
MALTON, CANADA
MEMBER: A. V. ROE CANADA LIMITED & THE HAWKER SIDDELEY GROUP

A Staff Report

How CORDINER Plan Would Work

THE Defense Department has completed its study of the Cordiner Committee merit-pay system and has sent its recommendations forward. That is the report we get as we go to press with this month's issue. Our prediction is that the Bureau of the Budget and the President will go along with the proposed incentive legislation and lay it before Congress. We further predict that Congress will pass this legislation without major overhaul. Going way out on a limb—we believe the first pay checks under the new plan will score no worse than a near-miss on the military's 1957 Christmas stocking.

If this admittedly rosy forecast holds up, most of the credit should go to Defense Secretary Charles E. Wilson. And, even if the Cordiner recommendations do not become law, Mr. Wilson deserves a rousing vote of thanks. This is the fourth time in his four-plus years in office that he has sponsored and supported legislation designed to improve the life of military careerists and to retain capable career personnel.

In 1953, he proposed corrective action based on the Womble Committee report. He got behind propositions such as the reenlistment bonus and the Career Incentive Act of '55. A helpful and understanding Congress supported him, and the measures already passed have helped a lot. Across all services reenlistment rates have increased from twenty-four percent in 1954 to forty-three percent in 1955. The officer retention rates are up from a low of one out of six to one out of four.

Mr. Wilson still wasn't satisfied. He saw millions of dollars trickling down the drain simply because the services couldn't keep the men they needed. Members of Congress, who keep a sharp eye on both service spending and efficiency, were also prodding for improvements.

Last spring Mr. Wilson appointed a special group with a typical Pentagonese title—"Defense Advisory Committee on Professional and Technical Compensation."

To chair the group, Mr. Wilson chose a man with an outstanding management reputation, particularly personnel management, Mr. Ralph J. Cordiner, President of the General Electric Company.

The Committee's work was divided into three major study areas. Dr. John A. Hannah, President of Michigan State University and former Assistant Secretary of Defense for Manpower and Personnel, directed the study of officer personnel. Charles R. Hook, Chairman of the Board of ARMCO Steel Corp. and formerly Chairman of the Committee on Business Organization of the Defense Department, directed the study of civilian personnel. H. Lee White, member of the law firm of Cadwalader, Wickersham and Taft of New York and former Assistant Secretary of the Air Force (Personnel), directed the study of enlisted personnel.

Mr. Cordiner's first task was to satisfy himself and the members of the committee as to the nature of the problem. They conducted extensive interviews at all levels and made numerous and detailed field investigations. They looked at present pay rates, training programs and costs, the skill scales, reenlistment trends, promotion systems, retirement, leave and furlough provisions, systems for weeding out unfit men and officers, housing, changes of station and a host of other pertinent factors, under present pay and allowance rates.

The recommendations of the committee affect all three services. We have devoted our attention to their impact on the Air Force. Here are some of the main points of the plan for airmen:

The Cordiner plan rewards the man who earns it. Two new super pay grades would be added to the structure, which now provides for only seven grades. Under the existing set-up a man who makes master sergeant in, say, twelve years, can look forward to no further promotion. If he "keeps his nose clean" he can sit back and draw a small pay raise every two years. If he "stays for thirty" he finally gets $62.40 a month more than he was getting when he first made "master."

The committee found throughout the Air Force many instances of master sergeants supervising master sergeants. In some cases, E-7s who had demonstrated outstanding ability were supervising E-7s who were drawing more pay simply because they had been in the service longer.

The disadvantages of this situation are obvious. It would be comparable to having an officer promotion system which permitted no advancement beyond the rank of colonels. The Cordiner Committee reasoned that if promotion is necessary in the officer rank in order to

(*Continued on page 45*)

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 to document the information beyond the fact that the sources are trustworthy.

In 1953 work got under way on a huge airfield in East Germany, north of Dresden. It was completed a few weeks ago. One of the features of this airfield is a large underground hangar system. The capacity of the subterranean hangars is said to be about 100 fighter aircraft.

Above the surface, barracks have been completed for about 1,000 men. The airfield has its own independent water and power sources. Cost of the installation has run to several million East German marks. Other installations of similar construction are believed to exist in East Germany as part of the Soviet air-defense system.

• • •

Another item from East Germany: About 500 students now study aeronautics at the new Institute of Aeronautics at the Technical High School, Dresden, Number 24 Duererstrasse. The school, whose training courses are somewhat elemental, nevertheless maintains close contacts with similar schools in the Soviet Union and Czechoslovakia.

• • •

Sketchy information on a new Soviet prototype interceptor has come through the Iron Curtain. Designated by the Russians as TsAGI-423 (prototype number), the aircraft is very similar to the MIG-21 shown at the Tushino air show last June 24 and NATO code-named Faceplate.

The sweptwing aircraft has a span of about thirty-eight feet, ten inches; its length is put at just under forty-four feet.

This fighter has been under development for some time, and there is no reason to believe as yet that it is an aircraft the Russians will order into production. In their development efforts the Soviets push a great many aircraft through to the prototype stage only to abandon them if they don't work out on performance test.

According to our sources, TsAGI-423 has had no less than three different fuselage aft sections. The first contained a centrifugal turbojet engine with nine combustors. The engine was five feet, three inches in diameter—allegedly an improved version of the VK-2 used in the MIG-17. There was a short afterburner. This airplane achieved Mach 1.7 at an unknown altitude.

The second version had two small axial turbojets, each about thirty-three and a half inches in diameter, and no afterburners. This aircraft achieved a ceiling of 59,055 feet; speed not known.

The third version employed some sort of double-turbojet arrangement, about which there are no details, except that it was regarded as a failure.

• • •

The same source reports that the Russians are pushing development of a Mach 2.5 interceptor of radical design. It features a new wing configuration, and the powerplant will consist of a centrifugal turbojet engine teamed with a fluid rocket. The engine design for this interceptor is now under way.

This would be a mixed powerplant, with the rocket engine a likely candidate for achieving supersonic dash near targets or to aid in climbing. The centrifugal turbojet, which the Russians are known to have perfected, apparently would be the powerplant for most of any flight because of its lower fuel consumption.

The Russians have long indicated an interest in combination propulsion systems. Early versions of the LA-17 had small rocket engines used in a similar way. The Russians, of course, got the idea from the Germans who had tried it on the ME-262.

• • •

Aeroflot, the Soviet Union's principal airline, is now offering jet transport flights between Moscow and Khabarovsk, in eastern Siberia. Total time in the TU-104 is eight hours, thirty minutes—less than a third the time required for piston-powered aircraft. The once-a-week flights stop en route at Omsk and Irkutsk. The airplane flies out from Moscow one day, back the next, carrying forty-eight passengers. Khabarovsk is the administrative center for eastern Siberia. The train ride from Moscow takes about nine days.

• • •

The Russians have announced that they have uncovered a large mountain of nephelite ore near Krasnoyarsk, in central Asia. The nephelite is said to have a high alumina content. A plant to extract aluminum from this ore is being built in the Achinsk-Chulyma River valley, where hydroelectric power presumably is available.

The Russians say they are laying out the largest aluminum plant in the world at this location and that it will turn out aluminum for twenty-five percent less than it now costs to produce it in plants located to the West, in the Ural Mountains.

Construction of this plant is in keeping with the evident spread of the Russian aircraft industry, and all industry for that matter, to the East.

• • •

Some 120 large cities (and innumerable smaller ones) now have regular air service, according to G. A. Piskov, director of the freight department of the Chief Civil Air Fleet Administration, which is a part of the Ministry of Defense. Piskov says air freight volume in Russia went up fifteen percent in 1956 over 1955; that it will double by the end of the present Sixth Five-Year Plan.

Among regular freight items he names copper goods from Balkhash to various factories to keep assembly lines going; radio tubes and medicines from Moscow; farm machinery to the "new lands" in central Asia. Piskov's remarks also revealed that the Russians used the TU-104 to haul freight for several months before they put it into regular passenger service. It is credited with hauling a goodly number of ball bearings from Moscow to Omsk where the bearings were needed for tractor production.

• • •

The Russians are frankly self-assured about their ability to launch a space satellite of their own during the forthcoming International Geophysical Year, and there is a good chance they may beat the US to outer space. Since April 1955 (some months before the first announcement about the US program), hints about their satellite development have appeared in the Soviet press.—END

TACAN unit shown with covers removed; plane is a composite model.

78-~~page~~ tube road map for jets

An 800-foot carrier may be as hard to find as a needle in a haystack, when the plane seeking it is at 20,000 feet and the time is 0200 hours.

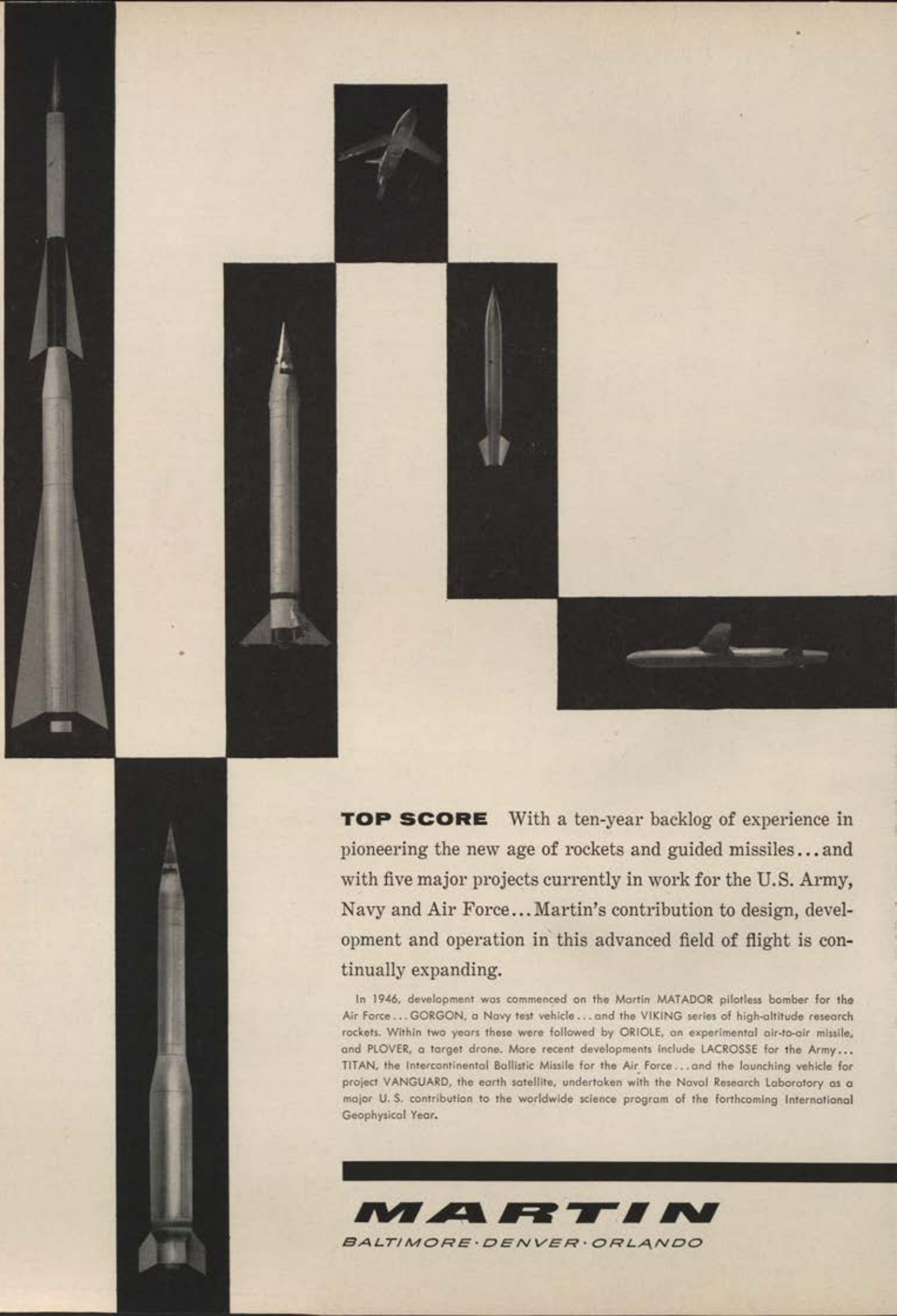
To make the homing plane a homing pigeon, we build the "ARN-21" TACAN equipment illustrated above. Its 78 tubes and associated components add up to a self-contained transmitter and receiver, rugged in its ride-resistance and accurate to pin-point tolerances.

The manufacture of equipment as important and complicated as this demands *perfection*, and nothing less. On the military as well as the home front, Stromberg-Carlson has long displayed the ability to take such problems in stride.

S-C STROMBERG-CARLSON COMPANY GD

A DIVISION OF GENERAL DYNAMICS CORPORATION

General Offices and Factories at Rochester, N. Y.—West Coast plants at San Diego and Los Angeles, Calif.



TOP SCORE With a ten-year backlog of experience in pioneering the new age of rockets and guided missiles... and with five major projects currently in work for the U.S. Army, Navy and Air Force... Martin's contribution to design, development and operation in this advanced field of flight is continually expanding.

In 1946, development was commenced on the Martin MATADOR pilotless bomber for the Air Force... GORGON, a Navy test vehicle... and the VIKING series of high-altitude research rockets. Within two years these were followed by ORIOLE, an experimental air-to-air missile, and PLOVER, a target drone. More recent developments include LACROSSE for the Army... TITAN, the Intercontinental Ballistic Missile for the Air Force... and the launching vehicle for project VANGUARD, the earth satellite, undertaken with the Naval Research Laboratory as a major U. S. contribution to the worldwide science program of the forthcoming International Geophysical Year.

MARTIN

BALTIMORE · DENVER · ORLANDO

airman's bookshelf

In a style similar to Walter Lord's account of the sinking of the *Titanic*, John Toland reconstructs the era of the dirigible in *Ships in the Sky* (Henry Holt, $4.95). Eight major airship disasters, recounted in minute detail, provide Toland an excellent framework for this rewarding history.

It begins in 1863 when Dr. Solomon Andrews makes several flights in a motorless cigar-shaped gasbag high over New York City's Fifth Avenue. But credit for setting the skyship on a practical course goes to Count Ferdinand Von Zeppelin. His first flight over Lake Constance, Germany, in 1901, marks the real beginning of the airship; and, ironically, the explosion of the *Hindenburg*—a Zeppelin product—brings it to a close at Lakehurst, N. J., on May 6, 1937.

Between these dates, nations vied with each other to build sky fleets. Germany grabbed an early lead. By World War I she had three commercial and six military Zeppelins. During the war she built eighty-eight. The largest was 750 feet long and had a service ceiling of five miles. German Zeppelins mounted scores of bombing raids on England. After the war Germany built Zeppelins for her former enemies. France, England, Italy, and the US joined the great experiment to produce the "ultimate" in world transport. Some great records were set. The US Navy's *Shenandoah*, *Macon*, *Akron*, and *Los Angeles*, electrified America with "air firsts." In 1926 the Norwegian-owned *Norge* crossed the North Pole to Alaska. Later, the *Hindenburg* lazily circled the globe and transatlantic service by Zeppelins became commonplace.

But one after another the great sky giants went down in tragedy. The strange disappearance in 1923 of the French *Dixmude*, over Africa, and in 1928 of the *Italia* in the Arctic, then in 1930 the explosion of the world's largest—the 799-foot-long British R-101—"cast a pall over the airship world."

In America the story was the same: in 1925 the *Shenandoah* crashed in Ohio during a tour of midwestern State Fairs. In 1933 the *Akron*, carrying Admiral William A. Moffett, Navy's Bureau of Aeronautics chief, foundered over the Atlantic. And in March 1934 the *Macon* dove crazily into the Pacific while maneuvering with the fleet off California. Of all the airship nations, only Germany remained relatively unjinxed.

By 1937 airship disasters had occurred so frequently that it took only the thirty-two-second destruction of the hydrogen-filled *Hindenburg* to end an era. But from the ashes of the airship came the lumbering "blimps," which performed yeoman service in World War II anti-sub warfare and convoy duty.

More than any other one factor—weather—brought on the demise of the airship. Air skippers were convinced that they could sail the air ocean as well as steel ships could sail the seas. Lacking knowledge of meteorology, they flew dangerously close to thunderstorms, through line squalls and fronts that today are overflown or circumvented. But it was weather that was the villain in all the great airship disasters. The bold dream of the ages awaited the heavier-than-air machines which so many dirigible skippers had ridiculed and called "unpractical."

Ships in the Sky is carefully researched from official documents and interviews with hundreds of eyewitnesses. In spots, sheer mass of detail obstructs continuity and slows the story. Yet this book will deeply interest and move all airmen, for it is a significant chapter in the conquest of the air.

• • •

Tying in with the Warner Brothers' film "The Spirit of St. Louis," Scribner's has republished a new hard cover edition of Charles A. Lindbergh's classic *The Spirit of St. Louis* ($2.49). The Random House World War II best seller *Thirty Seconds Over Tokyo*, by Capt. Ted Lawson with Bob Considine, is in their famous "Landmark Series"—for juvenile readers. Ballantine has paperbacked Adolph Galland's *The First and the Last* (50¢)—the story of the rise and fall of the Luftwaffe. We recommend all three.

• • •

The British-produced *A Picture History of Flight*, by John W. R. Taylor (Pitman, $5.75), is now available to American readers. This 190-page volume contains 650 photos and drawings tracing flight from its earliest conception to rockets and guided missiles. Photos fall into eight chronological periods. A narrative account of each period is supplemented by factual picture captions. Taylor's collection of aviation photography is rare and especially good on the early days. Throughout, emphasis is on the experimentation and development of flight in Europe although increasing space is devoted to American aviation beginning with World War II.

• • •

Only a few years after the Wrights first flew at Kitty Hawk, some men were predicting that the only limitations to flight would be the human element. Experimentation in human factors began early, and in 1918 the Air Service established a facility for aviation medical research at Mineola, L.I., N.Y. Today human factors research has become an important element in air research and development. But man himself is the "weakest link in the chain of his ambitious plans and projects," says Heinz Gartmann, German writer and author of *Man Unlimited: Technology's Challenge to Human Endurance* (Pantheon, $4.50). Gartmann explores the problems of human endurance required by advanced technology, the research being done to fit man into environments for which he was not designed, and the progress being made to enable him to keep up with his mechanical creations. This American edition, translated from the German by Richard and Clara Winston, is a readable, informative book for the non-specialist.

• • •

Following after Don Whitehead's superb *The FBI Story* comes another interesting chunk of official "gumshoeing," *The O.S.S. and I*, by William J. Morgan (W. W. Norton, $3.75). The author, a civilian psychologist before World War II, became a successful Army private—successful in deceiving his way into assignment to the Office of Strategic Services, America's most-secret-of-them-all. His book is in two parts: the training of agents and spies in England for covert dispatch behind enemy lines; and his experience parachuting with a load of small arms into Maquis territory in central France. Here he trains French civilians in behind-the-lines tactics, ambush, bridge demolition, and the like. The excitement builds with his actions against retreating columns of German soldiers. The book is as good as any that could be written from unclassified sources. The real thriller, however, will one day come when the secret files of the OSS are unlocked.—END

'The Greatest Invention Since the Parachute'

THAT'S the reaction of one enthusiastic pilot to the Air Force Association's Flight Pay Protection Plan. In return for an annual premium of only one percent of yearly flying pay, the Plan protects AFA members against loss of flying pay due to disease or accident. Rated personnel become eligible for this exclusive protection by joining Air Force Association.

At press time, some 4,500 rated personnel of all military services had taken advantage of the AFA Plan. This added up to almost $10 million worth of coverage. Thirteen claims had been honored. More than $11,000 dollars already had been paid in claims—with thousands of dollars more due to be paid in succeeding months. The largest single chunk for $1,225—went to a colonel grounded for hypertension.

Here's how one flight surgeon views the program. Brig. Gen. A. H. Schwichtenberg, Command Surgeon of Air Defense Command, writes us:

"The Air Force Association has taken a very fine step in the right direction in providing Flight Pay Protection to individuals on flying status.

"Perhaps one of the less obvious, yet very important elements, is that the existence of this type of protection tends to diminish still further any barriers which may exist between the flight surgeon and the flying personnel under his charge. I'm sure that we have had accidents which resulted from flying personnel not taking physicians into their confidence for fear they would have been removed from flying status. This is a perfectly understandable human reaction. If we can prevent even one mishap through better rapport between our flyers and their flight surgeons, the whole cost of the program may well be written off for the year, not to mention a life saved.

"I hope as time goes on that most of our people will see the wisdom of this. The beauty of the plan may be said to lie in the fact that one doesn't have to die to take advantage of it.

Another Command Surgeon, Brig. Gen. Edward J. Tracy, of the Air Materiel Command, writes: "The AFA plan for Flight Pay Protection has my most hearty approval and support. As a Flight Surgeon I am well aware of the reluctance rated personnel have in voicing physical complaints to a physician. This reluctance is based on two factors: first, the love of flying; and second, the loss of flying pay. The loss of flying pay is quite a severe shock to the family budget and your plan provides an adequate period of financial readjustment. . . . The plan will be a great boon to our flying safety program."

If you're currently on flying status and need your flying pay to meet the bills, why take chances? Tear out the coupon below and send it to us with your check or money order. Just remember that the premium is one percent of your annual flying pay. For example, if your flying pay is $200 a month, your annual pay is $2,400, and your premium is $24. If you are not presently a member of AFA, join up now and become eligible for this protection. Let us hear from you.—END

HERE'S HOW THE PLAN WORKS FOR AIR FORCE ASSOCIATION MEMBERS

Underwritten by Aetna Insurance Co., 670 Main St., Hartford 15, Conn.

All members of the US Air Force, Air National Guard, Air Reserve, and the other military services, who are on flight status and who belong to the Air Force Association, are eligible.

NOTE: Of course this protection does not apply in case of war, declared or undeclared, or hostile action, civil war, invasion, or the resulting civil commotions or riots. There are also other exclusions which may never apply to you, but you are entitled to know them. They are as follows:

Plan does not cover losses due to a criminal act of the AFA member; or from bodily injury occurring while in a state of insanity (temporary or otherwise); or from officially certified "fear of flying"; or caused by intentional self-injury, attempted suicide, criminal assault committed by the Member, or fighting, except in self-defense; or from failure to meet flying proficiency standards unless caused by or aggravated by or attributed to disease or accident; or accidents caused while riding or driving in any kind of race; or by alcohol, drugs, venereal disease, arrest or confinement; or willful violation of flying regulations resulting in suspension from flying as a punitive measure; or sentence to dismissal from the service by a general court-martial, submitted resignation for the good of the service, or suspension from flying for administrative reasons not due to accident or disease or voluntary suspension. Loss of life shall not be deemed as a loss for purposes of this plan.

In the event you receive the total limit of twenty-four (24) months' indemnity, your coverage is automatically terminated. You may thereafter reapply for insurance coverage in the same manner as a new Member. Coverage also ends with termination of membership in AFA, or with resignation, retirement, or pensioning from the service, or at age sixty.

This insurance is renewable to the option of the Company.

Policy Form No. 1-620-3A.

SEND REMITTANCE TO AIR FORCE ASSOCIATION, MILLS BUILDING, WASHINGTON 6, D. C.

(please print) RANK NAME SERIAL NUMBER YRS. SERVICE FOR PAY PURPOSES

MAILING ADDRESS

AMOUNT OF ANNUAL FLIGHT PAY

I certify I am currently on flying status and entitled to receive incentive pay, and that to the best of my knowledge I am in good health, and that no action is pending to remove me from flying status for failure to meet physical standards.

SIGNATURE OF APPLICANT DATE

APPLICATION MUST BE ACCOMPANIED BY CHECK OR MONEY ORDER FOR ANNUAL PREMIUM

The annual premium charge is 1% of ANNUAL flight pay.

NEW *PROVEN* COURSE AND DISTANCE COMPUTING SYSTEM SOLVES YOUR NAVIGATION PROBLEM—*FICo's ASN-7*

The flight-tested ASN-7 answers every navigational question the pilot can ask. Self-contained, automatic, this dead reckoning system is revolutionizing aerial navigation. In operation, the pilot sets in the latitude and longitude of his take-off point and of his destination, and the system guides him in—regardless of how his course changes, regardless of distance, and without air-ground or ground-air communication. Alternate destinations can be inserted and stored.

This FICo system can be installed in any aircraft—from jet fighters to tankers, bombers, transports and airliners. And it is in production now! It is smaller in size and lighter in weight than any comparable navigation system now in existence, and offers *extreme* accuracy. The ASN-7 features automatic variation and can be supplied with polar capabilities, automatic fix correction, and automatic drift and ground speed. For additional information, write to Airborne Equipment Department, Ford Instrument Co., on your letterhead.

FLIGHT INDICATOR of this system displays ground track, required course, heading error, and distance to the destination.

COMPUTER CONTROL feeds wind, variation, and destination data into the system. It displays present position, wind speed and direction, variation, and destination coordinates.

FICo

FORD INSTRUMENT CO.

DIVISION OF SPERRY RAND CORPORATION

31-10 Thomson Avenue, Long Island City 1, New York

Beverly Hills, Calif. Dayton, Ohio

ENGINEERS

of unusual abilities can find a future at FORD INSTRUMENT COMPANY. Write for information.

Only the men are flying

The fact is, men beat birds at their own game. Even when our feathered friends are grounded, we're aloft; flying ever higher, faster, safer, further. And, unbelievable as it may seem, more accurately.

Among the companies spearheading man's conquest of the sky are nine of the GPE Group. Their contributions are basic—technological bench marks such as—

• the only compass systems that *always* know where north is, whatever the plane does, wherever it goes: Kearfott's stable-platform gyro compasses;

• the only simulators to meet the need for on-the-ground training in supersonic flight: famous Link jet simulators;

• the only airborne navigation systems in operational use guiding planes automatically and with unprecedented accuracy — anywhere, in any weather: GPL Doppler autonavigators.

Inertial navigation, missile guidance, photoscience, and certain nuclear power applications, are some other phases of aviation in which GPE companies are deeply and jointly involved. And while many of the products of the GPE companies — particularly in the field of aviation—serve defense needs today, the important scientific advances they embody are "plowshares" for tomorrow.

Aviation is but one industry in which GPE companies work. A brochure describing the activities of the group is available. More than a dozen basic industries are served by products resulting from GPE coordinated technologies and resources.

GENERAL PRECISION EQUIPMENT CORPORATION

PRINCIPAL PRODUCING COMPANIES • Askania Regulator • GPL • Graflex • Griscom-Russell
Hertner Electric • Kearfott • Librascope • Link Aviation • Pleasantville Instrument • Precision Technology • Shand and Jurs • Simplex Equipment • Strong Electric

Arnold Air Society Conclave

More than 1,500 cadets representing some 175 squadrons are expected to attend the Eighth Annual Conclave of the Arnold Air Society, to be held April 17-20 in New York City's Hotel New Yorker. The host squadron is the Maj. William V. Holohan Squadron, of Manhattan College.

The theme of this year's Conclave is "Fifty Years of USAF," commemorating the golden anniversary of the US Air Force. Among the speakers scheduled to address the delegates are:

Lt. Gen. Charles P. Cabell, Deputy Director of the Central Intelligence Agency; Brig. Gen. Robert L. Scott, Jr., former Director of AF Information Services and author of "God Is My Co-Pilot"; Brig. Gen. Richard H. Carmichael, Director of Personnel Procurement and Training, DCS/Personnel, Hq., USAF; Maj. Gen. Roger J. Browne, Commander of ConAC's First Air Force; and John P. Henebry, President of the Air Force Association.

MAIL YOUR RESERVATION REQUEST NOW!

★ AFA National Convention & Airpower Panorama ★

WASHINGTON, D. C. • JULY 30-AUGUST 4, 1957

Since more than 3,000 delegates and guests will attend the Convention, everyone cannot be accommodated at the Sheraton-Park and Shoreham, headquarters hotels. Therefore, rooms and suites at the Sheraton-Park are restricted to AFA delegates and Industrial Associate companies. The number of suites at the Shoreham is limited, but is not restricted. The hotels below are listed in the order of their distance from the Sheraton-Park, with the Shoreham nearest, etc. The Continental is suggested for Panorama exhibit personnel.

AFA Hotels and Room Rates

HOTEL	SINGLE	DOUBLE	TWIN
Sheraton-Park*	$ 9.50	$13.00	$13.00
Shoreham*	9.00	14.00	14.00
Windsor-Park*	9.00	12.00	12.00
Dupont Plaza*	9.50	12.50	12.50
Woodner*	None	13.50	13.50
Mayflower*	9.00	14.50	16.50
Statler*	11.50	15.00	16.50
Lee House	8.50	12.00	12.00
Burlington	7.50	10.00	10.00
Ambassador	7.50	11.00	12.00
Hamilton	7.00	10.50	10.50
Continental	7.00	9.00	10.00

* *Suites available—one bedroom, $25; two bedroom, $40. Above rates are averages—lower and higher rates are available.*

Mail to:
AFA HOUSING OFFICE
Convention & Visitors Bureau
1616 K Street, N.W., Washington 6, D. C.

DATE _____

NAME _____

ADDRESS _____

CITY & STATE _____

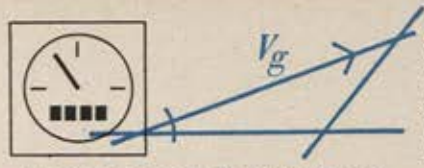
HOTEL _____ (FIRST CHOICE) _____ (SECOND CHOICE) _____ (THIRD CHOICE)

_____ (TYPE ROOM) ( ) Low ( ) Average ( ) High (DESIRED RATE)

ARRIVAL DATE & HOUR _____

DEPARTURE DATE _____

OTHERS IN ROOM _____

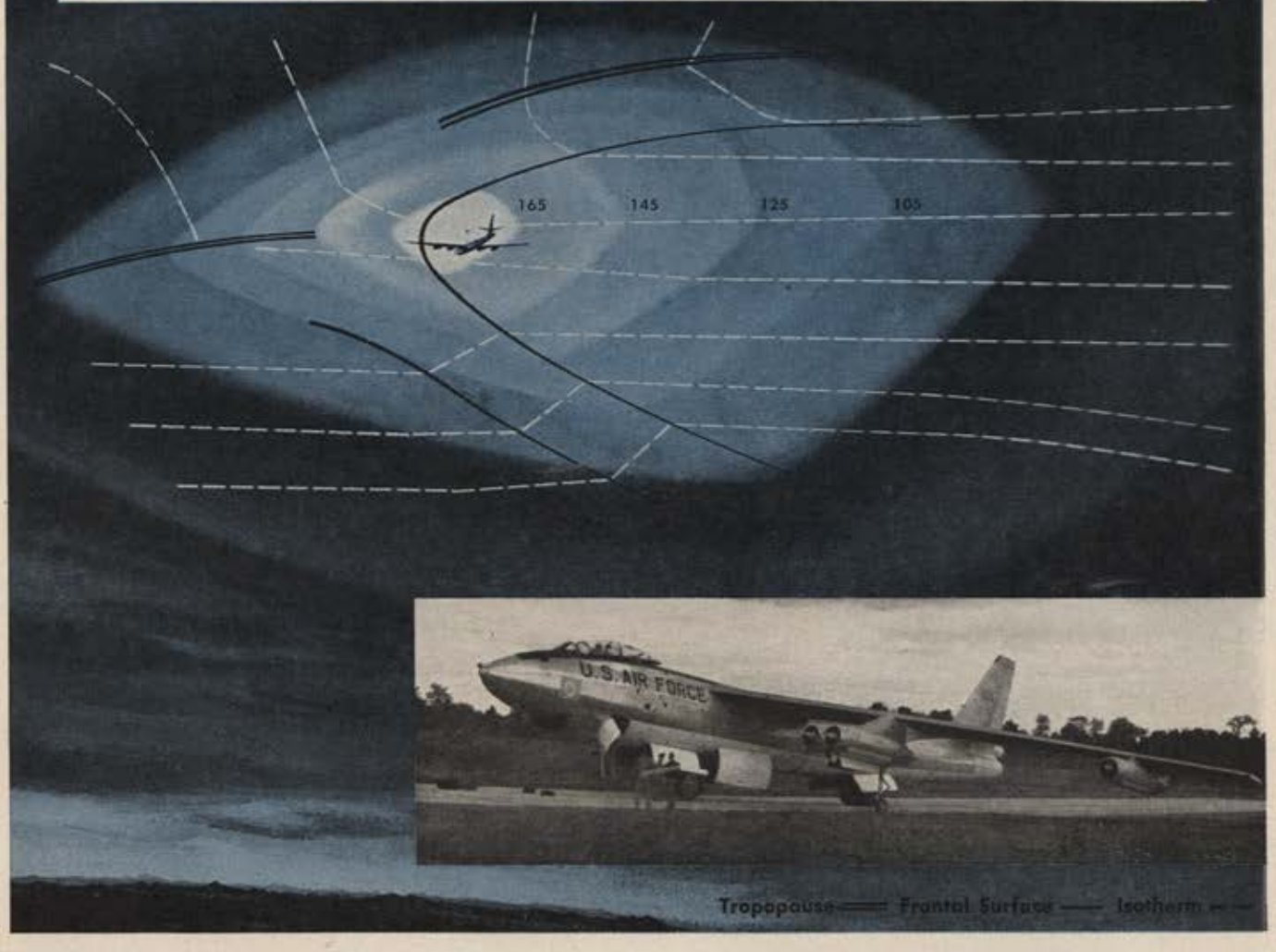


Ground Speed & Drift Angle
Any Time, Anywhere, Any Weather

Jet streams were cross-sectioned for the first time using the capabilities of GPL auto-navigators. Now these same ground speed and drift angle measuring equipments make riding aerial "express-ways" S.O.P. for military fliers.

A leading news magazine's story on the record-setting B-47 flight defined jet stream flying this way:

"To find the jet stream the pilot flies in its general direction . . . When the '66' tells him that his drift angle is increasing, he knows that he is getting into the jet stream . . . When the drift angle reaches a maximum, he turns downstream until the drift angle falls to zero . . . When the '66' is hooked to the autopilot, the airplane will follow the stream automatically, getting maximum benefit."



Cross-section of a headline

On January 25, 1957, in the early hours of a California morning, a USAF B-47 climbed skyward into the jet stream. With the aid of one of GPL's self-contained, airborne navigation systems, AN/APN-66, the crew put the plane into a 165 mph-plus jet stream core and held it there all the way across the country. 3 hours, 47 minutes later, the same "47" touched down within sight of the Atlantic Ocean.

The story made headlines and so did the part played by the GPL equipment.

GPL auto-navigators' demonstrated usefulness in locating and flying jet streams is just one application of their basic function – *precise point-to-point navigation, any time, anywhere, any weather.* The systems have flown millions of miles in transport, bombing, fighter, patrol and weather planes.

GPL, who harnessed Doppler shift to air navigation and developed self-contained auto-navigators, is the nation's leading manufacturer of these systems.

GPL
A SUBSIDIARY OF GPE

GENERAL PRECISION LABORATORY INCORPORATED, Pleasantville, N. Y.

ENGINEERS – GPL achievements have opened up some unusual research and development opportunities. Send resumé to Personnel Manager.

THE BATTLE FOR 'SPACE SUPERIORITY'

Maj. Gen. Bernard A. Schriever

AS COMMANDER of the Western Development Division, I am deeply engrossed in man's first concerted attempt to penetrate outer space.

The compelling motive for the development of space technology is the requirement for national defense. For this reason, the Air Force ballistic missile program was assigned highest national priority and is being pressed forward with utmost vigor.

Since 1954, the United States has come a long way in the development of space technology. The Western Development Division was given full authority and responsibility for all aspects of the Air Force's ballistic missile program at that time. . . . The program has already progressed through several important stages so that at this time, we can identify a number of significant accomplishments toward the conquest of space. . . .

Development Philosophy: Our development philosophy includes two elements: a philosophy of testing and a dual approach. Stated simply, the test philosophy requires a great deal of component reliability testing . . . before proceeding to subsystem testing, captive system testing, and on to launch. A second element is the multiple approach and back-up provision which calls for more than one contractor in the re-entry area, in guidance, in airframe, and in propulsion. Backing up this system development is a comprehensive program of basic research in various fundamental areas. . . . This approach provides insurance against failure and increases confidence in meeting schedules.

Development Team and Industrial Base: The complexity and urgency of the ballistic missile program required the establishment of a unique development management group. To meet this need an unusual arrangement was made involving two major commands of the Air Force and an industrial contractor. Western Development Division, a division of Headquarters, Air Research and Development Command, was organized to exercise over-all supervision over the management complex.

As Commander of WDD, I have full authority and control over all aspects of the ballistic missile program. Serving also as Assistant to the Commander of ARDC, I am able to coordinate related activities of the various ARDC Centers, of which there are ten. The Ballistic Missile Office of the Air Materiel Command is responsible to provide support in the areas of procurement and production, supply, maintenance engineering, and transportation. Brig. Gen. Ben I. Funk is in charge of the BMO office. Serving also as Assistant to the Commander, Air Materiel Command, he is able to secure cooperation from AMC and the Air Procurement Districts. The third member of the team is the Guided Missile Research Division of the Ramo-Wooldrige Corporation. This group of top-flight scientists and engineers is responsible for systems engineering for the entire Air Force ballistic missile program and technical direction of our contractors. The management complex is supported by sixteen major contractors representing the most competent elements of industry. Each contractor was selected on the basis of a competition.

Facilities: Since the ballistic missile program was accelerated in 1954, $470 million has been made available for new test installations and plant expansion. A substantial percentage of this total, over $100 million, is privately financed by both prime and sub-contractors. In airframe development, Convair, Douglas, and Martin have expanded present facilities or are building new ones. For example, at Convair in San Diego, a vast plant area was created virtually overnight for pilot production of Atlas airframes and within one year, cattle-grazing land at nearby Sycamore Canyon was converted to a complex for captive testing of the Atlas. Similar expansion has taken place in the engine development program at North American's Rocketdyne facility near Los Angeles, and the Aerojet-General Corporation which has expanded its complex of facilities at Sacramento, to develop and produce engines for the Titan ICBM. And so it goes, with General Electric, Avco, Bell Telephone Laboratories, Lockheed, Burroughs, Remington Rand, MIT, AC Spark Plug, Arma, and many others.

Laboratory test equipment such as environmental test chambers, random noise vibration equipment, and data reduction equipment has been installed at contractors' plants to accomplish the extensive environmental and reliability testing required. Major installations at Air Force Centers provide means for captive and launch tests of the complete system including thousands of miles of instrumented range whose scope and complexity far exceeds any previous missile effort.

These few examples make it demonstrably evident that the Air Force's ballistic missile program represents a concerted effort of unprecedented magnitude jointly pursued by the most competent and widespread government, science, and industry teams ever assembled on a single project. . . .

How else have the ICBM and IRBM programs contributed to the conquest of space? They have contributed in a very concrete sense from the standpoint of hardware that has been developed or is being developed for this program. A tremendous industrial capability is being built up and production know-how is being established in many new areas. . . . These airframe, propulsion, and guidance subsystems development and the data which will become available as ballistic missile test flights are made, will make possible a whole gambit of follow-on projects.

Take, for example, the propulsive unit. The same propulsive unit that boosts a heavy nose cone-warhead to 25,000 ft/sec, could boost a somewhat lighter body to the escape velocity of 35,000 ft/sec or to an orbital path around the earth. Using the same number of stages, the ratio of thrust to weight would be greater by using a lighter payload, and higher accelerations and velocities could be reached before burnout. Or with our present

(Continued on the following page)

state-of-knowledge, it would be relatively easy to add another stage. We have already done that successfully on our re-entry test vehicle, the X-17. The same guidance system that enables the warhead of a ballistic missile to reach its target within a permissible accuracy would also be sufficiently accurate to hit a target much smaller than the moon. Or, if we are talking about circular orbits around the earth, errors in guidance could be easily observed over a period of time and corrected, and the satellite kept on an accurate orbit. And, of course, these same propulsive and guidance components could also be used for surface-to-surface transport vehicles of various sorts to experimentally carry mail or strategic military materiel to critical sites. The same applies to structural advances of the ICBM that have brought us to new heights in the ratio of total weight to structural weight. I would be willing to venture a guess that ninety percent of the *unmanned* follow-on projects that one could visualize for the future can be undertaken with propulsive guidance, and structural techniques, *presently under development* in the Air Force ballistic missile program.

It is reasonable to expect that it will not be too difficult to extend these present developments to surface-to-surface transport of personnel by rocket propulsion, or space travel of personnel at some time in the future. However, before man can be committed to space vehicles, a tremendous amount of human factors research will be necessary. . . . Granted this research, there are other problems as well. A specific example of the kind of advanced development probably necessary for manned space flight to distant planets, is sustained thrust through space. This will permit

(Continued on page 34)

Mare's Nest of Problems

Dr. James H. Doolittle

PERHAPS the best way to make clear the urgency of what we in NACA must do is to discuss briefly some problems for which answers are needed, now.

For example: The mare's nest of problems that have to be solved, every one of them, before the ICBM can become a practical weapon system—structural problems, configuration problems, propulsion problems, guidance problems, aerodynamic heating problems.

Take propulsion for example, in relation to guidance. As you know, the guidance we can give a missile following a ballistic trajectory has got to be applied during the brief period, early in the flight program, when the rocket motor is still burning. Making sure that the missile is directionally on its proper course is only part of the problem; in addition you have to be sure that the missile is traveling at precisely the right speed when your rocket motor burns out. Otherwise, of course, you will overshoot or undershoot your target.

The rocket motor of the V-2 burned for about seventy seconds. Purely for illustration, let's say the burning time of one concept of an ICBM might be about three times that, some 200 seconds. During that time—three and one-third minutes—the fuel and oxident might be pumped into the combustion chamber at the rate of about a ton a second.

Now, the scientists have calculated that if the missile is going to destroy a priority target—say a dispersed airfield—the rocket motor must operate so efficiently that when it shuts off, the velocity that the ICBM will have reached will be accurate to within one part in 20,000. Likewise if one percent of the propellant isn't used, your miss may be measured in hundreds of miles. That means the whole burning process must be combustion perfect, and also that it must come to its end within a very small fraction of a second of the programmed time.

Fuel surging and boiling, combustion buzzing and destructive screech, the design of bearings and seals, the development of pump lubrication systems operable at temperatures as low as boiling hydrogen—424 degrees below Fahrenheit . . . these are some of the specific problems.

There is nothing romantic about research on this kind of problem; there aren't likely to be many dramatic breakthroughs. What we have to do is make step by step progress so that total solutions will be found by the time they are needed. The time factor in the development of components, of subsystems, and of the weapon system is of vital importance.

The record shows that, in the last analysis, the V-2 was a failure because of this time factor. Considering the stage of the war at the time it was ready we must conclude that the cost of the V-2 in technical and production manpower, money, materials, the total national effort that went into the project, was greater than the over-all damage it caused. Had this same effort been put into German armed bombers, or even fighters, at that time our problem would have been made much more difficult.

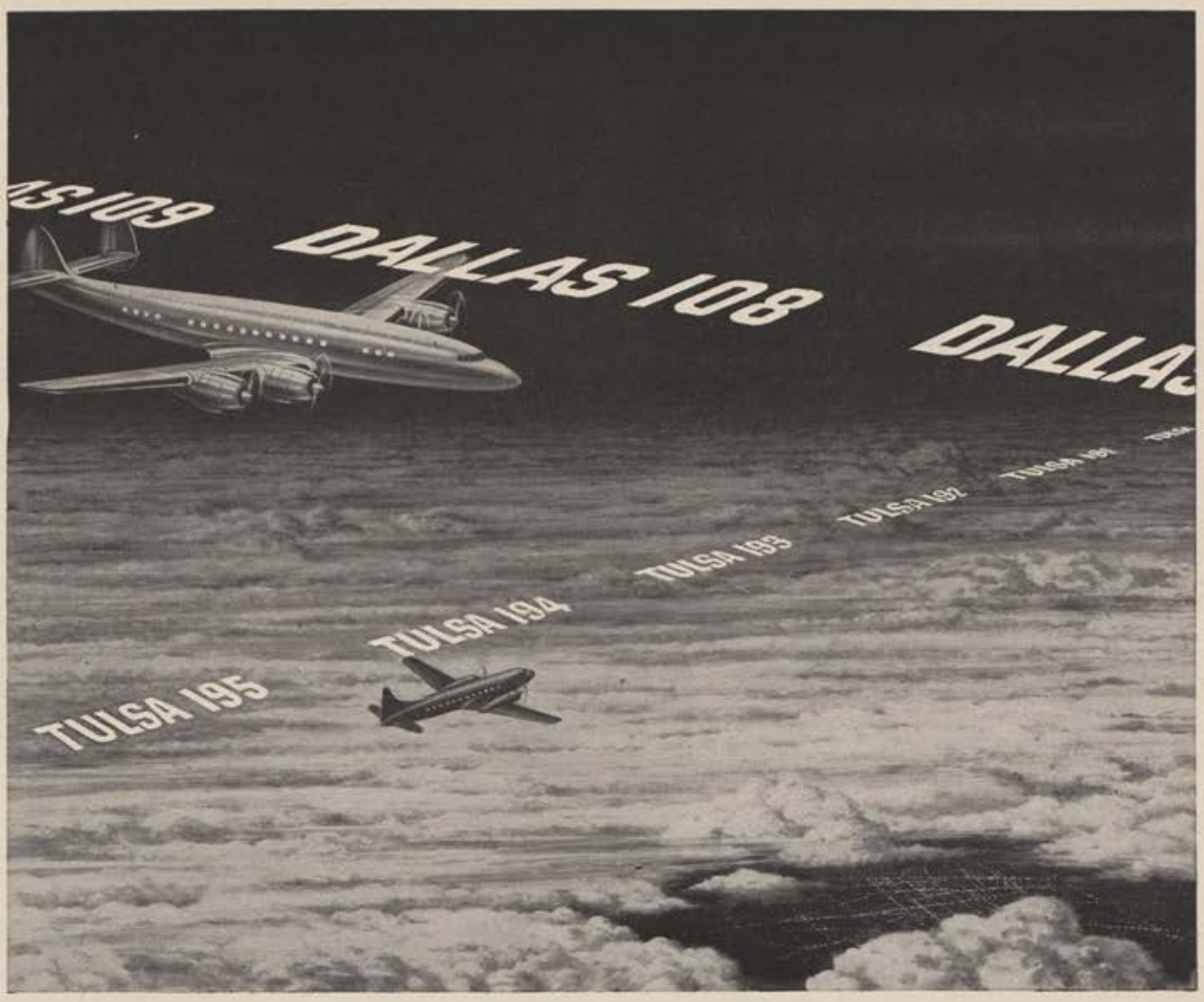
And yet no less an authority than President Dwight D. Eisenhower, in his book, *Crusade in Europe,* has said that if the V-2 had been launched against Great Britain only six months sooner than was the case, the Normandy landings would have been, and I quote, "difficult if not impossible."

Wernher von Braun began his studies that led to development of the V-2 in 1930. By 1937 he was installed at Peenemünde. The first V-2, the prototype, was fired in the spring of 1942; the first V-2 to be aimed at England was fired in September 1944.

Von Braun has said that until the success of the V-2 had been proved, "there was much hot and cold blowing . . . we had great difficulties, and Hitler himself was greatly opposed to the idea . . . later on, after we had demonstrated it worked, we were swamped with so much priority that it hurt more than it helped."

So we must say: The V-2 was a failure because it wasn't ready in time. I repeat, we must do the necessary research and develop our new weapon systems in time.

Jimmy Doolittle, who was recently named Chairman of the National Advisory Committee for Aeronautics, has long been active in USAF and Air Force Association affairs. His remarks on this page are from a speech he made before an Aviation Writers Association luncheon in Washington, D.C, on February 21, 1957.



IT&T now provides—
continuous ELECTRONIC MILEPOSTS IN THE SKY

VORTAC— ***the new, automatic navigation system for all civil aircraft.***

From Federal Telecommunication Laboratories, a division of International Telephone and Telegraph Corporation, came TACAN (tactical air navigation)—to give our military aircraft the pin-point navigational accuracy and reliability, both in distance and direction from a known point, demanded for military operations at jet speeds.

Because the present nationwide navigation system for civil aircraft, called VOR, already provides the directional information, the government's Air Coordinating Committee decided to add the *distance measuring* feature of TACAN—creating a *new* integrated system called VORTAC. Soon all aircraft—private and commercial as well as military—will receive *complete* navigational information from either TACAN or VORTAC.

In the skies, over the seas, and in industry . . . the pioneering leadership in telecommunication research by IT&T speeds the pace of electronic progress.

INTERNATIONAL TEL ... TEL

VORTAC airborne equipment is now available. For detailed information write to Federal Telephone and Radio Company, a division of IT&T, Clifton, N. J.

IT&T

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION, 67 Broad Street, New York 4, N.Y.

us to reach higher velocities and cut down the flight time which would otherwise be impractically long for a human passenger even to the closest planets. Such long sustained thrust, at a small enough magnitude level to be tolerable to a man, requires a type of propulsion technique that is not well suited to take-off thrust and general ICBM requirements. The successful achievements of the required propulsion system is clearly indicated by today's science, but it has to be developed as a program beyond the current ICBM program.

Space technology, probably for some decades, will not revolve primarily around apparatus for controlled movement of vehicles from one point to another in empty space. Perhaps not only initially but for all time, space technology will include as its most characteristic problem the need for going from the surface of one terrestrial body to another with successful passage through the atmosphere of each. The first big problems, then, are how to bring a substantial mass up to empty space with velocity sufficient to continue inter-body space travel, with adequate precision in the velocity vector control, and how to bring it back through an atmosphere without disintegration. In each of these respects, if one for the moment by-passes human cargo ambitions, the ICBM is attaining the necessary capability and, even for manned flight, the ICBM flight test program will provide experimental data of direct interest.

Granted then that the ICBM program is a major, pioneering, and foundation step for space technology, what appears to be a logical future program? The answer is not easy. It is very difficult to make a firm prognosis on military need during a twenty-year period for something as new and revolutionary as ballistic missiles, earth satellites, and space vehicles. We are somewhat in the same position today as were military planners at the close of the first World War when they were trying to anticipate the employment of aircraft in future wars. Consequently, my prognoses will go from those which are reasonably firm to those which might be considered visionary. Fortunately, there is a considerable overlap between the advances in the state of the art which are required for the firm needs and those now considered visionary.

First, we should consider those changes in the operational and technical characteristics of our long-range ballistic missiles to make them superior, reliable weapons. Almost any military planner would agree that if we can increase the range, increase the payload, reduce the gross weight, increase the accuracy, reduce the cost, or simplify the operational procedures, we will have made a worthwhile contribution. Now, in order to achieve any or all of these objectives, it will be necessary to advance the state of the propulsion art, the structures art, or the guidance art, or perhaps all three. When these advances are made, they will be applicable also to the more visionary projects. The basic science underlying these engineering arts has been well surveyed in the past two years. It tells us that considerable advance is possible on all fronts.

A word is necessary on the relationship between military need and scientific feasibility in space technology. In the long haul our safety as a nation may depend upon our achieving "space superiority." Several decades from now the important battles may not be sea battles or air battles, but space battles, and we should be spending a certain fraction of our national resources to ensure that we do not lag in obtaining space supremacy. Besides the direct military importance of space, our prestige as world leaders might well dictate that we undertake lunar expeditions and even interplanetary flight when the appropriate technological advances have been made and the time is ripe. Thus, it is indeed fortunate that the technology advances required in support of military objectives can, in large part, directly support these more speculative space ventures. . . .

Where does all this lead? My thought is that the evolution of space vehicles will be a gradual step by step process, with the first step beyond ballistic missiles being the *unmanned*, artificial earth satellite and then perhaps unmanned exploratory flights to the moon or Mars. These first flights would no doubt be research vehicles to gather scientific data and to accumulate information on space environmental conditions for future design use. The information gathered from these flights will supplement the information gathered from ballistic missile test flights. Many of the things that we can learn from satellites will lead not only to a better understanding of conditions to be encountered in space, but will lead to a better understanding of our own planet. Weather reconnaissance can be accomplished in a more effective manner. This will lead to a better understanding of the movements of polar air masses and the course of jet streams and will permit improved long-range weather forecasts and improved aircraft and missile operations. A better understanding of the earth's magnetic field will lead to better radio communications, more reliable navigation instruments, and perhaps new ideas for propulsive devices. Refined data on the earth's gravitational effects will lead to improved guidance. Much remains to be known about cosmic rays. Unmanned satellites will be the means for obtaining this information.

I have described some of the benefits to be derived from our early ventures into space, and the contributions the ICBM program is making in this direction.

Payload capability of a future satellite could be in the order of hundreds or even a thousand pounds. Such payload would permit more instrumentation and many varied types of space experiments.

Vehicles with additional complications could be made to have the ability to return intact from space. However, without fundamental extension the environment during space flight would not be suitable for a human passenger. Therefore, manned space flight cannot be attempted, with such apparatus, but many of the associated physiological questions can be answered by experiments with animals. We may, in fact, be able to fill nearly all the gaps in our knowledge which are now holding back the design of manned spacecraft.

Given vehicles with these capabilities, still another avenue for a scientific achievement is immediately opened—for with additional rocket thrust a lunar research vehicle is highly possible. In view of the small additional cost of such an experiment, it seems certain that in the not too distant future it will be tried.

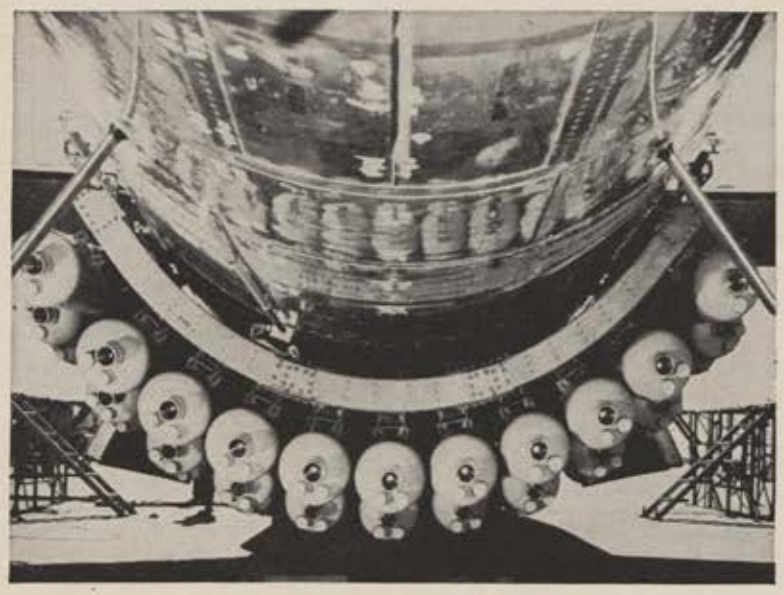
The ICBM program, through the technology it is fostering, the facilities that have been established, the industrial teams being developed and the vehicles themselves, is providing the key to the further development of space flight. Many fascinating new horizons are sure to open within the next decade as a direct result.—END

ABOUT THE AUTHOR

Maj. Gen. Bernard A. Schriever at 46 commands ARDC's Western Development Division and as such rides herd on the Air Force's ballistic missile effort, including Convair's Atlas, Martin's Titan, and Douglas's Thor. WDD's effort, in terms of people, facilities, and money, already exceeds that of the Manhattan Project which produced the first atomic bomb. General Schriever made the above remarks at a recent astronautics symposium in San Diego, sponsored by Convair and the AF Office of Scientific Research.

Advantages you get with Phillips 66

SOLID ROCKET PROPELLANTS



The M15 JATO loaded on Boeing B-47. The first of its kind to meet rigid Air Force performance tests. (Boeing Airplane Company photo)

● At the Phillips operated Air Force Plant 66 near McGregor, Texas, there are extensive facilities for development, testing, and manufacture of rocket propellants. Consult Phillips highly competent scientists and engineers about your specific propulsion problems.

● *LOW COST.* Phillips family of solid propellants for rockets is made from readily available petrochemical materials, such as ammonium nitrate, synthetic rubber, and carbon black.

● *VERSATILE IN APPLICATION.* Phillips family of rockets is easily modified to meet various needs.

● *WIDE TEMPERATURE RANGE.* These rockets operate successfully from –75 F to 170 F.

● *INSENSITIVE TO DETONATION* by impact or explosion. Exhaust gases are noncorrosive and relatively low in temperature.

● *STORAGE.* Phillips 66 propellants can be stored for long periods of time without deteriorating.

PHILLIPS PETROLEUM COMPANY
Bartlesville, Oklahoma

Address all inquiries to:
Rocket Fuels Division, Bartlesville, Oklahoma

Phillips 66

Dissenting View of Symington Airpower Report

Two months ago, when we reproduced the findings and conclusions of the majority report of the Symington Airpower Subcommittee, time and space precluded publication of the conclusions of a dissenting minority report, prepared and submitted by Sen. Leverett Saltonstall (R.-Mass.). Herewith are Senator Saltonstall's conclusions which, as he points out, were concurred in by former Sen. James H. Duff (R.-Penna.), who sat on the subcommittee but was defeated for reelection last fall. As in the case of the majority report, we have not published the lengthy supporting testimony on which the conclusions were based.—THE EDITORS.

I HAVE declined to signed the majority report because I conclude that:

1. The majority report takes an unduly pessimistic view of the state of our defense today and of our planning for the future.

2. It is not sufficiently objective because it does not take into account all of the testimony pertinent to the points covered.

3. It does not give sufficient weight to the testimony of the civilian heads of the Department of Defense. This runs counter to the constitutional principle of civilian control over the military forces which has been inherent in our form of government since 1789. Our present system which has its roots in our Constitution has proved itself in both peace and war.

4. It confines its analysis almost exclusively to the four years since 1953. In my judgment, the present military effort cannot properly be evaluated without considering our position at the close of World War II, the speedy demobilization after that war, and the build-up for the Korean war, which determined the composition and capabilities of our defense forces in 1953.

5. Our airpower and our naval strength, together with our ground forces, make us superior to the Soviet Union today.

That is the opinion of those who testified before the subcommittee on this point. I am confident it is the firm determination of those responsible for our defense to continue to plan and provide adequate military strength, of which airpower is the most vital segment, for the nation in years to come.

We can never engage in a numbers race with Russia. We do not want to do so. What we do want are balanced land, sea, and air forces which give us a visible deterrent and such power to retaliate quickly and devastatingly that no enemy would dare to attack us.

6. Our defense establishment can never be in a state of perfection because military forces in being at any one time can always be improved by new weapons and equipment which scientific progress is continually making possible.

The task, then, is to press forward with those programs which, in our judgment, will provide for such modernization of our forces as is essential for the security needs of our country.

Vast programs to this end are now in progress. We can be optimistic about them and take confidence from the many instances of solid accomplishment.

In my judgment, there are no quick and easy solutions to those problems already identified. They require continued unrelenting efforts by the Department of Defense. The Congress, too, will be called upon to act, particularly insofar as legislative authorizations and appropriations are concerned.

Where we can anticipate any problem areas in the future we must be quick to take early steps to meet them. The importance of this becomes apparent in considering our need to maintain our technological lead upon which our military superiority so heavily depends. Here is an area requiring sustained action over the years. It is one where every American citizen has responsibilities. Our educational institutions have a special responsibility. We must enlist their aid in producing ever larger numbers of scientists and engineers.

I believe eternal vigilance is the price of liberty, and we all have a solemn duty in that regard.

This minority report has been reviewed by former Sen. James H. Duff, who served with great diligence as the other minority member on the subcommittee throughout its hearings. He has authorized me to say that if he were a member of the Senate, he would approve this minority report.—END

AVRO CF-100 NIGHTFIGHTERS AT WORK

SERVICED AND ARMED

POISED

TAKE-OFF

ALOFT

ON DUSK TO DAWN PATROLS

The Royal Canadian Air Force nightfighter crews who fly these powerful CF-100's know that they guide one of freedom's most efficient weapons in the defence of North America and Western Europe.

•

Four RCAF squadrons of CF-100's have been assigned to NATO to meet its specific nightfighter requirements.

AVRO AIRCRAFT LIMITED

AVRO AIRCRAFT

MALTON, CANADA

MEMBER: A. V. ROE CANADA LIMITED & THE HAWKER SIDDELEY GROUP

The fatal sting...

defending the B-52 intercontinental bomber is the Arma MD-9 fire control system that picks up, tracks, and with uncanny accuracy fires at its target.

Developed and produced by Arma, the MD-9 is just one of Arma's capabilities in advanced weapon systems.

If you have an advanced electronics systems requirement, or would like to work with a leading engineering team, contact ARMA . . . Garden City, N. Y.

ARMA

A division of American Bosch Arma Corporation

BEAUTIFUL FULL-COLOR 22" X 17" REPRODUCTION SUITABLE FOR FRAMING—AVAILABLE ON REQUEST*

Contributing to superb performance . . . Boeing's B-52 Stratofortress is powered by eight Pratt & Whitney Aircraft J-57 turbojets with *main fuel pumps* engineered and built by Chandler-Evans.

Products, too, are "known by the company they keep", and CECO is proud to be airborne with many of the latest and finest military and commercial aircraft.

CHANDLER-EVANS • WEST HARTFORD 1, CONNECTICUT

**Address your request to "Stratofortress", Dept. K.*
An informative CECO fact folder is also available on request.

CECO
SYSTEMS / CONTROLS

An Editorial

Put the Intelligence Estimates in Focus

AT PRESS time the national budget had become the "bird" in a gigantic game of badminton between the Congress and the Executive Department. From the standpoint of national defense the prognosis was not good. Pressure for cutting the budget was mounting and, unfortunately, the most tempting area where cuts could be made was in the defense portion.

The sequence went something like this. A short time after presenting the largest peacetime budget in the nation's history, President Eisenhower voiced hope that the Congress would be able to cut it. This expression was accompanied by a drumbeat of statements by Administration figures on the dangers of inflation, talk of a depression "that would curl your hair," "spending ourselves into bankruptcy," and other phrases calculated to stimulate budget-cutting pressures.

A Democratic-led Congress neatly batted the bird back into the White House court by requesting Presidential guidance as to where cuts could be made safely. But the President volleyed with a rejoinder that the Executive Department had done all it could, that the next move was up to the Congress. Everyone wanted the budget to be cut but no one wanted to take the responsibility for it, or to make the first move.

Quite conveniently, in the midst of all this, there appeared some information that might serve as an excuse, if not a valid reason, for making cuts in the Air Force portion of the budget. The information was made known to the press, and subsequently confirmed before the Congress, that national intelligence estimates of production rates of Russian modern heavy bombers had been revised. The estimates reflected some slippage in production of the Bison, the big Red jet bomber, and a slight falling off of production of the turbo-prop Bear. Instead of falling behind the USSR in operational numbers of long-range modern bombers, we apparently were ahead, and would be so for about two more years.

This was welcome news to all would-be budget-slicers. It was trumpeted in the press that last year's supplemental Air Force appropriation, voted by the Congress against Administration protests, was a "$900 million bobble." The intelligence estimate revision was termed "an extraordinary turnabout in estimates of Soviet airpower during the year." Previous intelligence reports were described as "badly in error." The Russian bogeyman was being cut down to size, went the stories, paving the way for defense budget cuts without jeopardizing national security.

It is difficult to square such sweeping conclusions with the facts. True, the national intelligence estimates of Red

(Continued on following page)

production of modern heavy bombers have been revised, but only for the next two years. And there was no proof, as some asserted, that the estimates had been tampered with for political purposes, although the timing on the release of the information certainly served a political end. What was damaging was the many things which were being left unsaid. The picture was badly out of focus. To paraphrase Mr. Wilson's famous statement, the new estimates meant that we perhaps have discovered that the Russians are not eight feet tall, only seven feet, nine inches.

In the first place, it should surprise no one that national intelligence estimates are subject to revision. They are based on the best information available at any given time and quite properly they change as the situation changes and as new information becomes available. It would be much more disturbing if they were static tables, unchanging from year to year, instead of the fluid, viable documents they actually are.

What makes this latest revision unusual is the fact that it is downward. For in the past our tendency has been to underestimate, rather than the reverse. The list of such underestimates is far too long to document extensively here. It should suffice to remember how we underestimated Red capabilities in the matters of copying our B-29, jet engine production, the atomic bomb, the hydrogen bomb, MIG production before Korea, submarine production, all-weather fighters production, and so on. Our batting average in this field is none too good.

We must remember, likewise, that long-range bomber production is but one element of Soviet strength. Let's take a look at the long roster of other factors in which there has been no announced change for the better. These include:

The expanding Soviet base complex, both in the USSR and in Red China, a big factor in determining what our own attack capability must be.

The fast-growing Russian air-defense capability, one of General LeMay's biggest headaches.

Numbers of Red light bombers—Beagles and Blowlamps.

Numbers of Red jet fighters, including supersonic MIGs and all-weather Flashlights.

Numbers of intermediate-range Badger bombers, roughly equivalent in performance to our B-47.

The Red guided missile effort, in intercontinental and intermediate-range ballistic missiles, and defensive missiles as well.

Red production of scientists and technicians.

The rapidly closing gap between the US and the USSR in science and technology.

To the best of our knowledge and belief, the intelligence estimates in none of these fields has been revised in any direction except upward.

Nor can we take comfort in the fact that the revision of the estimates on Soviet modern long-range bombers applies only during the next two years, probably through 1959. In discussing this point before the Congress, General Twining emphasized that "there is no change in the level of strength in modern bombers that we estimate the Soviets could and probably will provide for their long-range force in the time period beyond the next two years."

In effect, this means that, while the Russians may not be even with us today in this one category of bomber production, by 1959-1960 they will have caught up with us and passed us. And this is precisely the period, from 1959-1960 on, which the Air Force is worried about, as General Twining has reiterated time and again.

Further, the aircraft procurement money in the FY 1958 budget, by and large, will not be spent within the next two years, in any case.

Nor do the new estimates add one airplane or a single missile to our own Air Force capability, now or in the future. As we have previously pointed out, that trend is steadily downward, with no force goal left at which to shoot. The Reds still know where they are going. Our Air Force does not. In fact, it is probably safe to say that we have a firmer grasp on where the Red Air Force is heading than where our own will eventually wind up.

This brings up an interesting sidelight on the matter of intelligence revisions. One would like to know how many times the Russian estimates of our own B-52 production have been revised during the past two years. The Symington subcommittee testimony brought out that we intended to produce, in round figures, a total of 600 B-52s. A year ago the production rate was projected at an eventual twenty per month. Yet the production figures for early 1956 went something like this: four in January, two in February, none in March, none in April, two in May, and so on. The production forecast was obviously much higher. Is it too much to expect that Red estimates of our B-52 production underwent some radical downward revisions last year? The point is that the kind of revision being touted as a complete turnabout might well have arisen from something as simple as the alternator trouble that was slowing our B-52 deliveries. Or it might reflect something as serious as a major breakthrough in the missile field that would allow cutbacks in Red bomber production.

There is still another item to consider. The new estimates, while only recently made public, did not burst suddenly on our defense planners. They were known at the time the final budget was being prepared; they were known when Mr. Quarles made a last plea for $21 billion for the Air Force; they were known at the time the budget was submitted to Congress. One can only assume that the budget, as presented, already reflected these new estimates. Hence, it is difficult to see how they can now be put forth as justification for Congressional cuts. If they are, it will be a case of using the same intelligence estimates to cut the budget twice, in effect—once in the Executive Department and again on Capitol Hill.

Or take the case of the Symington subcommittee report, issued last February. During its investigation, the subcommittee received some testimony which could not be made public for security reasons, including intelligence information from the Central Intelligence Agency and other sources. In addition, much supplemental intelligence material was requested, obtained, and inserted in the subcommittee record. The latest such material was received by the committee in November, and presumably it reflected the latest estimates.

Yet, in response to our query, a subcommittee staff member told us: "None of the unpublished testimony and none of the other material supplied during or after the hearings was such as to merit any change in the report."

In other words, although the newest intelligence revisions had been made available to the subcommittee, the majority found nothing in them to cause it to revise its gloomy picture of the relative airpower strengths of the United States and the Soviet Union.

In summary then, one must place the revised estimates in balance by remembering that:

They are temporary in nature, and apply only over the next two years.

They represent only a fraction of over-all Soviet strength.

They have already been reflected in the present budget.

We trust that the Congress will weigh these factors carefully in their current examination of the Air Force budget.—END

NORTH AMERICAN HAS BUILT MORE AIRPLANES THAN ANY OTHER COMPANY IN THE WORLD

ARTWORK BASED ON OFFICIAL U.S. NAVY PHOTOGRAPH

GLOBAL GUARDIAN

The Air Force's NAVAHO intercontinental strategic missile is near reality. How near is veiled in security. But we can tell you that it checks out as one of America's mightiest weapons in the struggle for peace. A major missile project executed in partnership with the U.S. Air Force, North American Aviation's NAVAHO development has accomplished the technical advances necessary to the production of an aerodynamic, supersonic, long-range guided missile. Bull's-eye accurate, and well nigh invulnerable to interception, the NAVAHO will extend this country's defense around the globe... at several times the speed of sound.

NORTH AMERICAN AVIATION, INC.

Los Angeles, Downey, Canoga Park, Fresno, California; Columbus, Ohio; Neosho, Missouri.

for TAC's new C-130 Hercules...

Flight Control System—by Sperry

A "quick-change artist" has joined the Tactical Air Command's global airlift team. It's the Lockheed C-130 Hercules, capable of performing a variety of missions in keeping with TAC's requirement for high versatility and mobility. The C-130 can carry up to 20 tons of cargo on long-distance flights or can paradrop a load of 27,000 pounds into a combat zone. It can be used as a combat transport to carry 92 airborne troops or can deliver paratroops to a combat zone. It can also be used as a flying hospital.

Since the C-130 works at different altitudes for its various missions—from cargo-drop level to over 35,000 feet—its flight control system must provide precise, automatic control over a wide range of flight conditions. More than equal to the job is Sperry's E-4 system which—for the first time in an Air Force plane—is linked to a Sperry Radio Beam Coupler.

This Sperry team of automatic pilot and Radio Beam Coupler saves time and fuel by maintaining straighter, more accurate courses. More precise approaches mean greater efficiency and speed in carrying out vital USAF missions. And pilot fatigue is substantially reduced.

GEORGE JUDE, Director, Flight Control Engineering of our Aeronautical Equipment Division. Serving aviation at Sperry for 15 years, he won the 1956 Lawrence B. Sperry Award "for significant contribution to the advancement of precision automatic flight control and safe all-weather flight."

Asking Sperry to design, engineer and build advanced flight control systems for today's advanced jet and propjet aircraft follows long-established practice. Thousands of Sperry systems are providing safe, efficient automatic flight control for all types of aircraft—from intercontinental jet bombers to private planes. If you have a flight control problem, Sperry engineers can help you find the answer. Write our Aeronautical Equipment Division.

SPERRY GYROSCOPE COMPANY
Great Neck, New York
DIVISION OF SPERRY RAND CORPORATION
BROOKLYN • CLEVELAND • NEW ORLEANS • LOS ANGELES • SEATTLE • SAN FRANCISCO. IN CANADA: SPERRY GYROSCOPE COMPANY OF CANADA, LTD., MONTREAL, QUEBEC

provide incentive, it is equally essential in the airman promotion system. The new plan is designed to correct this obvious inequity and provide continued incentive.

Under the new scale a master sergeant with demonstrated ability could move on up to the so-called "supergrades" of E-8 and E-9. And the door will be open for a certain number of high-ranking non-coms to go on up into the warrant officer grades, the top one of which will get as much pay as a major.

The new system is also designed to relieve the overcrowding in the present top grade structure, reestablish the prestige of top non-coms, and compensate them as they demonstrate greater experience and skill. Under the new rates an E-9 could draw up to $440 a month compared with a master sergeant salary of $250-$300 a month today.

New pay slots would also be opened up to men in grades of E-4 and above if they qualify on the basis of demonstrated proficiency. But the biggest increases come in the grades of E-5 and above. Under the present system, the minimum entry pay for an E-5 is $145.24. Under the new recommendation, this would be upped to a minimum of $210 a month. The new plan also provides that airmen with the necessary qualifications could draw the pay of the next grade and, in some cases, even two grades above their rank.

These increases would be selectively allocated on the basis of skill in critical fields. The present plan is to break down all AF skills into the categories of "non-critical," "critical," and "most critical." Examples of skills termed most critical are in such fields as weather observation reporting and forecasting, aircraft control and warning, armament, fire-control systems. Critical skills include key people in specialized fields such as communications, intelligence, aircraft engine mechanics. Non-critical skills include such examples as food service, administration, motor-pool mechanics.

The critical category of a given skill would be determined on the basis of such criteria as retention—where men are being lost; training costs; essentiality to mission; and the complexity of the skill involved.

Longevity, or plain old total years in service, which is presently the main basis for pay raises, would be eliminated. Instead, in-grade raises would be used, and there are even some limitations on these. For example, there would be no more raises after two years in grade for E-3s and E-4s, after four years in E-5s, and after six years in the E-6, 7, and 8 categories.

There would be a provision for flexibility in the selection of jobs on the critical list. It is conceivable that some jobs might be taken off the critical list as time goes on—others might be added. However, changes like these would mean no reduction in pay for the men already holding these positions, but they would mean no pay raise for specialists who qualified for such jobs in the future.

This insurance that no man, airman or officer, will be reduced below his present pay rate is known as a "saving clause." To take an extreme example, here's how this saving proviso might work: An E-4 with more than twelve years' service draws $195 under present pay schedules. An E-4 with more than two years in grade would draw only $180 under the new plan. But today's twelve-year E-4 would continue to get the same pay he gets now. Future E-4s would not. This same saving clause works for over-age-in-grade officers.

The committee found that under today's system more than 40,000 E-5s are getting more pay than some 40,000 E-6s. The study also showed that more than 3,000 lieutenant colonels are today receiving more base pay than some 3,000 colonels. These are the sort of situations the plan seeks to remedy in the future.

There is certain to be a lot of debate about "non-critical skills" and it is likely that there will be attempts to alter the scales in order to spread the money around among all the airmen jobs. To forestall this the Cordiner Report provides an opportunity for non-critical airmen to retrain into "critical" and "most critical" jobs and it also imposes controls on recruiting and reenlisting men who are capable only of holding "non-critical" jobs.

Another feature of the revised compensation system is the incentive it provides for remaining in the service. One of the main requirements for in-grade raises for E-4s and above is that the airman concerned must be on his second enlistment. However, there is a short cut to this. Airmen may take a short discharge and re-up after two years of their first enlistment, and in this way become eligible for higher skill pay grades sooner.

Air Force officials expect a deluge of short discharges if this part of the plan is enacted. However, the Air Force also stands to reap some benefits. Most men who have reenlisted under the bonus plan now in effect have signed for six-year tours. The Cordiner Report adds to the existing reenlistment bonus an opportunity for quicker promotion and substantial increases in proficiency pay.

Any reduction in airman turnover would benefit the Air Force immensely. Three out of four airmen now are on their first enlistments. About sixty-five percent of these first-termers get technical training, using up something like eighty percent of the total Air Force training facilities. Yet almost three-quarters of these men leave after their first enlistment, at a cost of millions of dollars per year.

The airman portion of the plan proposes to add to the quality and effectiveness of the Air Force by expanding the promotion system to nine enlisted grades; eliminating pay inequities which permit over-age corporals to draw more pay than young, more efficient sergeants, and providing increased proficiency pay for the man who demonstrates he has the desire and demonstrated ability.

The new plan for officers is based on the same set of principles. The committee found that the need for Air Force officers with a high level of education capable of becoming good leaders, good managers, or high trained specialists is continually increasing.

Here again, the Cordiner Group proposed an end to longevity. However, the same saving clause that protects airmen in this category will be applied to officers. No one will lose pay.

Here is a sample situation the committee found time and again. Many a colonel is finding himself hard-pressed financially. He can't buy that new car, he scrapes to send his children to college. In short, he finds himself on a tight budget with living costs rising all the time.

The colonel's plight is no secret. The majors and captains, struggling along themselves, see no great future even when the coveted promotions come along. They say to themselves, "Life's no bed of roses today and the colonel's not doing much better. Is it worth it? What do I have to look forward to?"

This rather grim outlook has filtered down through the officer ranks and is even passed along from the officers to the airmen. It is probably one of the biggest factors in the decision of a junior or middle-grade officer to leave the service.

It is true that some leave the service for jobs on the outside that pay little more, sometimes even less. But the compelling factor is not what they can make immediately. It is the eventual opportunities they see on the

(*Continued on following page*)

outside. They realize that there is no assurance that they will become a $20,000-a-year executive in short order. But they also figure that if they have the potential there is far more room for advancement to higher salaries in industry. If they don't make it, they have no one but themselves to blame. They are not restricted by a system, only by their own potential and efforts.

The Cordiner Committee has found that the salaries now being paid to lieutenants and captains is pretty much in line with that of their contemporaries on the outside. For this reason, the committee recommended no marked increases for officers at these levels. But to provide the incentive for these men to stay on, they have recommended significant increases in the high ranks, particularly for general officers.

The recommended rates for general officers is certain to get careful scrutiny and a certain amount of criticism. However, consider General Partridge—whose Continental Air Defense Command is guarding more than 10,000 miles of US borders—has equipment worth $3.5 billion, and controls an outlay of $1 billion a year. Compare his income with an industrial counterpart, say a top executive in industry. On this basis the proposed increases for general officers appear conservative.

The Cordiner Committee also took a very careful look at the Reserve Officer situation. The highlight of their recommendation in this field is a Term Retention Contract which would give lump sum payment to officers when they leave extended active duty—two months' pay for every year of active duty—up to a maximum of two years' incentive pay.

The committee also came up with some strong recommendations regarding the "selecting out" of sub-standard officers. As they see it, there is no place for a non-producing officer in the modern military setup and there should be no rewards for such men simply to stay on year after year.

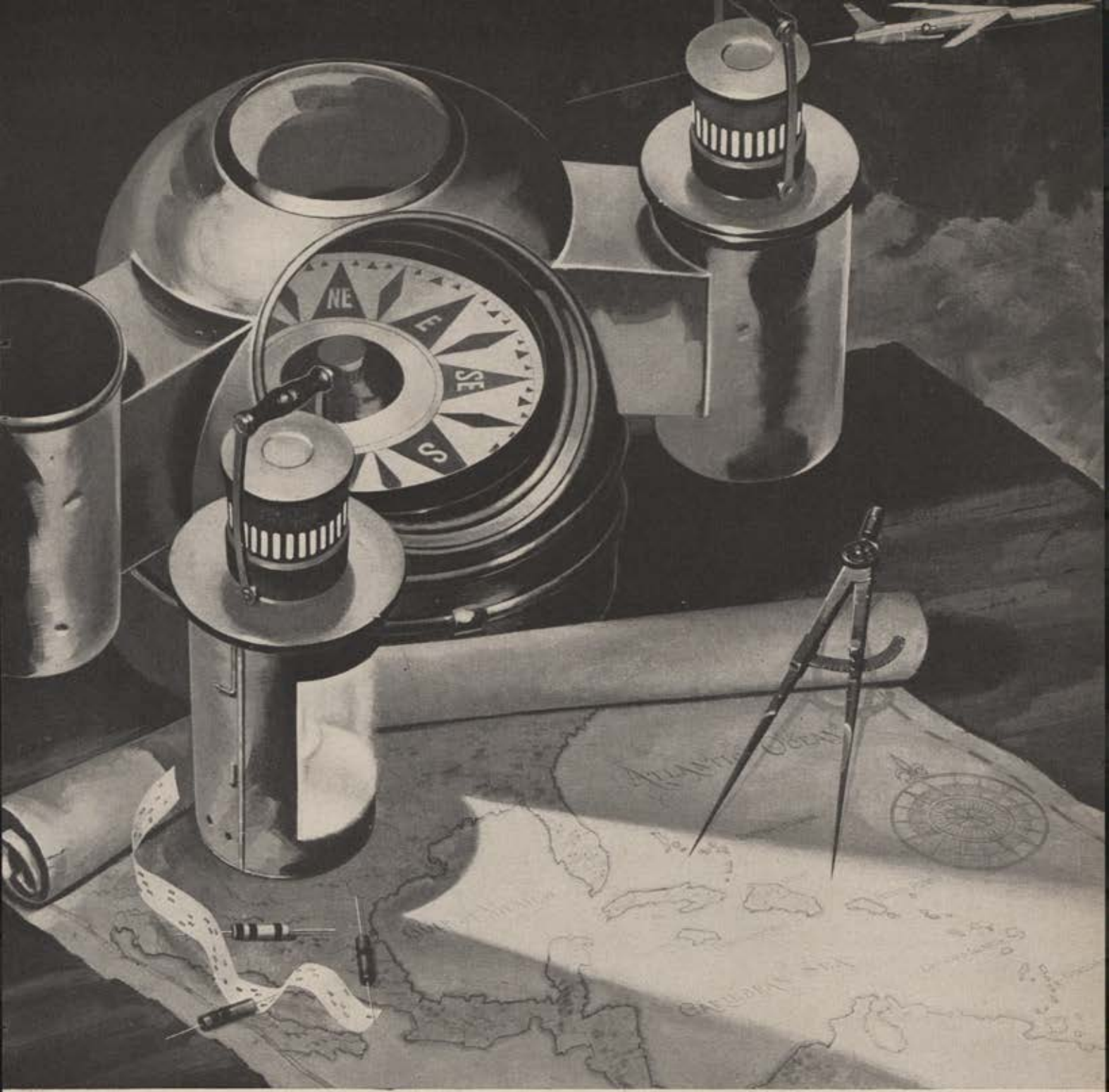
Secretary Wilson's committee studied a good many areas other than those outlined here. They examined the pay and incentive system for men serving at isolated duty stations. They studied family separations allowances, quarters allowances and housing. However, it is not expected that legislation reflecting these studies will be proposed to Congress this year.

Defense officials believe they should attempt to correct one major defect at a time and they considered the pay and incentive the most important.

The big question is, of course, how much will it cost? Preliminary reports indicated an initial cost of $750 million for all services to put the plan into effect for Fiscal Year 1958. It now appears that initial costs, affecting this year's budget, will be much smaller. Here's why.

Once the plan were to become law it would take some months to put it into effect. During this time, there would be no added outlay in money, yet immediate savings could be effected through increased reenlistments attributable to the plan. Further savings would accrue through implementation of the plan. Thus, for Fiscal Year 1958, the amount needed in a supplemental appropriation to put the plan into effect need not be exorbitant—perhaps $200 million or so.

And in ensuing years the services feel the plan will more than pay for itself. In fact, it should cut annual personnel costs by billions of dollars. That would be welcome news.—END



TRAIL BLAZING – Many frontiers of science have been charted by Northrop Aircraft engineers and scientists in seventeen years of research and development of manned and pilotless aircraft. Northrop Snark SM-62s, first intercontinental guided missiles to be disclosed by the U. S. Air Force, are now flying from the Florida coast over the USAF missile test range. Northrop's newest trail blazer is a supersonic trainer designed to help pilots master the complexities of tomorrow's combat aircraft. Other Northrop trail blazers include Scorpion F-89 interceptors; pilotless target aircraft and missiles from Northrop's subsidiary, Radioplane Company; ground support and armament equipment from the Anaheim Division; and entirely new concepts of integrated weapon systems which are constantly being initiated to improve our national defense.

NORTHROP

NORTHROP AIRCRAFT, INC. • HAWTHORNE, CALIFORNIA

Pioneers in All Weather and Pilotless Flight

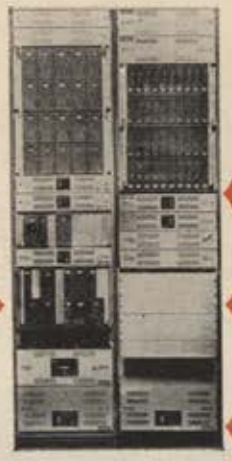
and now kineplex®

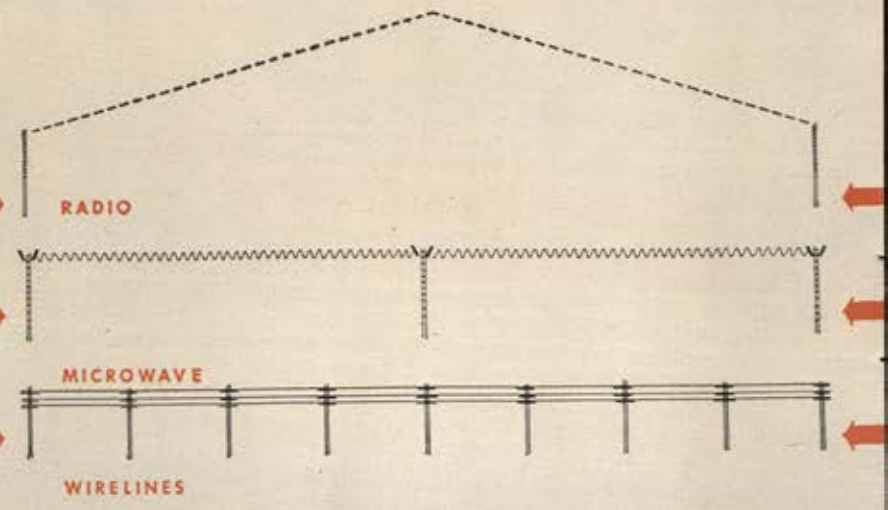
a high-speed digital transmission system

to double communication capacity

DATA

3,000 bits per second or 40 teletypewriter channels of 100 words per minute in a 3 kc bandwidth, or a combination of the two.





Collins **CREATIVE LEADER IN COMMUNICATION**

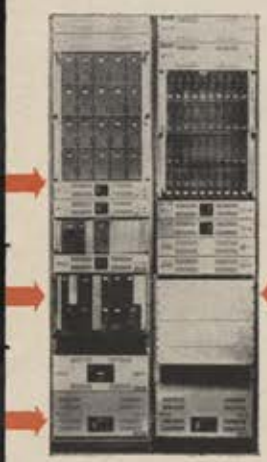
COLLINS RADIO COMPANY, 315 2nd Ave. S.E., Cedar Rapids, Iowa • 1930 Hi-Line Drive, Dallas 2 • 2700 W. Olive Ave., Burbank
261 Madison Ave., New York 16 • 1200 18th St. N.W., Washington, D.C. • 4471 N.W. 36th St., Miami 48 • 1318 4th Ave., Seattle
COLLINS RADIO COMPANY OF CANADA, LTD., 11 Bermondsey Road, Toronto 16, Ontario • COLLINS RADIO COMPANY OF ENGLAND, LTD., 242 London Road, Staines, Middlesex

Another major stride forward in communication. From the research and development laboratories of Collins Radio Company comes KINEPLEX — a spectrum conserving, high-capacity, synchronous data system which transmits and receives 3,000 bits of information per second on a 3 kc band, with superior signal-to-noise performance.

Adaptable to wireline, cable, radio, or microwave facilities, KINEPLEX provides twice as many channels on a 3 kc band as present day carrier teletypewriter systems. In teletypewriter applications this means 40 channels on a 3 kc band at 60, 75, or 100 words a minute operation.

KINEPLEX will take stored business machine data in serial or parallel form and transmit it at the same 3,000 bit per second rate. Material can be fed from magnetic tape, paper tape, punched cards, or other storage media.

KINEPLEX can also be used for telemetering, supervisory control, and facsimile. The total data transmission capacity of the system can be divided between various services to fit specific applications. Write today for literature on Collins new TE-202 KINEPLEX Data System.



DATA

3,000 bits per second
or 40 teletypewriter channels
of 100 words per minute in
a 3 kc bandwidth, or a
combination of the two.

COLLINS

For additional information: call your nearest Collins sales office or write for technical brochure.

Collins also leads development in the fields of

AVIATION

Collins completely outfits airline, military and business aircraft with the most advanced communication, navigation, flight control and instrumentation systems in aviation. Many new lightweight, reduced-size versions are now being delivered. Collins designed the original Integrated Flight System, leads in combining comm/nav/ident units into a single compact "CNI" package for new military aircraft, and continues to pace the industry in developments in airborne radar, ADF, ILS, VOR, HF and VHF communication.

GROUND COMMUNICATION

Collins engineers, designs and supplies the equipment, installs, and puts into operation integrated point-to-point communication systems of any scope. The Collins system engineering staff is backed by the finest equipment in the world, whether standard MF, HF or VHF, Transhorizon "scatter," microwave relay and multiplex or single sideband HF. Typical of Collins communication progress is "Kineplex" — a high speed data transmission system doubling communication capacity.

AMATEUR RADIO

In the early 1930's Collins set the standard in Amateur radio and, through continuous design and development, has raised this standard to its present single sideband station — the most honored and prized in the Amateur fraternity. This station is the top performing rig on the air with its kilowatt KWS-1 transmitter and highly selective 75A-4 receiver. Many of the leaders in the electronics industry became acquainted with Collins through the Company's superior Amateur equipment.

BROADCAST

Collins supplies a complete new AM station from mike to antenna or modernizes existing facilities. Besides the superior line of transmitters, Collins supplies the broadcaster's needs with such advanced additions as TV-STL microwave relay system, the lightest 4-channel remote amplifier on the market, phasing equipment and audio consoles. Collins field service organization has built an enviable reputation in assisting the broadcaster in installation or in times of emergency.

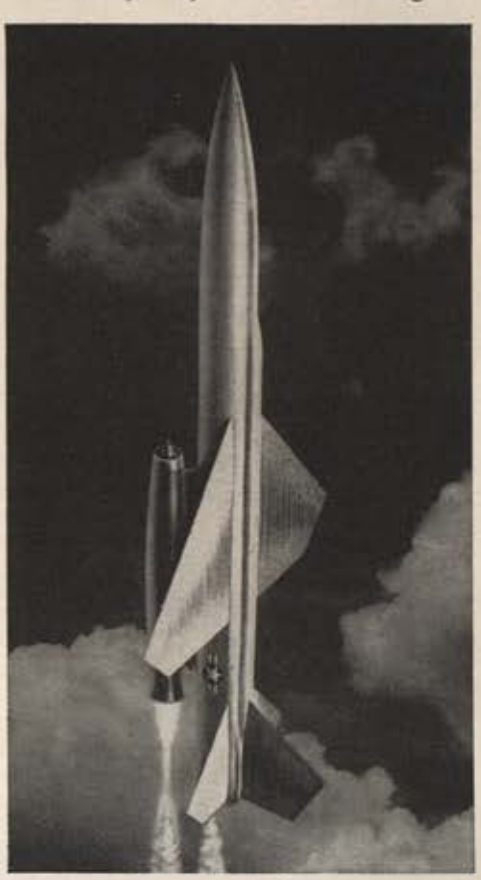
COMPONENTS AND TEST EQUIPMENT

The degree of precision and reliability of Collins products requires development by Collins engineering of components such as Autotunes and Autopositioners, Mechanical Filters, oscillators, heat reducing tube shields and ferrites. These developments and other high quality components are sold by a Collins subsidiary, Communication Accessories Company of Hickman Mills, Missouri. The same principles of accuracy and reliability apply to Collins test equipment, built especially for Collins but adaptable to testing other equipment types.

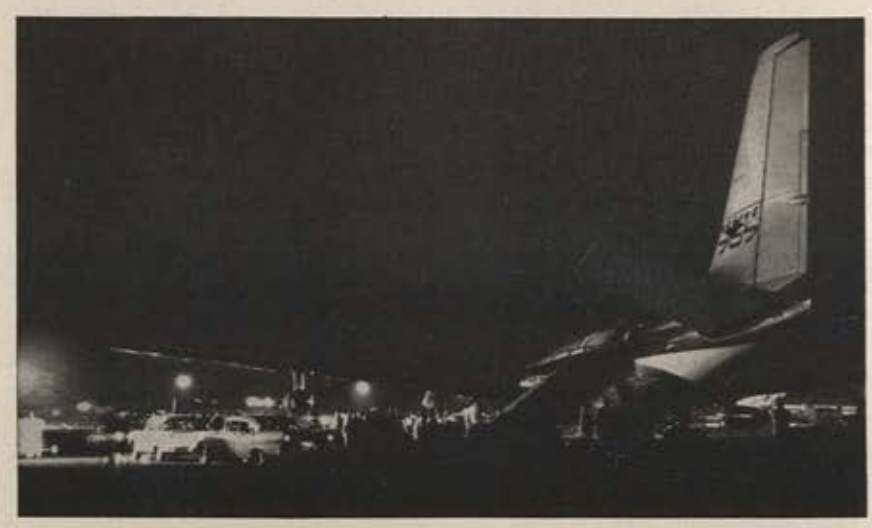
BULLETIN FROM BOEING

IT'S A SMALLER WORLD. Air Force crews made aviation history when they flew three Boeing B-52 jet bombers around the world, nonstop, in 45 hours, 19 minutes. The B-52s were refueled aloft from Boeing KC-97 tankers. Previous 'round-the-world record was set in 1949, by the famous B-50 "Lucky Lady"—another Boeing.

AFTER THE LANDING, the Air Force flight commander commented: "With a plane like the B-52 and the fine crews we have, the flight was strictly routine." These three Boeing B-52s are the first jets ever to circle the earth nonstop.



BOMARC. Boeing is conducting successful firing tests of supersonic defense missiles. In addition to the BOMARC missile, Boeing is developing an entire weapon system, including launching means, bases, communications and electronic guidance.



AMERICA'S ONLY JETLINER, the Boeing 707, is backed by the same unequalled jet experience that produced the history-making B-52. Pictured at Los Angeles airport, the 707 is helping officials set standards for commercial jet flight in U. S.

BOEING

SHOOTING THE BREEZE

WITH THE EDITORS OF AIR FORCE MAGAZINE

It seems quite fitting that, in the same issue which covers AFA's Jet Age Conference, we are happy to report that we personally entered the Jet Age via an hour spin in Boeing's 707 jet transport. It was quite an experience. We had ridden in jets before but always complete with hard hat, oxygen mask, and other operational paraphernalia. This was different. We climbed aboard at Baltimore's Friendship International Airport, settled into a comfortable air line seat, buckled the belt, and we were off.

Capt. A. M. (Tex) Johnston, Boeing's chief test pilot, took us up to 25,000 feet in about ten minutes, and we were off on a leisurely 450-mile trip up and down the East Coast in an hour's time. Tex cut the number one engine and restarted it in flight, and no one would have known the difference had he not told us about it.

Beyond this, the only unusual thing about the flight was the extreme comfort—little noise, no vibration to speak of, no lengthy warm up at the end of the runway, conversation in normal tones, no ear problems with the cabin pressure at a comfortable 8,000 feet.

With a light load of passengers and jet fuel, the big bird broke ground at less than 5,000 feet on takeoff and landed in about the same distance. If the flight was any indication of the brave new Jet Age World, we're all for it.

☆

As the battle of classification goes on apace, we note a worthy suggestion from Adm. William M. Fechteler, former chief of Naval Operations. Admiral Fechteler was discussing the backlog of classified documents from World War II—some six billion of them still stamped "Secret"—and said, "The best cure for this is a big bonfire."

☆

The following exchange on Capitol Hill was reported by the Associated Press:

"Don't let the fellow at the next desk look down his nose at you because he's a specialist. Tell him you're a generalist."

The word saw the light at the House Appropriations Committee hearings on the civil defense budget. Civil Defense Administrator Val Peterson was asked what was meant by the listing of generalist on his staff.

"Is this a super-specialist?" asked Rep. Yates, (D. Ill.).

"No," Mr. Peterson replied. "Our choice of terms may not be too good. This is a man who is jack-of-all-trades. He can go out and do business in most of these fields."

"Now you are talking in language we can understand," remarked Rep. Thomas, (D., Tex.). "We can all qualify."

Boeing's 707 jet transport prototype, which roared from Seattle to Baltimore, Md., in three hours, 48 minutes.

☆

About forty of the original Doolittle Tokyo Raiders are to gather at Eglin AFB, Fla., this month, April 18-20, for their fifteenth annual reunion. The Raiders trained at Eglin in early 1942 for their historic bombing of Japan.

☆

In mid-March Smoky Hill AFB, Kan., was renamed Schilling AFB in honor of Col. Dave Schilling (AIR FORCE, Jan. 1957). In the dedication speech on March 16, General Twining referred to Schilling as typical of men who "restlessly seek new ways to do old jobs better, or [who] search out the new jobs to be done."

In recognition of Schilling's many contributions to the Air Force in the field of flight, AFA's Board of Directors, meeting in Washington in February, unanimously voted to rename AFA's Flight Award, which Schilling won in 1952, the "Colonel David C. Schilling Memorial Trophy."

(Continued on following page)

Lighter than Air

It was my first trip across the Rockies in a Sabrejet. I was forty-five minutes out of Denver and hadn't seen the ground since I took off. On top of this I hadn't had a radio checkpoint for thirty minutes. My radio compass was putting out a high grade of static and I began to get concerned about my position. For fifteen minutes I fiddled with the radio compass, listening for some sound of humanity. Finally, after my nerves were getting a bit fractured, a sweet, feminine voice from radio station KENO sang out, "Have you talked with the man upstairs!"

DAVID F. MCCALLISTER
Swarthmore, Penn.

• • •

This chuckle-and-snort corner is devoted to true unpublished anecdotes about AF life. Send us yours. We'll pay five bucks for each one published. All stories used become our property.

Apropos the current budget debate, these words from Admiral Radford: "As for complacency, we have at times exhibited a tendency to extol our strengths and accomplishments and, at the same time, blind ourselves to the strengths and accomplishments of others. Any such smug self-satisfaction is merely a form of paralysis. This is not the time to coast on any laurels."

☆

We were amused by the following tidbit which comes to us from a friend in the aircraft industry:

"What might happen if work simplification principles were applied in the field of music is indicated in the following report as seen through the eyes of an organization and methods engineer who has just attended a concert of the Dallas Symphony Orchestra.

"1. For significant periods of time the four oboe players had nothing to do. Obviously, the numbers should be reduced and the work spread more evenly throughout the entire orchestra, thus eliminating peaks of activity.

"2. On numerous occasions all twelve of the first violins were playing identical notes. This, without question, is unnecessary duplication. The Staff of this section should be drastically cut; if a large volume of sound is required, it could be provided by means of electronic amplifying equipment.

"3. Much effort was devoted to the playing of demi-semiquavers. This seems like an excessive refinement. It is recommended that all notes should be rounded off to the nearest semiquaver. If this were done it would be possible to use trainees and lower grade operators more extensively.

"4. There seemed to be far too much repetition of some musical passages. Scores should be subjected to a major pruning. No useful purpose is served by repeating on the horns a passage which has already been handled by the strings. It is estimated that if all the redundant passages were eliminated, the entire concert time of two hours and twenty minutes could be reduced to twenty minutes, and there would be no need for an intermission.

"The Conductor concurs generally with the foregoing recommendations but suggests there might be some falling-off in box office receipts. In that unlikely event, it should be possible to close sections of the auditorium and thus effect a considerable saving in overhead expense—lighting, heating, attendants, etc.

"If worst came to worst, the whole idea could be abandoned and the public could stay home and watch pre-talkie movies on TV."

☆

After more than two years of uphill fighting, the US Civil Service Commission last month approved "in principle" the Air Force Association-sponsored plan to authorize technicians for the Air Force Reserve.

The plan is similar to that which has been in effect in the Air National Guard for almost ten years. Briefly, it provides that civilian employees of Reserve units be members of the units. Civilian employment is identical with the man's military employment and, in the event of mobilization, the individual goes on active duty with the unit in his military capacity.

The plan was developed originally by the Reserve Council of the Air Force Association. It became the subject of a resolution adopted by the Association's 1955 annual convention in San Francisco.

The "in principle" agreement of the Civil Service Commission does not mean that the Air Force is about to set the plan in operation. In fact, the "in principle" agreement was given verbally. Final approval is still to come and the Commission has indicated this won't happen until clearances have been obtained from veterans' groups, labor unions, and the House and Senate Post Office Committees.

One labor group, upon hearing of the "in principle" agreement, immediately denounced it. The Government Employes Council (AFL-CIO) charged that it smacked of coercion in that it would make military service a prerequisite to employment.

The Air Force feels, however, that eventually everyone will get together and the program can begin. The Air Force estimates that as many as 8,000 active-duty officers and airmen, now assigned to caretaking tasks in Reserve Flying Centers, can be released for assignment against world-wide commitments.

Fully operational, there will be in the neighborhood of 14,000 Air Reserve technicians. There are about 5,500 civilians now employed in the Air Reserve program.

The Air Force has assured the Civil Service Commission that no one now employed in the Reserve program will lose his job if he fails to qualify for membership in the Reserve unit. Those displaced, the Air Force says, will be assigned to other and similar tasks on the same base where they are employed. Only they'll be working for the Air Force instead of the Air Force Reserve.

The technician plan is designed to increase the combat potential of Reserve wings. This can be done, the Air Force is certain, because men holding key technical positions in the wings will accompany the wings upon mobilization. Under the present set-up, in the event of mobilization, key civilian technical people stay behind and the wings go on active duty undermanned. Then the Air Force has to raid its active-duty organizations to fill the holes.

How soon the Civil Service Commission will give final approval to the plan is a matter of conjecture. It may not take as long to get all interested parties together as it did to get the plan out of the Pentagon's desk drawer.

But it's a safe guess that the Air Force Reserve won't be hiring technicians this month.—END

PIONEERING SCIENTIFIC FRONTIERS AT GENERAL MILLS

WE START WITH PLASTIC SHEETS, END WITH STRATO DATA ANALYSIS

Building the polyethylene balloon, as shown here, is part of General Mills balloon systems service. The "full package" service, typical of our thoroughness in other areas of activity, includes: design of vehicle and instrumentation, manufacture and flight planning—including meteorological services, flight operations, telemetering, tracking and recovery, and finally, analysis of collected data.

Manned strato-balloon flights probe the mysteries of space

This is the Navy Project Strato-Lab balloon that set a new altitude record in a recent ascent at Rapid City, S. D. The fact that Commanders M. D. Ross and M. L. Lewis rose to 76,000 feet, the highest man has flown in a balloon, was incidental. Of far more importance was their demonstration that a light, comparatively inexpensive polyethylene balloon, with a gondola carrying its own atmosphere, is a feasible means of carrying human observers above the present ceiling of sustained powered flight. Manned flights to altitudes of 100,000 feet or more are possible today.

Man has flown higher in a rocket plane, but only for seconds at a time. General Mills strato-balloons can remain at controlled altitudes for days if required. (Thus, "passengers" have time to make detailed observations.) They can also be used as launching stations to give rockets a "head start" into space.

Upper-air research is one of many areas being pioneered at General Mills. Possibly you can profit from our experience in this field—or from our research, development and production of electro-mechanical sub-systems and major assemblies for weapons defense, guidance and controls, and weapons testing. Send today for booklet with all the facts.

MECHANICAL DIVISION

CREATIVE RESEARCH AND DEVELOPMENT + PRECISION ENGINEERING AND PRODUCTION

General Mills

Minneapolis 13, Minnesota

FAIRCHILD SHIPBOARD RADAR

...Push Button Guidance

FOR THE REGULUS

Shipboard radar, designed and produced by Fairchild Guided Missiles Division, makes possible the completely automatic guidance of the Regulus. Push-button operation contrasts the engineering complexity of this uniquely accurate guidance system. So versatile is its installation and adaptability, the Fairchild SPQ-2 radar system is now in operation with the fleet around the world.

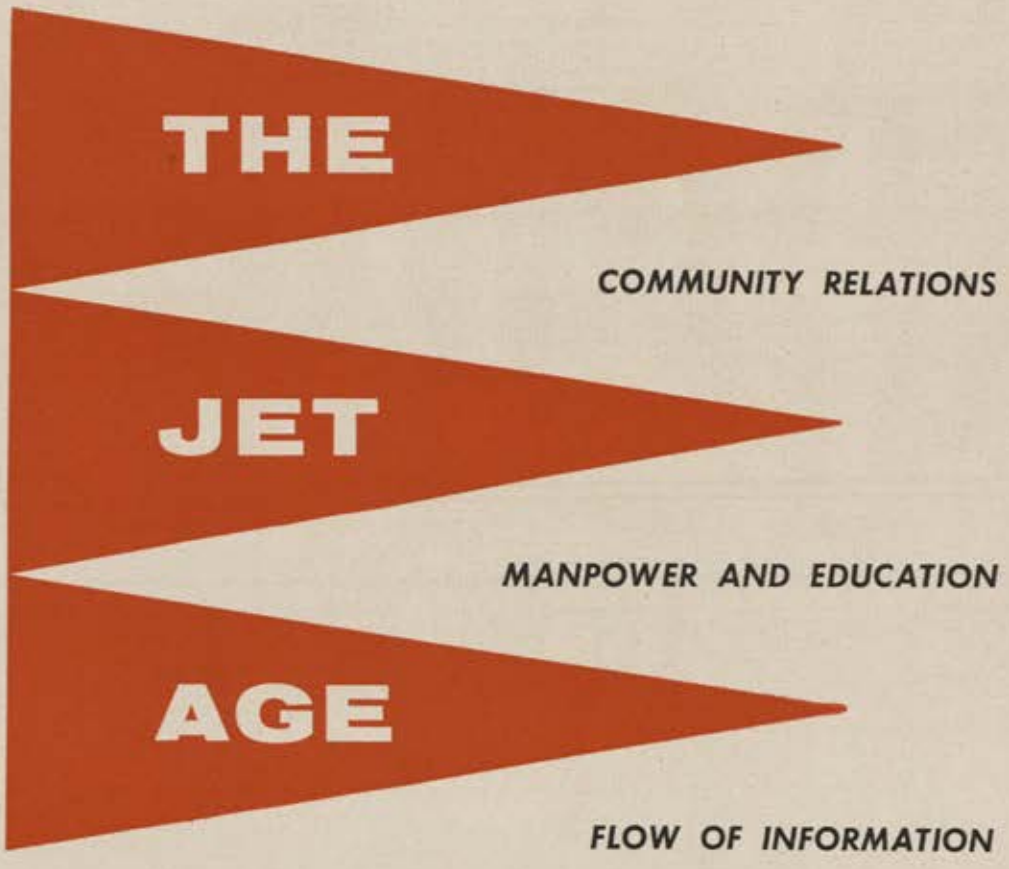
FAIRCHILD

GUIDED MISSILES DIVISION • WYANDANCH, LONG ISLAND, N. Y.

A DIVISION OF FAIRCHILD ENGINE AND AIRPLANE CORPORATION

...WHERE THE FUTURE IS MEASURED IN LIGHT-YEARS!

AIR FORCE
APRIL 1957



A Special Report on

AFA's Second National Jet Age Conference

IN this issue of AIR FORCE Magazine we are proud to document the second annual National Jet Age Conference of the Air Force Association, held at the Sheraton-Park Hotel in Washington on February 14 and 15. Never before, said John P. Henebry, AFA's President, had "so many people of influence assembled for the sole purpose of exploring mutual airpower problems."

From all corners of the country, more than 1,700 registrants represented every facet of the mighty force we call American Airpower. Representatives of civil aviation, military aviation, business and personal flying, city, state and national governments, the aviation industry, educators, airport owners and operators, the organized labor movement, the Congress, leaders of the Air Force Association—all met in Washington's gigantic Sheraton Hall to discuss, for a solid day and a half, the problems and complexities of this Jet Age which is indeed upon us but which many only dimly understand. The conference was made possible through AFA's Industrial Associate program, in which almost 300 companies are presently enrolled.

Only a year before, at the first of such national Jet Age Conferences, many of these same people had assembled in the same hall in the first organized public attempt on a national scale, to hack at the barriers to Jet Age progress. And there were, and are, many such barriers. Last year, Air Force Association leaders were warned that the time was not yet ripe for public examination of these vexing problems, that no good purpose would be served by ad-

(Continued on following page)

Plus remarks by Secretary of the Air Force Donald A. Quarles

mitting that all was not rosy in the fields of air traffic control, jet noise suppression, airport expansion, community relations and the like. To bring such issues into the light of day would only needlessly alarm an unsuspecting public, so the story went.

But AFA weighed the factors carefully and decided that a mutual exchange of ideas among all facets of aviation—both civil and military—would be a healthy thing. It further decided that this should be done in public session. For these were public problems. The public not only had a right to know, it had a duty to act. And under our democratic form of government, enlightened public action can only come through enlightened public opinion.

So the first National Jet Age Conference was held and could be termed an unqualified success. But it did not stop there. Many of the problems brought out were local in nature and could only be attacked on a local basis. So the national headquarters of AFA prepared action kits, based on the national conference, and distributed them to AFA squadrons across the nation. As a result it is possible to report that, to date, more than two dozen local Jet Age Conferences have been held in communities from one end of the nation to the other. Thousands of persons have heard scores of qualified speakers in open forum, in the true American town meeting tradition.

It was against this backdrop of proven success that the second national conference was held. The first session, on the afternoon of February 14, was devoted to an updating of the matters discussed the year before, grouped under the general heading of community relations. The first speaker was Gen. Thomas D. White, Vice Chief of Staff, USAF; his topic, military aviation. Discussing commercial aviation was Brig. Gen. Milton W. Arnold, USAF (Ret.), Vice President, Operations, of the Air Transport Association. General aviation, including both private and executive flying, was discussed by Dr. Leslie A. Bryan of the University of Illinois, and Chairman of the Executive Committee of the General Aviation Facilities Planning Group. The aviation industry was represented by Gen. Joseph T. McNarney, USAF (Ret.), President of the Convair Division of the General Dynamics Corp. Anchor man on the first afternoon's program was the Hon. James T. Pyle, Civil Aeronautics Administrator.

To quote AFA President Henebry again, "Basic to progressive development of our air strength—if not to survival itself—is the manpower requirements for the Nation." As a result, the second conference session, on the morning of February 15, was devoted to manpower and education. Leading off, with "The National Problem" as his topic, was Dr. Detlev W. Bronk, President of the National Academy of Sciences, and a member of the President's Committee for the Development of Scientists and Engineers. Dr. Bronk was followed to the rostrum by Lt. Gen. Clarence S. Irvine, Deputy Chief of Staff, Materiel, USAF; Gen. Orval R. Cook, USAF (Ret.), now President of the Aircraft Industries Association; and Dr. Edward Teller, Professor of Physics and Associate Director of the Radiation Laboratory of the University of California.

Concluding the program, the last afternoon session dealt with the flow of information, how to reconcile the manifest public need for dissemination of information with the national need for a certain degree of security and secrecy. Speaking for the Department of Defense was the Hon. Philip K. Allen, Deputy Assistant Secretary for Public Affairs. Rep. John Moss, of California, reported on the findings of his Subcommittee of Government Operations of the House Committee on Government Operations. A representative of both industry and science, Dr. Louis Ridenour, Director of Research of Lockheed's Missile Systems Division, followed. The last program speaker was Gen. John E. Hull, USA (Ret.), who spoke as a member of the Defense Department's Committee on Classified Information.

Perhaps the most valuable service of the entire conference was performed by the eighty-odd newsmen who covered the affair for the nation's major newspapers, wire services, radio and TV networks, and periodicals. For, in the last analysis, it was their hard work and good reporting which carried the word from the conference over the length and breadth of the land.

On the following pages, the conference proceedings are documented, with only introductory material eliminated from the texts of the speeches and mild liberties taken with the extemporaneous questions-and-answer periods. Included is a luncheon address delivered to conference registrants by the Hon. Donald A. Quarles. We hope this issue of AIR FORCE will prove a valuable reference—The Editors.

In order to carry discussion beyond the formal presentation of each speaker, the following ground rules were established. In addition to the main speakers, each session had its own moderator, to perform the necessary introductions and to monitor the question periods. At the end of each presentation, the speaker was interrogated by a three-man panel, each composed of experts in the field being covered. Questions from the floor were also permitted and encouraged. Following are the moderators and panel members for each session:

Community Relations (page 57): Moderator, Peter J. Schenk, a member of AFA's Board of Directors, and manager of projects for the General Electric Company's Technical Military Planning Operation at Santa Barbara, Calif. He is a former lieutenant colonel in the Air Force and holds a mobilization assignment in the Air Force Reserve to the Office, Deputy Chief of Staff, Development. Panel members included Hon. William B. Hartsfield, Mayor of Atlanta, Ga., and Chairman, Special Committee on Airports, American Municipal Association; Arthur E. Abney, Director, Illinois Department of Aeronautics and President, National Association of State Aviation Officials; and Foster V. Jones, Director of Airports, Louisville, Ky., and President, Airport Operators' Council.

Manpower and Education (page 83): Moderator, T. F. Walkowicz, a member of AFA's Board of Directors and technical advisor on the staff of Laurance S. Rockefeller. He holds a Doctor of Science degree from the Massachusetts Institute of Technology and, as an Air Force officer, served on numerous AF scientific committees. Panel members included: Dr. H. Guyford Stever, Associate Dean of Engineering, MIT, and former Chief Scientist of the Air Force; Dr. Evan Evans, Executive Secretary, National Aviation Education Council; and Chalmer E. Jones, General Manager, Systems Division, Daystrom, Inc.

Flow of Information (page 108): Moderator, Stephen F. Leo, a member of AFA's Board of Directors and Vice President, Sverdrup & Parcel, Inc. He formerly was Director of Information of the Air Force under Secretary Stuart Symington. Panel members included: Jerry Greene, Washington Bureau, New York *Daily News;* Theodore F. Koop, Director of News and Public Affairs, Columbia Broadcasting System, Washington, D.C., and Ken Ellington, Vice President, Republic Aviation Corp.

THE JET AGE

Community Relations

MILITARY AVIATION

Gen. Thomas D. White, USAF
VICE CHIEF OF STAFF, USAF

General White has been AF Vice Chief since 1953. Earlier he was Director of Legislative Liaison, and after WW II commanded the Fifth AF in Japan. During the war he was Deputy Commander of the Thirteenth AF in the Southwest Pacific and commanded the Seventh AF in the Central Pacific. Born in Walker, Minn., in 1901, he was graduated from West Point in 1920. He has served in China, Russia, Italy, and Greece.

LAST year the greatest single point of friction between the Air Force and the community was aircraft noise. It still is.

So far, it is the military aircraft, particularly our jets, that are making most of the objectionable noise. Yet, in comparison to the total area of the United States, or in comparison to the total number of airfields in the United States, we are noisy in only a very few spots. Military air bases comprise only about six percent of the nation's airports. Of these, many are unable to handle jet traffic and only a handful support supersonic operation.

But even this relatively limited operation has already become the basis of mounting opposition to aviation activities in general, and to jet operation in particular.

This trouble did not come on us unexpectedly. Many years ago we foresaw this problem.

We initiated several very complete studies on the nature, propagation, and effects of noise. We began research on all the methods of noise suppression. We began to devise and use noise-abatement programs.

Long ago, before anyone had ever heard a jet engine, we followed a policy of trying to build our bases away from towns—in the interests of economy, flying safety, and more efficient operation. Today, our criteria for the location of new bases are even more stringent in their requirements for separation from population centers. Wherever possible, we are getting our noise away from communities.

But, as you know, we have found this to be a solution that has little lasting value. An air base is a big business that automatically spawns communities around it. We could not afford to buy land around each base simply to provide buffer areas. In some cases we are hard enough pressed to get sufficient land for runway extensions. Inevitably, the nearest town grows out to an air base and, eventually, surrounds it.

In any case, there are two classes of air bases that must, of necessity, be found in the proximity of our greater population centers. First, our air-defense interceptors must be so located as to provide maximum range protection around the most lucrative US targets, since attacks can come from many directions.

For this reason, we must locate many of the fighter-interceptor squadrons of our Air Defense Command near our important centers of industry and population.

Second are the Reserve and National Guard bases. Obviously, these men must train at bases fairly near their homes. Even more important, we must rely on the combat readiness of these units. Since most of our Air Reserve and Air National Guardsmen live in populous areas, their bases must be relatively close by. Otherwise, they would need too much time to get to their organizations for fast reaction or efficient training.

In addition to these types of bases, which are always allied with population centers, we will face yet another problem in the future. I refer now to the requirement for our forces, particularly our Strategic Air Command, to be dispersed. Thus far, we have been successful in deterring attack on the United States. However, a potential aggressor steadily and rapidly is increasing his ability to launch intercontinental strikes with atomic weapons. Continued deterrence will be, as it has been, mainly a product of the retaliatory power of SAC.

It would be well for us to remind ourselves what constitutes this retaliatory power. The USAF's retaliatory power is by no means the total number of weapons in our stockpile added to the number of long-range bombers and crews that exist before an enemy strikes. Our retaliatory power is composed only of the crews, bombs, and bombers that would escape enemy bombs and missiles. Some SAC

(Continued on following page)

units would survive by taking off before the attack. Some on the ground would conceivably survive because all of our bases might not be effectively bombed.

There is a subtle difference between that retaliatory power—which implies lashing back at an attacker—and our deterrent power, which implies discouraging a potential attacker. Our deterrent power is more abstract. It consists of the US crews, bombs, and bombers that a potential enemy estimates would survive the most effective attack of which he is capable. In other words, our deterrent, *per se*, exists only in the mind of the would-be aggressor. If the aggressor's assessment of his strike capability in relation to the number of US targets and US air defenses leads him to believe that he can destroy enough of the USAF so that an effective retaliation is unlikely—then there is no deterrence.

As you know, the B-47s, the B-36s and the B-52s are now concentrated on too few, highly crowded bases. In addition, Air Defense squadrons are often wedged in as a tenant at one end of an already busy air base.

We want to make an attacker's job harder. We want to make it apparent that our defending forces and our strategic retaliatory forces cannot be knocked out even with the great force the potential aggressor has today. To accomplish this we intend to spread out these combat forces. For example, we will divide the striking force into smaller and more numerous packages. These will be deployed to enough bases so that a potential attacker could never hope to destroy enough of our bombers to prevent our decisive retaliation.

In other words, we feel that super bases would make super targets. If enough of this nation's defense resources are concentrated on a small number of attractive targets, it becomes more an invitation to attack than a deterrent to war.

While our heavy jet bomber wings are being strengthened to forty-five aircraft each, our aim is that each wing will be divided among three bases. One squadron would remain on a parent base with complete maintenance facilities, and two squadrons would operate from satellite bases with limited facilities.

In addition, we plan to use other existing airfields for emergency staging and dispersal. Even the big B-52 can adapt to this type of operation. In this early stage of its use, the B-52 is comparatively trouble-free. Thus, we would not have to make extensive preparations for maintenance. Recent large-scale exercises demonstrated its capability to use non-military airports.

Such dispersal will strengthen our deterrent to war without increasing the size of our planned force. This is good. It will also make it possible for a great many more citizens to hear the sound of jet bomber engines. This is not so good.

So far I have emphasized two points: One, that aircraft noise is still the Air Force's most apparent community-relations problem; and, two, that it would be tactically disadvantageous as well as prohibitively expensive to isolate all military air operations so that the civilian populace would not be bothered by noise.

There are, however, measures that we can and are taking.

On the ground, we are taking measures to make our operations more acceptable to surrounding communities. First, we try to schedule ground run-ups at times when the engine noise is less bothersome, avoiding extensive ground checks early in the morning or late at night.

Then we attempt to locate our ground operations at a place on each base where the least noise will reach the community. In some instances we can operate behind hills, buildings, or other built-in baffles. In other cases, we must take maximum advantage of distance and perform our tests at an isolated part of the base.

Last, we have mechanical devices to dissipate the noise of engines being run on the ground. These have proved very effective.

There are fewer means of noise suppression available to us in the air. To avoid irritating the community we have altered traffic patterns so as to fly as little as possible over built-up areas. If possible, landings and take-offs are made over water or the most sparsely settled areas around the base.

Power reductions after take-offs and sharp turns have proved effective in some cases. Steep climbs for take-offs and sharp descents for landings are also used to cut down the amount of low-level noise.

As I mentioned, the Air Force is making a research and development effort in search of noise suppressors that can reduce the sound of jet engines to more acceptable levels. Various aircraft companies are also spending much time and effort on these devices. Unfortunately, the more effective of the devices developed so far degrade the performance of jet engines. Obviously, for the military mission, we need every pound of thrust, every mile of range, and every foot of altitude per pound of fuel that we can get. Thus, we cannot afford to reduce noise by reducing capability, for this would defeat the very ends we are trying to achieve.

I am, however, optimistic that the efforts of industry and the Air Force will eventually produce an effective jet-engine noise suppressor. This will be a real aid to our operations in populous areas.

The future appears bright in other areas, too. We are progressing toward short take-off and landing planes. Boundary layer control is here, and reverse thrust is well on the way. The vertical take-off aircraft is coming. All of these developments should reduce the noise level outside the areas of our bases.

Even now, our Century Series fighters, although much louder, are showing remarkable climb characteristics, which will aid them considerably in avoiding residential areas.

Looking even further ahead, we are on the threshold of the missile age. Our practicing and testing of missiles can be and must be accomplished in remote areas. The actual operational missiles, both defensive and retaliatory, would be silently in place and ready to go at their sites. Thus, as missiles more and more replace airplanes, our noise problems should reduce in proportion.

So far, I have dwelt upon solutions we can attempt alone. All of these measures together answer the problem only partially. I believe we will achieve our greatest success in measures designed to further public understanding of aircraft noise.

As General Twining said last year, "We must not only pre-condition communities, we must pre-condition the nation."

I cannot say precisely how well we have done in preconditioning the nation, but during the last year we have made good progress in our relations with local communities.

I would like to wind up this discussion by telling you of two specific examples of this sort of progress. One deals with the Air Defense Command. The other with the Strategic Air Command.

At Truax Field, Madison, Wis., we have a fighter-interceptor squadron. This squadron was scheduled to be re-equipped with the new F-102. The F-102 is not a

quiet airplane, and Truax Field is not isolated from Madison. Here was an obvious potential problem area.

The Air Force and Convair, the builder of the F-102, joined forces in preventive action. Twenty-nine prominent and influential Madison citizens were invited to go on a very educational journey.

First, they were taken to Continental Air Defense Command headquarters at Colorado Springs. There they were given an extensive briefing on the nature of the threat to the nation's security. They learned how our air defenses are organized to meet the threat.

Then, the group was taken to San Diego to tour Convair's F-102 plant. They learned the history of this interceptor, how it was made, and what it would do.

In short, these citizens got a feel for the job of air defense and our means to do it. They returned to Madison with real understanding of the strategic part Truax Field plays in our defense program. These people, in turn, spread the word. We are proud of the fact that the community of Madison continues to support the Air Force despite the inconveniences caused by more powerful fighter-interceptors. This is just one example of an inside separate community relations program.

The other example is Mather Air Force Base at Sacramento, Calif.

Last year, it was announced that jet bombers of the Strategic Air Command would be based at Mather. The base commander took prompt action to initiate studies of jet noise as it would apply to his local community.

As a result of these very extensive studies, complete with maps, charts, and diagrams, the base commander contacted the Sacramento Planning Commission and the County Board of Supervisors and gave them a complete briefing. After this the planners and supervisors had sufficient information to tentatively disapprove several housing subdivisions planned to be built in the area that would be affected by jet noise.

Later, the commander had more data upon which to base suggestions that certain areas be zoned only for agricultural or manufacturing activities.

This was followed by a dinner meeting at the base for fifty prominent city and county officials. At this dinner, a formal presentation was made which defined jet noise and showed, graphically, areas to be affected by jet operations from Mather.

Throughout all these actions, it was specifically spelled out that no attempt was being made to dictate use of privately owned property. Rather, this program was a fulfillment of Air Force responsibility to present the facts so that the community could plan its future.

Soon thereafter, this presentation was repeated for members of the local press, radio, and television.

This aggressive, preventive action has more than paid off. Sacramento is another community where we have achieved mutual understanding of common problems. We expect that the fine relationship of the Air Force and Sacramento will continue.

I mention these two examples because we are proud of them. They represent progress, and they are bright spots in a picture that has other very dark areas.

These prove that the citizens of our nation will, as always, accept their obligations and respond nobly when all the facts are made known to them.

This, to me, is the big job—to make the facts known on a national scale. To accomplish this will require a national effort—a working together of all aviation activities taking common actions to achieve a common goal.

Meetings like this are the first step in such united action.

QUESTIONS

Mayor Hartsfield: When it was publicized that I would be on this program, I received a letter from the mayor of Madison, Wis., in which he states they are very much dissatisfied with the operation of jets. He sends me several newspaper editorials and articles, and he also sends a list of accidents, together with a resolution on the part of his city government, which cites that since 1921 there have been twenty-eight accidents either at the Madison Airport or in the immediate vicinity. He cites a number of operational accidents with reference to jets, minimum fuel flame-outs; three actual flame-outs; engine troubles, twenty; maximum fuel systems on jets, seventeen; unsafe gear, sixteen; smoke or fire indications, eight; controls failures, five; and he asked me to bring it up at this conference.

In analyzing the complaints, it seems that the Air Force evidently said that a new runway was necessary to divert the traffic away from the city of Madison.

He recognizes the problems of jet operation, but says that either the Air Force or the Army Engineers or Congress had failed to put up the money to build a new runway which would divert these jets away from the city of Madison.

Have you any information on that or any encouragement that you could give to the city of Madison? Here there seems to be a failure possibly of Congress to cooperate—and other cities might be in the same position—in the building of such runways as would divert jet traffic from over a populous area.

Have you any information on this lack of a suitable runway?

General White: I don't have specific information on a runway there. I would say that if we are satisfied that a runway really is necessary, we will certainly go into it. If it is not vital, in this day and age of high taxes and high budget, that is something else. I do not favor extending runways when they are not absolutely vital. People sometimes complain about the fire engines going down streets that may be too narrow. They haven't got the money to widen the streets, but they still have to have the fire protection.

I hope we can work out some solution on that sort of a basis.

Mayor Hartsfield: You stated in your talk that the Air Force is doing research and development in an effort to find noise suppressors and reduce the sound of jet engines. Do you think that there will be developed any way to reduce the sound of jets to make them palatable to nearby areas?

General White: I am not an engineer, but I don't think, specifically, as to the mechanical processes, it is very near. I think alleviation lies in other methods, such as some of those I outlined earlier.

Mr. Abney: What means has the Air Force presently, or if it has no present means, what does it intend to do, to protect the approaches to its runways, either by zoning or otherwise, and to prevent the growth of housing developments in those approaches?

General White: We don't have enough money to buy all the land required for the zoning of the approaches, and I think the only good answer to that is working out with the city fathers and the zoning authorities what the safety zones are, what the plans are, so that they can take action similar to that taken at Sacramento, which I have outlined.

Mr. Jones: We airport operators are a little concerned

(Continued on following page)

about your statement that you would disperse the bomber wings with two satellite fields. That is nearly tripling the number of airports. We are kind of running out of space for airports, and we want to know how those satellite airports will fit into a national airport plan and not infringe on the area of the civilian airports.

General White: With the forces presently in the program, we do not intend to disperse to any except existing military areas.

Mr. Abney: Then am I to assume that under this dispersal program there will be more military aircraft based on civilian fields?

General White: No. There will be more B-52s dispersed on military fields than are presently dispersed.

Mr. Schenk: General White, I have just learned that the aircraft manager from Truax is here and has some illuminating remarks on an earlier subject.

Mr. Skuldt: I should like to touch briefly on the runway situation at Truax Field. This morning I had the pleasure of discussing the runway situation at Truax Field, Madison, Wis., with Mr. John Ferry, who is the Special Assistant to Secretary of Air Force Quarles in charge of installations. We have had this runway situation before the Secretary of the Air Force for some time, since the present approach to Truax Field is directly over one and a half miles of heavily populated area of the city of Madison.

A year ago some other officials from the city of Madison and I came down here to meet with the Air Force and with Mr. Ferry, and we found out that money had been appropriated to extend a runway at Madison to accommodate supersonic jets. We found out, much to our dismay, that that was the same runway that was carrying the heavy traffic over the city of Madison. We pointed this out to the folks down here in the Pentagon, and they apparently saw the light. There has been some effort made, considerable effort made, on their part to attempt to extend a different runway, which is the one that Mayor Hartsfield mentioned and my boss, Mayor Nessinger of Madison, would like to see extended since it would carry the jets over an unpopulated area near the city of Madison. . . .

Only earlier this week the city of Madison held a hearing before the State Aeronautics Commission of Wisconsin, to attempt to establish a new municipal airport to serve the municipality of Madison, since we do not feel that the long-range jet use picture with the military at Madison is tenable.—END

Community Relations

COMMERCIAL AVIATION

Brig. Gen. Milton W. Arnold, USAF (Ret.)

VICE PRESIDENT, OPERATIONS, AIR TRANSPORT ASSOCIATION

General Arnold, a graduate of the US Military Academy, received his master's degree in meteorology from the California Institute of Technology. Early in World War II he pioneered the North Atlantic route for the Air Transport Command. Born in Hogansville, Ga., he now lives in Washington, D. C. He retired from military service in 1946 to become an ATA vice president, responsible for monitoring air traffic control problems.

I HAVE decided to entitle my remarks "General Rudenko and General White." This will no doubt surprise General White.

Gen. Serge Rudenko is, roughly speaking, General White's opposite number in the Red Air Force. General White and his associates have one main job: To maintain the supremacy of American military airpower. General Rudenko and his associates have one main job: To catch up with the United States Air Force.

General Rudenko, in going about his job, does not need to worry about the noise made by jets. General White does. That fact imposes an additional worry, therefore an additional handicap, upon him.

Well, that's part of the American way. I doubt that General White or anybody else would oppose the right of people to complain about a noise. That right of complaint—the right of dissent, if you will—is one of the important things that General White is charged with defending. But the rest of us ought to recognize the irony in a situation which compels the United States Air Force to defend the necessity of operating the aircraft which we want them to operate to preserve our safety.

And I think that all of us in the aviation family have an obligation to keep telling the Air Force—and the naval aviation—story: The sound of a military jet engine *is* in truth the sound of freedom and the sound of safety; and all Americans owe gratitude to their fellow countrymen who today patrol our skies so that the rest of us—and the rest of the Free World—can live.

And we should combat the notion that military aviation is by policy careless of the public comfort. Many instances could be cited in which military air units have reorganized their pattern of operations in order to cause minimum discomfort to the public. Military interest in developing

methods for vertical and short take-offs and landings promises still more improvement for the future.

But the matter of airport community relations is not exclusively a military problem. All of us in aviation share it. And the air lines of the United States have been dealing with the problem for some time. Frequently, the airlines have worked in cooperation with other elements of the aviation community. The National Air Transport Coordinating Committee in New York, headed by Admiral Charles E. Rosendahl, is an outstanding example.

Basically, the air-line problem may be summed up in two facts. The first is that to be useful to the public, airports served by air lines must be reasonably close to population centers. The second fact, experience indicates, is that airports, because of the substantial economic benefits they confer upon an area, attract population as a magnet attracts iron filings. Since airports can rarely be relocated, and since the movement of population to airport areas can rarely be prevented, the problem is to conduct operations in such a way as to cause minimum inconvenience.

And that the air lines do, or at least attempt to do. Our use of preferential runways—that is, the selection whenever possible of runways whose use will cause minimum inconvenience to residential communities—is well known to the aviation industry, although perhaps not so well known to the general public as it ought to be.

The air-line industry is equally aware of its responsibilities for the future. No American would expect that a military combat plane should sacrifice even one ounce of power in order to achieve a reduction in noise. The air lines, however, are prepared to make that sacrifice, and they deserve credit for it. Naturally, we hope that the power loss caused by the installation of noise suppressors on jet air liners will be very small. But the fact is that every air line purchaser has stipulated to the manufacturer that the jet air liners must be equipped with noise suppressors.

What success are the manufacturers having in developing suppressors? Data supplied by the Boeing Airplane Company indicate . . . that a noise suppressor now in existence reduces a 707's noise envelope to a size smaller than the noise envelope generated by a DC-7.

The 707 and the DC-7, at the point of take-off, have surprisingly different noise patterns. The 100-decibel DC-7 envelope extends out 32,000 feet from the start of the take-off roll, while the 707's 100-decibel noise envelope only projects 18,000 feet from the beginning of the runway. As the two aircraft commence to climb, the DC-7 envelope of ninety decibels of noise projects out 80,000 feet from the start of the runway, while the smaller ninety-decibel envelope of the 707 now only extends outward to 32,000 feet. It should be noted here that the 707 climb capability far exceeds that of the DC-7. Further, its speed of climb is almost twice that of the DC-7. Therefore, the noise intensity experienced by a ground observer under the 707 will be extremely brief. A reasonable approximation of the relationship between noise and distance can be stated. "Noise intensity (in terms of energy) varies inversely as the square of the distance from the source, all other factors being equal." For example, if the distance from the source is double, the new intensity would be one-fourth or only twenty-five percent of the original. I will come back to this in a moment, but it can be seen that the superior performance of our new jets will contribute materially in reducing our noise problem with our airport neighbors.

There is another promising factor concerning jet air liners—those air liners will have a much swifter rate of climb than today's piston-powered air liners. The jet air liner should be able to gain altitude very rapidly. Or, alternatively, it can, if necessary, reduce power, and hence noise, in order to cruise over a densely populated area.

The Boeing 707-120 with the J-57 engines, while climbing very well, will soon be surpassed by the 320 series, to be equipped with J-75 engines. The DC-8 series all will be equipped with the J-75 engine. With the two climb techniques I have just described, for example, if it were desired to pass over a community relatively close to the end of a runway, power could be reduced until the community had passed underneath, at which time the climb could be resumed. Another approach, if conditions permit, would be to follow the procedure described as DC-8 Steepest Climb. The planned performance for the Lockheed and Convair turboprops shows great promise for good handling characteristics.

The use of preferential runways, the avoidance of residential areas where possible, and the insistence that the jet air liner should be equipped with noise suppressors, are ways in which, operationally, the air lines are fulfilling their responsibility to airport community relations. But the problem is more than operational in nature. We are dealing also with a continuing public-relations problem: The problem of creating greater awareness—*on a factual basis*—of the airport as a community and a national asset.

Again, we have a situation that has elements of irony. On the one hand, we have a public to whom airports today are indispensable for commerce and for defense. On the other hand, we have experts who know from their own experience of the services that airports perform for communities.

We need a greater interchange between the experts and the public. The air lines, by the way, attempted to sum up some of those aspects of airport usefulness by the publication of the Air Transport Association's Airports Manual and by the production of the Association's motion picture "Mr. Withers Stops the Clock." The Association will continue to produce material bearing on airport usefulness.

But the air lines are by no means the only experts on airport usefulness. There are the airport operators and the airport executives, members of the Airport Operators Conference or of the American Association of Airport Executives. There are the experts of the Civil Aeronautics Administration. There are the members of the National Association of State Aviation Officials. There are the private flyers, as represented by the members of the Aircraft Owners and Pilots Association. And there are the operators represented by the National Business Aircraft Association. There are also the numerous aviation manufacturers and suppliers, who know a great deal about airports and have an interest in them, as well as an obligation to support them.

Such groups as I have just mentioned would be performing a useful public service by uniting to tell the story of airport usefulness. In particular, common action is needed whenever a trouble spot develops—a situation in which some airport neighbors are complaining about the airport itself.

Generally speaking, the first person to become aware of complaints about an airport function is probably the airport manager or equivalent official. Why would it not be logical for the airport official, under such circumstances, to notify the ranking Civil Aeronautics Administration official as soon as possible? Upon notification, the CAA could thereupon call upon all elements of civil aviation, as well as military, if they were involved, to study the problem and to take necessary action to bring about a solution. Use of the CAA as a coordinator is logical, because the CAA is the federal agency responsible for airports. And I can say flatly that the air lines of the United States would cooperate systematically in such joint efforts—as they have already cooperated elsewhere.

Aviation has made a mistake, however, by talking about airports only when called upon to defend them. That point

(Continued on following page)

of view frequently results in a defensive rather than an affirmative approach to the topic. With the motion picture and the publication which I mentioned earlier, the air lines have attempted to produce two tools which tell the affirmative story of airports, regardless of any particular airport situation. But the telling of the affirmative story is something that airport managements, with the support of other elements of the aviation community, should incorporate into their day-to-day operations.

Are there specific ways in which they can do this? Let's name just a few.

There is nothing new in the list of suggestions which I am about to offer. But they do serve as an example of a specific check list. I should acknowledge, by the way, that their formulation owes a great deal to the work of Admiral Rosendahl.

1. The first step is for the airport management to decide that there is to be a continuing aviation education program.

2. A second step is to enlist the support of other aviation interests in the program.

3. It makes sense to concentrate, in the initial phases of the program, on community leaders.

4. Airport tours are a good starting point. But tours should be carefully organized, so that the significance of the airport is properly spelled out. Supporting literature should be provided.

5. Courtesy flights, where feasible, are also a useful tool.

6. After a program has been started with a tour or a courtesy flight, it is important not to lose touch with the interested community leaders. A regular newsletter—on a monthly or quarterly basis—is a good way of keeping in touch.

7. It would seem to be sensible to write special letters on special problems to the list of community leaders. They are entitled to be informed of such problems, and frequently can help, if only on an informal basis, in arriving at a solution.

8. An airport can be made part of a community by offering it as a base, when facilities permit, for community events.

9. Some airports do make, and it seems probable that all airports should make, an annual report to the public. Such a report is an opportunity not only to present significant statistics but to describe the general beneficial effect of the airport on a community. Such a report would almost certainly include information on the size of the payrolls and the purchasing activities connected with the airport.

10. News stories and feature stories are, of course, a first-rate method of creating awareness of an airport's role in a community.

In looking over that list, it would appear that most of the steps suggested are obvious. But the point is that community understanding can be lost through a failure to do the obvious.

In a forum such as today's, we necessarily, I am afraid, tend to approach the question of airports from their problem aspect, we tend to view them as burdens to be borne. But we must never forget that the airport is in fact the gateway to a community's future, despite the systematic railroad attack on airports. Nor must we ever forget that the great bulk of our citizens are aware of the importance of airports to themselves and to their children. We in aviation simply have the responsibility for enabling the public to retain the confidence which it already has.

America's airports are, of course, a source of even greater annoyance to the Russians than they are to the railroads. General Rudenko would no doubt like to do away with them. But it is also a fact that in the last analysis all Americans would rather preserve their lives, their safety and their freedoms than preserve absolute quiet. Even as he goes conscientiously about the job of trying to fit military air operations into the pattern of American life with a minimum amount of inconvenience to the civilians whom those operations defend, General White can take comfort from the fact that all of us, once we understand the issues, would rather support him than assist General Rudenko.

QUESTIONS

Mr. Jones: You suggest that the airport management take an active lead in the community education program. These programs cost a lot of money, and we would like to know whether the air lines now will financially support such a program and consider it as a justifiable expense of airport operation?

Gen. Arnold: This, as an operating expense, is certainly one that could be passed on to the users of the airport, and quite properly. While we are attempting to suggest something constructive, we know it will cost you and the American public much more if we attempt to open an airport with poor public understanding.

Mr. Abney: The cooperative program which you suggested would be carried out on a local level. Where you have individual complaints, individual problems, to work on, you can't try to resolve them on a local level. Might it not be worthwhile considering pooling our efforts to attack this community relations problem on an affirmative over-all nation-wide basis?

Gen. Arnold: I think we must do both. A national unified program must be worked out if we are to continue in the jet age successfully commercially. We believe that unless we meet the noise problem face-on immediately in commercial aviation, we will not be able to successfully operate the aircraft.

Mayor Hartsfield: Can we assure our people that passenger jets now on order by the major air lines will be no more, and possibly less objectionable, than the DC-7?

Gen. Arnold: I personally feel that we can attain that level. I don't think that that is satisfactory, though. I am directing my remarks primarily toward the climb, the descent, and the landing. I think we have an additional problem which today we have not licked, in ground handling of the airplane. Today my feeling is that the noise level is a little worse than in piston aircraft.

Mayor Hartsfield: Do you think that the jet will have to be hauled into its place on the ramp?

Gen. Arnold: I think that is one of the most difficult problems that we have to face. And we are going to have to face this individually. In some places it is entirely impracticable, unless we were to cut thirty or forty percent of our traffic, because of the unavailability of taxiing and landing areas. We must accept the fact that the jet aircraft will fall into a noise level equal to or less than the piston aircraft, or we must admit today that we are not going to operate the aircraft.

Mayor Hartsfield: All of us tell our people the importance of the airport, the number of flights, the payroll. But oftentimes we are afflicted with complaints by those who claim not to be beneficiaries of that flood of money. They live in suburban areas. And now a new wrinkle has been introduced. We have a bill in the Georgia Legislature that would subject that part of our airport—and it is the major part geographically, in another county—to *ad valorem* taxes. We would be throwing them to the

(Continued on page 66)

OPERATION from -40° to +80°F

As officer in charge of the Air Section of the Army's Arctic Indoctrination School, Capt. Foy R. Ketchersid became intimately acquainted with the first Bell helicopter ever sent to Alaska.

During nine months of 1953-4, he logged over 500 hours in this 'copter, flying in the worst sort of weather with temperatures ranging from 40° below to 80° above. On one occasion he even flew with the thermometer registering -60°. The Bell, he reports, showed infinite stamina and a much better than human ability to withstand cold and adverse weather.

A bomber pilot in both Europe and the Pacific during World War II, Capt. Ketchersid returned to service with the Oklahoma National Guard at the outbreak of Korean hostilities. With over 1500 hours fixed and 1600 hours rotary-wing experience to his credit, he is a Senior Army Aviator and typical of the officers who are devoting their careers to building the strength and efficiency of Army Aviation at the Army Aviation Center, Ft. Rucker, Alabama.

Helicopter flight and mechanical training are available to qualifed personnel at the U. S. Army Aviation School, Ft. Rucker, Alabama.

BELL Helicopter CORP.

FT. WORTH, TEXAS

Subsidiary of Bell Aircraft Corp.

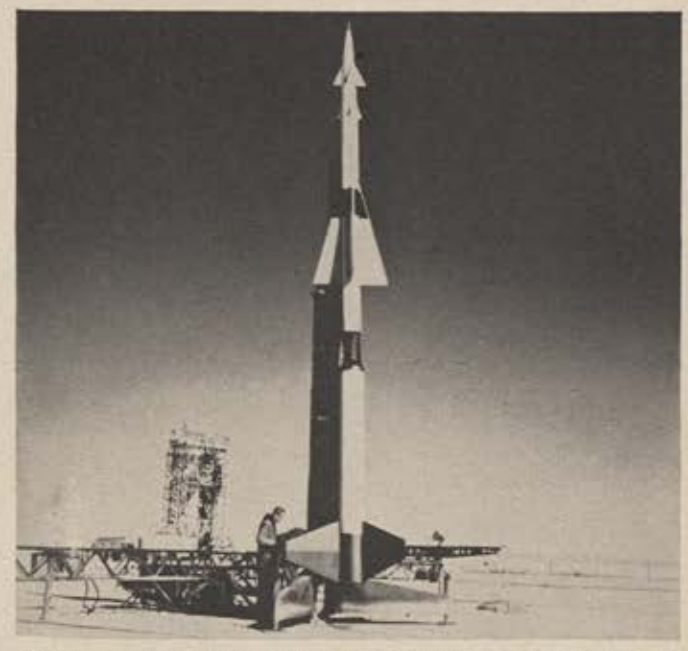
The first men on the moon

What Douglas engineers are doing to make it possible!

Space travel, a dream five years ago, is now so near reality that lunar landings are predicted by the end of this century.

This is hastened by knowledge being gained in *present* and *practical* research. For instance, when Douglas engineers find new ways for fliers to survive high gravitational pulls at supersonic speeds, they also help some future pilot survive the blast-off of a moon-bound rocket. And current studies on heat dispersion, aimed at getting an intercontinental missile back into our atmosphere without air friction burning it up, will apply to the problem of returning a space ship safely to earth.

With the possibility of interplanetary flight accepted by engineers, man now looks to outer space and is speculating on new power sources needed to get him there. A predicted break-through is the plasma engine, which will harness ions or light itself to drive aircraft nearly 186,000 miles per second.



At Douglas, a Missiles Division with the longest history in its field, is building rockets and missiles for military use. Nike Ajax (above) is already guarding principal cities, and soon the more potent Nike Hercules will be ready to take over these assignments. Thor, an intermediate range ballistics missile, is undergoing tests, and on the classified list are many other out-of-this-world projects in engineering, design and construction.

Depend on

DOUGLAS

first in Aviation

wolves of taxation, which we think will endanger future revenue certificates and federal aid.

Now, those people are in another county. They don't derive those benefits we are talking about. Also they are the type of people who need education.

And may I say that one of our problems is that we are often educating ourselves. We need to educate a class of people who don't know who General White and General Rudenko are. All they know is that something is keeping them from sleeping at night, and they are mad about it.

Don't you think that this problem is of enough seriousness for the federal government, through its different branches, to undertake a campaign of national education that will reach all these people, and not expect the individual airport, already plagued with the problems of airport expansion, and additional money, to do that?

Gen. Arnold: That is true. But I don't think we are going to escape the problem that you mentioned rather casually, that as a local official you must stand for election.

In the same way we feel we are somewhat on the firing line; namely, we are the people who make the noise. And we feel we have to join in and take the maximum responsibility. And we are suggesting here a coordination of the federal government under the CAA. But I think, in all fairness, the air lines and the air operators and the other users of the airport are the people who must face the public and explain it to them and take those proper procedures which will improve the situation.

From the floor: If the Air Transport Association were to loan its crystal ball to the Air Force, would the Air Force also see a noise suppressor in the immediate future?

Gen. Arnold: That is primarily a problem that is up to the Air Force. But our present concern is that the noise suppressor naturally decreases your power and the efficiency of the airplane. If you are trying to get every ounce of additional power out of the airplane from the standpoint of military utilization, you are counteracting that. Certainly on some flights there is the possibility that it could be used.

Sam Freeman (National Aviation Trades Association): One other problem seems to be beginning to plague us a little bit, and that is this sonic boom business. We had a pretty good example of it in a nearby area to New York, which busted a bunch of windows and caused some damage. I hope we can get some assurance from the Air Force that they are aware of this problem and can do their acceleration to the speed of sound somewhere other than over populated areas.

And I would like to get some assurance as to the effect of these sonic booms on rather small aircraft in flight. Are we apt to have the problem of having an aircraft hit the sonic barrier somewhere near a small airplane and literally knock it out of the air?

Gen. Arnold: The Air Force can probably give considerably more information, but for the reason you hit upon we have been interested in this problem for over two years. The NACA has a very active project on just this point. I do know the Air Force—and it can go into more detail—has rather elaborate procedures on the sonic boom problem—or going through the barrier.

The other point is one which we are concerned with, as you are; namely, the possible injury or damage to aircraft in flight in the vicinity of the sonic boom.

So far, the reports of the NACA and the Air Force reports have shown that it is practically impossible to consider that it will be of any damage. That project is quite active in NACA.

Mayor Hartsfield: Is there any possibility of some use of noise suppression on military planes that could be used in practice work in peacetime and quickly dispensed with in war, when people will stand anything?

Gen. Arnold: I have seen some developments which the Air Force is using today which promise something toward this same thing you are speaking of. There is very little loss of power. This is undergoing test; and, like anything that first starts out, it looks very successful.

At the present time I think it has had about a six months' test.

The problem is whether it will cut fifteen or twenty decibels off, and how much power will be lost under the runway conditions.—END

Community Relations

GENERAL AVIATION

Dr. Leslie A. Bryan

DIRECTOR, INSTITUTE OF AVIATION,
UNIVERSITY OF ILLINOIS

THE PAST year has been a year of gratifying maturity for general aviation. Not maturity in the sense of having achieved adulthood as far as numbers and usefulness is concerned, though there was notable production and utilization of general aviation aircraft—about 7,500 last year and general aviation flying of perhaps 10,000,000 hours for the year. But rather maturity in the sense of cooperative relationships directed to the end of the mutual growth and development of all aviation. General aviation,

(Continued on page 69)

Message from Melbourne

A recent short-wave broadcast from Melbourne, Australia . . . received in Syracuse, N. Y. (over 10,000 air miles) **with no perceptible flutter or fading** . . . is further proof that General Electric's new radio technique . . . Synchronous Amplitude Modulation*. . . is the solution to the problems of long-range radio operations. Its concept and operation are uniquely simple . . . SAM* is compatible with all present forms of radio equipment . . . its operators need no further specialized training . . . yet it preserves complex wave forms even while handling the Doppler effect. Its suppressed-carrier, double-sideband transmission and synchronous reception promise significant savings in weight and cost. Of paramount importance is SAM's* resistance to jamming and interference. Here again, is a vivid example of LMEE's invaluable contribution to progress . . . in furthering new uses for electronics.

For the very latest information on SAM* . . . write Section A

LMEE

Aviation Electronics Products Include:

WEAPONS CONTROL RADAR • SEARCH RADAR • INDICATORS AND DISPLAY • COUNTERMEASURES • NAVIGATION
MISSILE CONTROL • AIRBORNE SONAR • COMMUNICATIONS • FUZES • AUTOMATIC TEST • DATA PROCESSING

Progress Is Our Most Important Product

GENERAL ELECTRIC

LIGHT MILITARY ELECTRONIC EQUIPMENT DEPARTMENT
FRENCH ROAD, UTICA, NEW YORK

Laredo AFB crew replacing a J35 engine in a T33 trainer.

Aeroquip Self-Sealing Couplings Help Crack Crew Change Jet Engine in 6 Minutes

Aeroquip Self-Sealing Couplings speed disconnection of hydraulic lines in removal of the engine.

Close teamwork of the 6-man crew enables them to set an unofficial world's record for engine change.

A complete jet engine change in 6 minutes, 55 seconds! That's the record set recently by a six-man team of skilled mechanics at Laredo Air Force Base, Texas, replacing an Allison J-35 engine in a T-33 Jet Trainer.

Helping to cut changeover time were Aeroquip Self-Sealing Couplings installed on three main hydraulic lines. These lines were disconnected quickly without fluid loss . . . then reconnected in seconds, without air entering the hydraulic system.

Fast-acting Aeroquip Self-Sealing Couplings speed maintenance, reduce ground time.

A complete line of Aeroquip Hoses and Reusable Fittings for all air frame and engine applications also help speed replacement of aircraft hose assemblies. Please write for complete information.

Aeroquip Series 155 and 145 Self-Sealing Coupling meet the requirements of MIL-C-5502 (AN-C-656).

Aeroquip

REG. TRADEMARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

AEROQUIP CORPORATION, WESTERN DIVISION, BURBANK, CALIFORNIA

AEROQUIP (CANADA) LTD., TORONTO 10, ONTARIO

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD—AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

by definition, includes all segments of aviation except commercial air line air transportation and military aviation.

One of my academic friends, in all seriousness, asked me the other day, "What else is there?" It's a reasonable question.

At the risk of boring you I think it desirable to take a minute to list again the various aviation segments that are normally thought of as being parts of general aviation. Included in general aviation are flying for agriculture and business; charter and other for-hire flying; flight instruction; and flying for non-business purposes such as for pleasure and sport. It all adds up to a lot of activity. But how much is a lot, and similar questions, became embarrassing questions when early last year general aviation suddenly found that it just did not have all the facts necessary to pass on to Mr. Edward P. Curtis, Special Assistant for Aviation Facilities Planning to President Eisenhower. Everybody had some ideas and some facts but nobody had all the facts. Some facts seemed available but were questionable.

In other cases alleged facts simply did not agree and often for good reason. For instance, the state numerical surveys of their airports in some cases were at glaring odds with those of the CAA. A little checking showed some differences in definition, but the main problem seemed to be a lag in changing the records of CAA. This is in no sense a criticism of CAA. It only states the situation as it was found to be and an explanation of why the discrepancy existed.

Faced, therefore, with the need for the facts so that a defensible projection for the future could be made as a help to the planning which Mr. Curtis must produce for the President, the General Aviation Facilities Planning Group was formed. This group is composed of eleven presently existing organizations. They are: Aeronautical Training Society; Aircraft Owners and Pilots Association; American Association of Airport Executives; Aviation Distributors and Manufacturers Association; Flying Physicians Association; National Association of State Aviation Officials; National Aviation Trades Association; National Business Aircraft Association; National Flying Farmers Association; National Pilots Association; and Utility Airplane Council of the Aircraft Industry Association.

Representatives of these groups met and (1) agreed to pool all their knowledge and factual resources that might be helpful in ascertaining the facts of general aviation; (2) appointed an executive committee whose primary job was liaison with Mr. Curtis and his organization to the end of being the most help possible; (3) agreed upon the retention of the management consulting firm of Booz, Allen, and Hamilton to provide the technical assistance necessary; and (4) set up the machinery for financing. All these things are in addition to the many and useful activities of those eleven groups in their specialized aviation endeavors.

The maturity of general aviation to which I referred earlier becomes evident when it is further noted that the representatives of the group early agreed that the technical advisors should determine the facts without bias, and that those facts should be reported to Mr. Curtis without pressure for his use in making his report and recommendations. The group further agreed that the facts uncovered should remain confidential until his report is issued. The group has every confidence that Mr. Curtis with his staff will give proper weight to the now established facts of general aviation as they plan for the future.

At the present time, I do not know the final results of the general aviation survey and could not give them to you if I did. Doing so would make Mr. Curtis's responsibility more difficult. I can tell you, however, of what Booz, Allen, and Hamilton were asked to find out and something of the methods used to determine the facts.

The first question to which the answer was sought was, "What is general aviation today?" This means numbers, types, and purposes of the general aviation aircraft in use, their equipment, their owners, and the pilots' qualifications. It means also the present usage of aircraft, the amount of night flying, altitudes flown, and the effect of weather. Especially important and needed were the questions of the present pattern of local general aviation flying at hub and non-hub areas, the amount of itinerant operation at such areas, as well as the flying activity in the airspace between the hub areas.

Answers to such questions required lots of data. This was obtained by several methods. The first of these was the Aircraft Owners Survey, which was done by mail using a comprehensive data sheet of seventeen questions. When completed, the questionnaire folded into a prepaid self-addressed return envelope. The questions concerned ownership, aircraft, pilot, and operational data. A covering letter told the why and wherefore of the questionnaire. The data returned from this survey was tested and found statistically sound. A field survey was made of manufacturers of airframes, engines, and equipment and conferences were held with trade association officials, the CAA staff, and others for the purpose of gathering all information which was relevant to the general aviation picture.

The Airport Data Record Survey and the Aircraft Operation Survey were unique in the history of surveys as well as unique in the history of aviation. These surveys were done together on October 26-27, 1956—a period of forty-eight hours.

During this period at some 900 airports throughout the United States about 1,000 interviewers questioned every general aviation pilot taking off or landing at each airport. The airports were selected on a scientific sampling basis. The weather cooperated by being beautiful in Chicago and practically non-flyable in Philadelphia, for instance. Thus, there was a well-balanced picture from the weather viewpoint. Something over 100,000 interviews were obtained so that a statistical picture of general aviation ac-

(Continued on following page)

In addition to being Director of the Institute of Aviation at the University of Illinois, Dr. Bryan is chairman of the Executive Committee of the General Aviation Facilities Planning Group. Born in 1900, in Bath, N. Y., he received his bachelor's degree from Syracuse University, and his M.S., LL.B., and Ph.D. degrees from American University in Washington, D. C. In World War I he served in the Air Corps and was overseas in 1918-19. In World War II, as the operator of an Army contract school, he trained more than 8,000 pilots. He is now active as a colonel in the Air Force Reserve. He has been in his present position at the University of Illinois, where he is also a professor of management, since 1946. In 1945 he was Director of Aeronautics for New York state, and was president of the National Aviation Education Council in 1952-53. He has also been active in the University Aviation Association, the American Association of Airport Executives, the National Air Council, and the Institute of the Aeronautical Sciences.

---

tivities as well as airport data were obtained. It was a most amazing example of unselfish cooperation and excellent organization of the state aviation officials, the Civil Air Patrol, the airport operators, aviation clubs, and similar groups. It was an honest job, well-done, and statistically completely acceptable.

The next step was the putting of the information on cards for machine tabulation. From these cards came the numerical picture of the aircraft in use, their performance characteristics, who owns them, what they are used for, the equipment carried, as well as the pilots and their qualifications.

Likewise from the cards it was possible to find the operating patterns of a general aviation aircraft—the time of day it flies, where it goes, and its seasonal changes; the character of local flying; and the cross-country flying pattern. Information on these matters is detailed. For instance, from such records one can tell the number of general aviation aircraft in the air at three o'clock Saturday afternoon, October 27, in the Chicago area, or what the usual cruising altitude of flights between Indianapolis and Chicago was, and similar information.

On such a solid picture of the present, it is possible to project a reasonably accurate picture of the growth and development of general aviation during the next twenty years. Knowing the probable growth and the resulting needs, it is feasible to make the best possible plans for handling such traffic safely in the air and on the ground and with the least confusion. Such information makes it possible to fit general aviation into the over-all planning for the whole aviation picture with fairness and justice to the other two great segments of aviation—the air lines and the military.

As I see it, general aviation can now be forecast with reasonable certainty twenty years hence, as to numbers of aircraft, their purpose, and their characteristics. Similarly the qualifications of the pilots, the pattern of flying, the effect of weather, time of day, seasonal and other pertinent items can be projected with the best possible accuracy. I am sure that neither the verified facts of the present nor the projections for the future will be a great surprise to many of us in aviation. But I am most pleased that the diverse segments of general aviation have gotten together to provide the most complete picture of general aviation yet produced. That is the outstanding event in general aviation during the past year which for all of aviation has been, in many respects, the best year yet.

Now as to the community impacts of general aviation during the past year. They have not changed much. The three-pronged political, social, and economic effects of developing aviation of all categories are still with us. Problems of growth and the attendant adjustments still are causing some headaches. However, the typical social results of an expanding aviation economy are slowly evolving. The out-of-the-way locality with previously undeveloped resources is growing proportionally as the business aircraft connects it with the outside world. Similarly, the configuration of cities is changing as the result of the demands both for more and larger terminal-type airports and the need for the general aviation landing and servicing areas.

Especially during the past year has there been a renewed emphasis on the need for more and better non-air-line airports to serve the general aviation traveler. The demand for these is getting greater, and the growing realization of the need on the part of the public officials concerned is notable. Small strip and helicopter pad development, in connection with the many large highway projects present and projected, is being seriously considered. Foresight on this type of development is a prime need. So, too, is the planning need for adjacent-to-the-factory flight strips to aid the business aviation traveler. The increasing decentralization of large corporations and the many acquisitions of subsidiaries in being both point the need for more and more convenient general aviation airports.

So, in summary, during the year community impact of general aviation hasn't changed much, but we still need farsighted planning and a continued campaign of aviation education to keep all those not connected directly with aviation abreast of our community aviation needs. To that end, general aviation made great strides in gathering the facts upon which to base further planning for at least the next twenty years.

QUESTIONS

Mr. Abney: Do you believe that business flying, which is one of the bigger and more rapidly growing segments of the aviation picture, will be detrimental to the air lines?

Dr. Bryan: No. On the contrary, I think that it is helpful to the air lines. Actually, the air lines are hitting approximately five hundred cities in the United States, and we have another three or four thousand airports that that can take business aircraft. As executives use a company plane, they tend to recognize the economy as far as time-saving and lack of fatigue are concerned. They want time-saving for their junior executives and so forth and thus encourage air line traveling. In fact, Mr. Patterson of United Air Lines recently said that in his opinion the increasing growth of business travel, from four to seven million hours last year, was helpful to his air line.

Mr. Stell: Has the General Aviation Facilities Planning Group done anything, or are they planning to do anything, as far as general aviation is concerned, in connection with civil defense, as to ground observers or evacuation?

Dr. Bryan: That will be an element in our letter of transmittal to Mr. Curtis.

Mr. Webster (Purdue University): I would like to answer Mr. Abney's question about the effect on the scheduled carrier of business aircraft.

We operate two DC-3s in connection with the University, operating with some hundred-odd institutions and businesses in the Midwest. We have made checks from time to time, and over fifty percent of our passengers had never been in any kind of a scheduled air transport operation up to the time they first took that trip.

Mr. Jones: Do you think the people who are actually flying the general aviation aircraft recognize the financial responsibilities that are going to be inherent in the development of facilities for them?

Dr. Bryan: In other words, you are worried about the fellow who comes into your airport and does not get the service he wants, and you are wondering if he is aware of the amount of money it takes to run an airport.

I think the general business flying which uses co-pilots, DC-3s, Convairs, Lockheeds, that sort of aviation, general business flying, does appreciate the amount of money that goes into an airport and the overhead expense that is necessary to do all the things required to make an airport attractive. I think the smaller aircraft, the training aircraft, and the instructional aircraft, possibly do not.

Mayor Hartsfield: Don't you think if a part of your report could encompass what the people think about general aviation, it would be well? What do these people think about it who live near airports?

Dr. Bryan: That was not a part of the job which was assigned to general aviation, and it is being taken care of by other activities in Mr. Curtis's office. So it will come up for consideration.—END

Community Relations

AVIATION INDUSTRY

Gen. Joseph T. McNarney, USAF (Ret.)
PRESIDENT, CONVAIR DIVISION, GENERAL DYNAMICS CORP.

General McNarney became Convair president in 1952 after more than thirty-eight years of military service, including combat in both WW I and WW II. A West Point graduate, he flew with the First Aero Squadron in WW I, and in WW II was Supreme Allied Commander, Mediterranean Theater. After the war he was Commander-in-Chief, US Forces of Occupation in Germany, and was later commanding general of the Air Materiel Command.

THE JOB of building our twelve-mile-high fences against aerial attack was handed to the country's youngest military organization—the tri-service Continental Air Defense Command.

You are all familiar, I am sure, with ConAD's problems in welding its three components—the Army Anti-Aircraft Command, the Naval Force for ConAD, and the Air Defense Command—into an air-defense team.

Close liaison is maintained with the Canadian Air Defense Command, and ConAD now has assumed operational control of the air-defense mission in the Alaskan and Northeast areas. Tied in with these forces are the early-warning radar outposts that stretch concentrically far to the north, east, and west, giving ConAD the vision it needs to fly—and to fight if necessary.

Naturally, the construction of these far-flung fences has not been accomplished without some misunderstandings, annoyances, and inconveniences in local communities.

It is here—in the backyards of towns and cities across the land—that another kind of fence sometimes is erected, a fence built by a community against the very men who are there to protect it.

Just the other day, the United Press told of a dilemma that is giving the Air Force "a multi-billion-dollar headache."

The headache, according to this article, came from ear-splitting jet noise and the sonic booms synonymous with our new jet age. Bluntly, the article stated that "the only cure seems for the Air Force to spend billions of dollars—which it does not want to do—or to receive greater public understanding—which it covets."

The article said increasing complaints of noise and damage are reaching Congress and causing concern in the Air Force. Air Force Undersecretary James H. Douglas was quoted as reporting to Defense Secretary Charles E. Wilson that it would cost the government billions for sites alone, were ConAD to relocate fighter and interceptor bases away from populous centers. Such a costly step could alleviate the situation only temporarily, as new towns invariably spring up around a new military base, Mr. Douglas pointed out.

The high performance of today's jet aircraft depends upon the noise-generating power of their engines. There seems no effective way of silencing the noise without impairing efficiency. Thus, the article concluded, the Air Force has one alternative: Wider understanding to convince the public that noise, while distasteful, is a necessary companion to effective national defense.

How to achieve this wider understanding is what concerns us here today. And because Convair, the builder of one of these new jets, since last March has been deeply involved in a cooperative Air Force-industry-community-relations program, I'd like to tell you something about it. We and the Air Force believe the program is proving itself out.

Early in 1956, as the time drew near for delivery of Convair's first F-102A all-weather supersonic jet interceptors to ConAD squadrons, our company, at the suggestion of ConAD, went to work on a cooperative public-relations program to accompany introduction of this new aircraft. With such a program we hoped to help counteract community resistance we believed was likely to develop with the arrival of 102s at interceptor bases.

Actually, our thinking about the problem was stimulated long before this. We are familiar with earlier community relations work, such as that instigated for the Strategic Air Command by Gen. Curtis E. LeMay at Omaha, and the so-called "Madison Story" in which Col. Harry Shoup, as commanding officer of ConAD's Truax Field, played such a dynamic role. In what has since become known as the "Shotgun Wedding," Colonel Shoup met Madisonians' complaints about jet operations head-on, and at every opportunity explained the Air Force's problems and purposes directly to the community's residents.

Other aircraft companies—North American with its "Twenty-Four-Hour Alert" movie, and Lockheed with a motion picture for ADC on the ground controller—also had helped further public understanding of Air Force functions.

While these and other community-relations activities did essentially what they were designed to do, we felt that Convair's case required a more comprehensive public-relations program. For this there were two compelling reasons.

First, as a major supplier of one of the Air Force's newest pieces of complex and costly equipment—large numbers of supersonic interceptor aircraft—we and the Air Force had a common interest in achieving maximum acceptance of this new aircraft.

The 102 was Convair's first venture into the highly specialized field of manufacturing fighter-type aircraft. Admittedly, we were better known to the Air Force as a builder of transports, bombers, missiles, seaplanes, and trainers. To fighter pilots we had to prove we also were a fighter company. This, if you like, was our selfish motive.

Second, we knew that with the advent of jet-powered fighter and interceptor aircraft the Air Force had been asked to leave many communities across the country. Some of these communities—or at least some highly vocal

(Continued on following page)

residents of those communities—felt an unreasonable nuisance was being imposed upon them. We also knew that introduction of the more powerful and supersonic 102 might aggravate this situation, where it already existed, or set off new opposition in communities in which no organized opposition to jet aircraft bases had developed up to now.

So we worked out with the top personnel at ConAD headquarters an extensive program of community-relations activities to accompany introduction of the 102.

This program assumed first that if a young officer is asked to take off in an aircraft that climbs into the stratosphere so steeply the pilot's feet are above his head, this pilot must have not only complete confidence in his aircraft but also in who builds it.

The program also assumed, as the Air Force already had learned, that for the present little could be done technologically to alleviate the noise situation. More power—better performance—more noise.

Still another assumption was that if there were antagonisms toward ConAD in any of the communities in which its squadrons were now or would be based in the future, these antagonisms sprang largely from a failure of these communities to understand why these men in blue and their noisy jets had selected this particular spot from which to operate. We could not eliminate the noise but we might create understanding and tolerance for it.

We reasoned that lack of understanding, where it existed, could best be overcome by an informed community leadership—by the respected leaders to whom the community looked for guidance and whose opinions the majority of the residents mirrored.

If we and the Air Force could give these key community leaders an understanding of what the Continental Air Defense Command was doing and how their local communities fitted into the over-all air-defense picture—if we could show these leaders why all this was necessary—then with their support and help we could spread the story to an entire community. As more and more communities were won over, we could attain some measure of national acceptance.

If the program were well planned and skillfully executed, we were confident it would turn such hostility as we might encounter into cooperation; nuisance into necessity; antagonism toward base and squadron personnel into friendly camaraderie; and irritation into proud identification with the offending aircraft, the squadron members, and the mission.

As Col. Victor Milner, director of tactical evaluations at ConAD headquarters, has told many community leaders during orientation visits to Colorado Springs: "That little first lieutenant, who takes off from the airbase in your town at three a.m. during a storm and goes up to identify an unknown aircraft, has more responsibility on his shoulders than any military commander ever has had in the history of warfare. In a couple of minutes he must make a decision on which millions of lives and billions of dollars depend. He needs all the help that he can get, particularly from the people of his own town."

I referred a moment ago to fighter pilots, and here I want to point out another underlying educational problem ConAD and we had to face. This was the necessity for ConAD to indoctrinate its personnel as thoroughly as possible in the changing nature of the air-defense mission and the complex new airplane designed to help carry that mission out. "To defend the United States against air attack!" This always has been the simple, straightforward definition of ConAD's job.

But it takes an entirely different kind of plane to do this today than it did just a few years ago, when the measure of a good fighter or interceptor was how fast would it fly, how aerobatic and maneuverable it was, and how superior it was to the enemy's in firepower.

The pilot trained in that older school flew and fought with his own eyes. Aircraft were slower then, and armament was built for close-quarter and visual combat. But greatly increased aircraft speeds and higher altitude capabilities have changed the air-defense mission. As the pilot's mission has changed, so has his equipment. Today he is an interceptor of atomic attack against the community in which he lives.

As an interceptor, he has to be able to find the enemy aircraft without fail, even if hidden by darkness or overcast. To do this the interceptor pilot has had to relinquish some of his "tiger" roles to guiding electronic "black boxes." Some of his sharpshooting skill has given way to guided missiles that supersonically seek out and destroy with their own internal "brains" a target he may never have seen with his own eyes. In short, there has had to be an *emotional* acceptance of the interceptor mission and of the 102 by the men who fly this aircraft.

The cooperative ConAD-ADC-Convair program for introduction of the F-102s initially provided for twenty-three sequential activities, each calculated to reach a particular audience at a particular time in the activation period. Not a rigid program, it has been altered to jibe with experience gained in actual operation.

Of primary interest has been what we called the Direct Contact Group—the people who live in communities immediately adjacent to F-102 bases. In the seven communities with which we've worked so far, we've made a fortunate discovery. Most residents of these cities and towns understood and had become more or less familiar with jet operations.

But while the community opposition appeared to be far less severe than we had anticipated, ConAD and we knew that such opposition easily could develop if no attempt were made to explain to the community why the new and more powerful aircraft made more noise than the aircraft to which the community had become accustomed.

Timing has been most important in planning and execution of the 102 introduction program. The program is divided into four broad phases.

Phase One, devoted to preparing the community for arrival of the new aircraft, begins several weeks before the first 102 arrives at a squadron. We strive for the psychological moment—when the community first becomes aware that something new is to be in the air.

Cooperating with the base commander and his information services people, we send a team of Convair community-relations specialists into the town with publicity material. This material provides background on the base, its officers, and history, on the 102, its mission, its capability, and its design features.

Thus, well in advance of the arrival of the first 102 at the base, the area's newspapers, radio stations, and television broadcasters have at their fingertips a wealth of information and photographs on which to base their coverage of the news that is to come.

Window displays, models, and other graphic materials are provided for banks, stores, libraries, and other public gathering places.

Probably the most effective community-relations device in the entire program is the Phase Two activity: An orientation tour to ConAD headquarters at Colorado

(Continued on page 75)

Will today's defense dollars buy you "mail-by-missile" tomorrow?

A relentless scientific quest is underway today in the secrecy of America's laboratories and proving grounds. The object: to enable missiles to safely "reenter" the earth's atmosphere before searing supersonic heats reduce them to dust. The problem is doubly important—while missiles serve America's defense today, their real future might well be to serve man peacefully—as super-fast mail carriers, for instance, that span continents and circle the globe in minutes.

The impetus of military research programs has generated important progress in this quest. Recent Avco research achievements—in thermodynamics, metallurgy, advanced electronics and inertial guidance, in all the sciences that figure prominently in "re-entry"—create hope for a prompt, decisive solution.

Through such experiments as these, America stands to gain over and over again from its investment in defense. For as science forges defense strength, it lays the groundwork for a nation prosperous in peace.

FOR A COPY OF THIS WEIMER PURSELL ILLUSTRATION, SUITABLE FOR FRAMING, WRITE TO PUBLIC RELATIONS DEPT., AVCO MANUFACTURING CORPORATION, CROSLEY DIVISION, 1329 ARLINGTON ST., CINCINNATI 25, OHIO

avco | Crosley

defense and industrial products

"DEFENSE DOLLARS DELIVER TWICE," *says* Lt. Gen. James M. Gavin, *Chief, Army Research and Development* "For each military application of new scientific discoveries there are many parallel developments for peaceful use to improve the health, comfort and well-being of present and future generations."

Avco's defense and industrial products combine the scientific and engineering skills, and production facilities of three great divisions of Avco: Crosley; Lycoming; Research and Advanced Development —to produce power plants, electronics, airframe structures, missiles, and precision parts.

TODAY'S MILITARY SERVICES, WITH THEIR TREMENDOUS TECHNOLOGICAL ADVANCES MADE POSSIBLE THROUGH SCIENCE, OFFER A VITAL, REWARDING CAREER.

ALLISON POWERS

Navy's fastest All-Weather fighter

—THE McDONNELL DEMON

Fast carrier task forces of the new Air Navy stand guard 24 hours every day on the seas of the free world—75% of the earth's surface. Key weapon in this vital mission is the Navy's fastest all-weather fighter-interceptor, the McDonnell F3H Demon. The Allison-powered Demon has proved that it's ready for action in any weather, day or night.

A single Allison J71 Turbo-Jet, producing more than 10,000 pounds thrust, gives the Demon speeds of over 600 mph to engage enemy aircraft at high altitude. Allison engines are designed and built by America's pioneer producer of turbine aircraft engines.

ALLISON DIVISION OF GENERAL MOTORS—Indianapolis, Indiana

ALLISON *Prop-Jets and Turbo-Jets*

GM GENERAL MOTORS AIRCRAFT POWER

Springs and then to Southern California for a visit at Convair's plant in San Diego. General White touched on this, but I would like to give a little more documentation.

This tour usually involves twenty-five to forty leading men and women from the squadron area—mayors, county supervisors, school superintendents, college administrators, bankers, lawyers, civic club presidents, Farm Bureau leaders, ministers—a cross-section of the key individuals whose influence on community attitudes and viewpoints is well known. Tour participants are selected by the base commander, for it is he who knows best who *are* the community's opinion leaders.

Usually, several of the top squadron, air base, or air division headquarters personnel accompany the civilians on the trip, made in military transports. On this three-day trip civilians and military leaders invariably become better acquainted with each other.

At Colorado Springs, these influential persons are given a thorough briefing on the operation of ConAD and its air component, the Air Defense Command. They learn what its mission is and what ADC squadrons do to try to alleviate operational noise in areas adjacent to the base.

The visitors then are flown to San Diego for more briefings on the 102, its place in the ADC mission, how it was designed, and how it is produced. They are taken on tours of Convair's development, test, and manufacturing facilities. They watch these complex aircraft being precision-built and tested, and from this experience gain insight into why these planes represent an investment of millions of tax dollars.

Phase Three, aimed at creating public kinship with the base, the ADC, and with the 102, is set in motion at the time the squadron becomes fully equipped with the new aircraft.

To signal activation of the first squadron at George Air Force Base, Calif., Convair and ConAD planned an open house and Pageant of Air Progress—an air show tracing the evolution of fighter-type aircraft from World War I to the present. On a hot California Sunday in September, more than 50,000 spectators converged on that Mojave Desert air base to watch the show and the 327th Fighter-Interceptor Squadron's dramatic demonstration of what their new delta-wing aircraft could do.

That show will not be quickly forgotten in Southern California. It attracted local, regional, and national news and television coverage. In fact, it was so successful the second 102 squadron, the 11th Fighter-Interceptor Squadron at Duluth, Minn., promptly scheduled a two-day open house and Pageant of Air Progress air show for October 28-29. Another 50,000 attendance mark was recorded at Duluth. Traffic on highways leading to the municipal airport was the heaviest in Duluth history.

While undeniably effective in spreading the ConAD gospel, these air shows are costly undertakings. The opportunity for national news coverage justified the considerable extra effort involved in the public events at the first two 102 bases, but Phase Three events at subsequently activated bases have had to be less ambitious.

Several bases have held public open houses after receiving their quotas of 102 aircraft. In all of these undertakings we have given the bases every assistance we could. The public drawing power of such activities can be measured by the experience at the little Michigan resort town of Oscoda, where Wurtsmith Air Force Base was host to 7,500 visitors at a January 19 open house, despite subfreezing weather. Oscoda's winter population is 1,500.

Phase Four—the follow-up part of the F-102 introduction program—includes get-togethers for officers and enlisted personnel at the bases; presentations of scrapbooks, photographs, and other mementos of the activation to the base personnel and civilians instrumental in Phases One and Two; and dissemination of news about the squadron locally and throughout ConAD. Tour participants, equipped with plenty of background material, are encouraged to speak to local civic and veterans organizations—to tell what they have learned to any audience that will listen.

There are many other facets of the program—indeed too many to enumerate here. However, a couple are worthy of special mention. To help explain ConAD's military objectives and tell why supersonic Century Series aircraft are noisier than earlier jets, Convair produced a twenty-two-minute sound-and-color motion picture, entitled "The New Sound of Freedom." This film is being distributed to ConAD bases, divisions, air-defense forces, and Air Force schools for public showings. Already the film has been screened for hundreds of audiences throughout the country and is proving an effective tool for broadening public understanding.

This Sunday, ConAD's mission and an alert scramble will be further dramatized for millions of television viewers on the NBC network's "Wide Wide World" show, originating live from George Air Force Base near Victorville, Calif. A TV cameraman, riding the second seat of a two-place TF-102 combat trainer, will follow an F-102 from take-off to high-altitude intercept and will attempt to telecast for the first time an aircraft going through Mach one.

Through such promotional devices as I have described, the delta wing is fast becoming a significant shape in the minds of the people, as well as in the skies over the land. For this we are grateful, for we believe this is justification of our designers' faith that such a triangular wing provides the stable platform the Air Force needs today for high speeds at high altitudes, as well as low speeds at low altitudes.

The 102 itself has made our task of community orientation easier. This aircraft has proved a persuasive salesman for Convair as a fighter builder, and for ConAD as a vital and dramatic element of the nation's military resources. Any anxieties we may have had about fighter pilot acceptance of a semi-automatic aircraft like the 102 have been dispelled by the reactions of the men who have flown it.

What have we accomplished so far with this cooperative 102 introduction program? Probably it is too early to say, with complete assurance. But the signs are encouraging that its basic philosophy is sound, that it is indeed helping to bring the communities closer to the squadrons defending them. I'd like to read from a few of these communications.

From the Madison area, Lt. Col. Margaret Steele, ISO officer for the 37th Air Division at Truax Field, reported the base has had no complaints since the 102s arrived, although the flight pattern sometimes is directly over the town and the Wisconsin state capitol. Madison's mayor, in a television "Report to the People," predicted that while the 102s may seem noisier than the jets the townspeople have been accustomed to, the 102s climb away so much faster the town will find the noise less objectionable.

And a weekly publisher from Madison, writing of his 4,800-mile orientation trip, told his readers that "objection to Truax Field's present location, to its effect upon property values, to the influence it will have on Madison's future development, to the dangers of accident, to the noises of the jets, dwindle to near nothingness in comparison with the high purposes to which the field is dedicated. The least the citizens of the area can do is to give their

(Continued on following page)

greatest possible cooperation to the successful operation of the base. . . . Should M-Day ever come to Madison, about the sweetest music one could hope for would be that of fifty F-102As taking off to meet the challenge."

At Tacoma, Wash., an editorial in the *Sunday News-Tribune and Ledger* commented: "The new supersonic jets soon to begin their flight over Western Washington and Oregon will bring with them a new sound as well as a new look in air defense. It is all part of a carefully planned program for safeguarding our coastal areas from attack."

And a Tacoma Air Force officer wrote: "Our F-102s have been flying daily and almost nightly, and the 317th Fighter-Interceptor Squadron even put on a small air show for squadron personnel last weekend, with the result of only one noise complaint. (I can remember receiving forty calls in just one afternoon.)"

Speaking of the Pageant of Air Progress show put on at Duluth, Minn., Jim Dan Hill, president of Wisconsin State College and a general in the US National Guard, inactive, said, "The tremendous turnout and widespread interest . . . transcends anything I have seen in a non-shooting era of so-called peace. It was a marvelous performance. The good will, the interest, the sense of pride, and the feeling they were getting their money's worth for defense, represent good will assets to which no money value can be attached."

To me the most reassuring part of the spontaneous response to the program has been the obvious sense of team cooperation with which these people have become imbued. They actually see themselves as a vital part of the air-defense team. This personal identification with the national defense effort and its newest weapons has made missionaries of them—missionaries for the Air Force. In these United States, if you have a real problem and you honestly and straightforwardly convey understanding of that problem to a community, we've found you will get almost more volunteer support than you can manage.

But let me emphasize we do not claim this program to be a panacea for *all* the ConAD or Air Force community-relations problems. Perhaps ninety percent of any opposition that may develop in any community can be overcome with good community education. But there will always be a few who won't be convinced.

While the Air Force has had to face up to this jet-noise problem first, I think you can all readily understand that as soon as our major air lines go to jet transports, both the air lines and the companies that make these aircraft will have a very direct stake in community acceptance of jet operations.

There are genuine problems attending the jet age that will require remedial legislation, such as creation of buffer zones around military bases to curb heedless community development right up to an airstrip. Military bases that share facilities with commercial air line operators on municipal airports also create ticklish and special difficulties that may be resolved only by wise municipal planning and farseeing controls.

Of one final thing I am certain: While we in industry have a great responsibility to help the Air Force as much as we possibly can with its jet age community relations, the long-range responsibility rests ultimately upon the local commanders, their fellow officers and men. Even now, ConAD and we are endeavoring to perform all possible functions of our cooperative 102 introduction program through military personnel from the base or squadron.

These Air Force officers and crewmen are devoted men—men of intelligence, skill, and undoubted courage. The better the community comes to understand these men—comes to know them by their first names, even, and gains appreciation for the hazardous nature of the missions these young men fly with such unquestioning loyalty—the better that community and this country can be defended.

QUESTIONS

Mayor Hartsfield: If you were mayor, and a group of people came to your office—maybe they had seen the air show and enjoyed it, but maybe they lived under a glide path or near it, where they could not sleep at night—and they came to you and made their complaints, and you said, "Well, folks,"—and I don't mean to be facetious when I say this—"this is just the sound of freedom." Do you think you would get anywhere with that?

General McNarney: Probably not with a certain individual who faced a loss of money. But you might ask him if he bought his home after the airport was established.

Mayor Hartsfield: You know, you never argue with a voter. We who run cities often have hostility from areas over which we have no control. We do not control the actions of satellite towns or of adjoining municipalities or of adjoining counties. We have a hostile bill today affecting the Atlanta airport that arises from a separate county, and they have introduced a bill that seriously affects our airport. What is your solution?

General McNarney: The only solution I can think of is attempting to solve that kind of a problem by better community cooperation, through the state, through the counties, through all of the surrounding municipalities. This is not a problem that can be cured by a single mayor or by a single man, but these problems can be helped starting with federal aid through state and county. It is something that all of us have to get together on.

Mayor Hartsfield: What happens is that you get an airport, and the developer is then able to buy the adjoining property slightly cheaper, because the smart people know that that is a potential nuisance. And then he builds houses. And he induces these little innocent boys and girls, returning soldiers, to buy these houses. And they find out after they have bought them that they have a house they can't sell. Don't you think that some federal action can help cities in that respect?

General McNarney: As far as cities go, all cities that I have ever been in have building regulations to use for zoning residential housing.

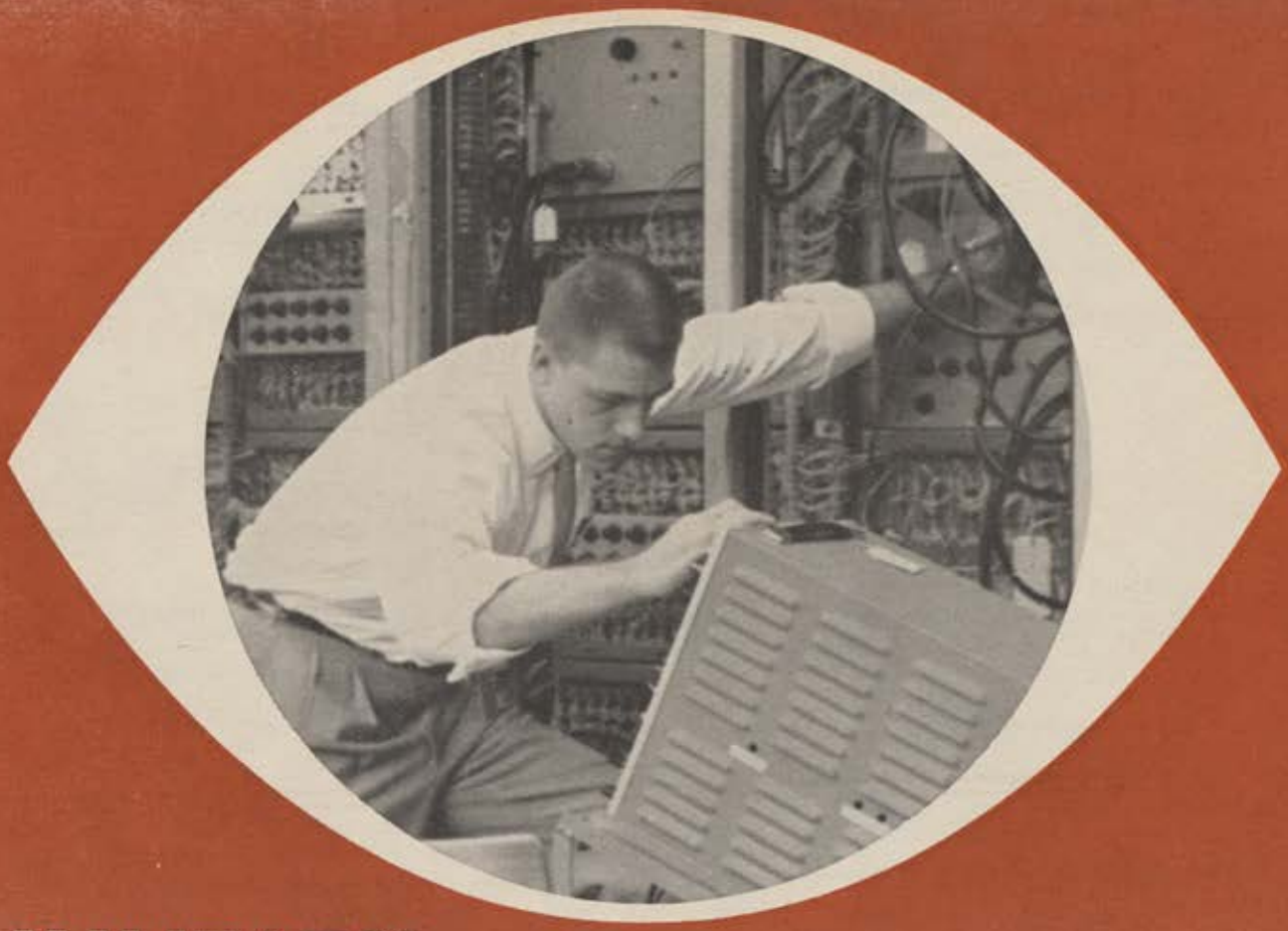
Mayor Hartsfield: But these airports are not located inside of our cities. They are more often in other jurisdictions, with surrounding satellite towns and counties.

General McNarney: If they are outside of your jurisdiction, naturally you yourself can't do it, but the county commissioners ought to work together on it.

Mr. Abney: In your presentation, General, you confined your remarks almost solely to the military jet operation. Knowing that you folks are engaged to some little degree in construction of civil aircraft, I wonder if you would care to express an opinion as to what effect the advent of commercial jets will have upon our civil airports, as respects the requirement for their being lengthened.

General McNarney: There is no doubt that for a large number of cities in the United States, the runways are not long enough to take care of the large long-range jets that are being built. We are building the 880, which we call a medium long-range airplane, and there are over 150 now existing airports in the larger cities of the country which the 880 can operate out of without any difficulty up to a range of 1,500 miles. Sending it transcontinental

(Continued on page 79)



MILITARY FIELD SERVICE

an integral part of Burroughs responsibility for computation in SAGE

For its vital computation phase of SAGE (continental air defense system) Burroughs responsibility to the Air Force begins with research . . . extends through engineering, development, production, testing, and installation . . . and includes essential field training, service and engineering.

Resident teams of Burroughs Military Field servicemen are assigned to each SAGE site. These specialists install and continually test each computer, executing field service functions through intimate knowledge of the equipment.

Already, scores of Burroughs specialists are on Military Field Service duty at home and abroad, wherever they are required to service complicated equipment.

This is another demonstration of Burroughs *complete* systems responsibility for numerous Armed Forces projects embracing instrumentation, control systems, communications, electronic computers, data processing.

In the areas of our proved capabilities, we welcome further inquiries. Call, write or wire Defense Contract Organization, Burroughs Corporation, Detroit 32, Michigan.

INTEGRATED BURROUGHS CORPORATION DEFENSE FACILITIES INCLUDE:
Burroughs Corporation plants in Detroit and Plymouth, Michigan
Burroughs Research Center, Paoli, Pennsylvania
ElectroData Division, Pasadena, California
Control Instrument Company, Brooklyn, N. Y.
Electronic Instruments Division, Philadelphia, Pennsylvania
Electronic Tube Division, Plainfield, N. J.
The Todd Company, Inc., Rochester, N. Y.
Military Field Service Division, Philadelphia, Pa.

Burroughs
The Foremost Name in Computation

Looking to continuing expansion, Burroughs invites inquiries from qualified engineers.

Lightweight! But magnesium can really take punishment

Magnesium is the world's lightest structural metal. It weighs only 23% as much as steel, 20% as much as yellow brass and 65% as much as aluminum. But magnesium is strong, too. How strong? Look at a few of its uses in the aircraft industry, for example:

The magnesium wheel in the picture above has to be light, but it also has to withstand tremendous shock when the plane touches down. In another application, the entire weight of a two-ton helicopter is suspended from a magnesium rotor. In large cargo planes magnesium floor members support heavy weights in flight.

Magnesium was selected because it has the necessary lightness, strength, rigidity, durability and other desirable properties. It's the *combination* of light weight and strength that makes magnesium the choice for countless applications throughout industry.

What do these facts mean in terms of your products, parts or equipment? They mean that magnesium can do an equal or better structural job at a substantial savings in weight. For more information, contact the nearest Dow sales office or write to us. THE DOW CHEMICAL COMPANY, Midland, Michigan, Magnesium Department MA 1401E.

YOU CAN DEPEND ON DOW

from New York to San Francisco or Washington to Los Angeles would require longer runs, but the airports of those cities are already available, with larger parking ramps. As a matter of fact, anything that will take the DC-7, I think will take one of the modern jets. One thing you probably have to do is sweep the runway four or five times a day to keep foreign objects from getting into the intakes.

Mr. Abney: I was thinking about the extra length.

General McNarney: For long-range jets that try to do intermediate missions you will have to improve the airports.

Mr. Jones: Would you like to comment on just what Convair is doing about noise suppression?

General McNarney: Noise suppression for the Convair is being researched and developed by the engine manufacturers.—END

Community Relations

CAA PROGRESS REPORT

Hon. James T. Pyle
CIVIL AERONAUTICS ADMINISTRATOR

Mr. Pyle was appointed to his present position by President Eisenhower in December 1956, to succeed the late Charles Lowen. A veteran of twenty-five years in aviation, Mr. Pyle served with Naval Air Transport Service squadrons in the Pacific in WW II. His career started with Pan-American Airways in 1935. He was assistant to the vice president when he left in 1946 to head the Air Charter Company.

THE Civil Aeronautics Administration has a wide variety of responsibilities in the aviation field, including such things as enforcement of safety regulations, evaluating new aircraft from a safety standpoint, licensing airmen, and helping municipalities to improve their airports.

But our biggest job, measured by manpower and money, is constructing, operating, and maintaining the federal airways. These airways might be viewed as aerial highways stacked one above another at 1,000-foot intervals. They carry not only the scheduled airline transports, but also a heavy load of military traffic and a growing fleet of business and executive aircraft.

You probably have heard all sorts of things about our airways. "Inadequate" and "overcrowded" are among the milder adjectives which have been tossed around in recent years.

Well, the truth is that we have simply outgrown our old airways system and are struggling, as hard as we know how, to complete a new system to meet the needs of the present and the immediate future.

In 1946, for example, there were 4,000,000 takeoffs and landings at major US airports. Ten years later, in 1956, there were almost 15,000,000. We estimate that this will grow to 22,000,000 by 1960, 30,000,000 by 1965, and about 35,000,000 by 1970.

From these figures alone it is easy to see why a system which was adequate in 1946 is bursting at the seams today. But landings and takeoffs tell only a little of the story.

Aircraft speeds have greatly increased in the past ten years, and will take another big spurt in 1958 when the 550-mph jet transports appear on the scene.

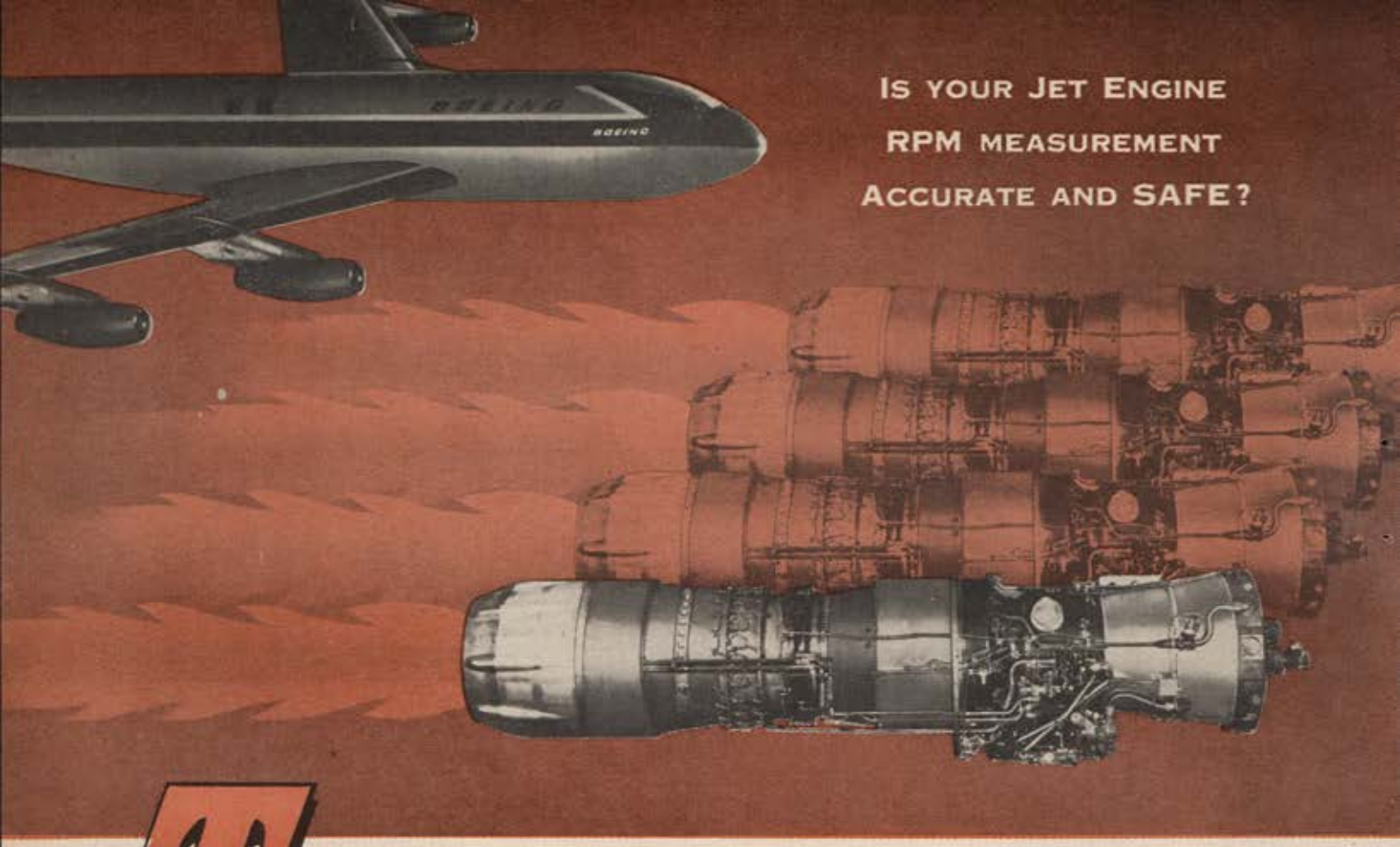
Today's volume of air traffic is made possible by reliability—the assurance that you will arrive at your destination at approximately the time scheduled. This requires precision landing aids for safe approaches under low visibility and ceiling. Here again the figures tell an impressive story of why our airways are congested. In 1946 there were 104,000 instrument approaches; in 1956 this had increased more than sevenfold to 782,000. We expect these approaches to increase to 1,600,000 by 1960, and by 1970 to number more than 3,000,000.

In all this activity, the military is one of our biggest "customers." Last year, forty-three percent of the operations handled by our air route traffic control centers were military. We are pleased that we can render this service to our defense forces, and we in turn have been helped immensely in our jet age preparations by the splendid cooperation they have given us. Not only have their jet operations provided us with valuable laboratory experience, but the Air Force has expedited our jet age work by such tangible contributions as the loan of two B-57s for high-altitude airways testing; making possible delivery a year ahead of schedule of a Convair with which we will begin intermediate-altitude testing; and making available a T-33 and two F-80Cs for initial jet training of our safety agents.

A good example of military cooperation with civil aviation is the new radar weather advisory service offered by the Air Defense Command. A pilot merely calls the code word "stargazer" on the appropriate radio frequency to get guidance in avoiding hazardous weather areas. This service from the military radar network is available to civil and military pilots, and is a valuable contribution to aviation safety.

The separation of aircraft in the sky is an intricate and complex affair. Along the airways they must be separated vertically, and those flying at the same level must be kept from overtaking one another. Aircraft of many different speeds are mixed together in the airways system. These aircraft must rise from the earth and descend again, in the most congested areas near the airports. They must hold in space at times, flying circles at fixed points. Under instrument weather conditions our traffic controllers play what has been called "a tight little game of chess, not in two dimensions but in three."

(Continued on page 81)



IS YOUR JET ENGINE
RPM MEASUREMENT
ACCURATE AND SAFE?

TAKCAL®

READS JET ENGINE SPEED to GUARANTEED ACCURACY of 10 RPM in 10,000 RPM (±0.1%)

The inter-relation of RPM to efficiency and thrust in jet engines is fundamental. Proper adjustments for maximum thrust, maximum engine life and maximum safety of operation can be made only upon accuracy of instrumentation. The TAKCAL tests to guarantee that accuracy.

The new B & H TAKCAL incorporates a refinement of the frequency meter principle. It operates in the low (0 to 1000 cps) range, reading the frequency of the tachometer generator on a scale calibrated in percent RPM corresponding to the engine's RPM. It reads engine speed while the engine is running with a guaranteed accuracy of ±0.1% in the range of 0 to 110% RPM. Additionally, the TAKCAL circuit can be used to trouble-shoot and isolate errors in the aircraft tachometer system, with the circuit and tachometer paralleled to obtain simultaneous reading.

The TAKCAL's component parts are identical with those used in the J-Model JETCAL Analyzer. They are here assembled as a separate unit tester and for use with all earlier models of the JETCAL Tester.

The TAKCAL operates accurately in all ambient temperatures from −40°F. to 140°F. Low in cost for an instrument of such extreme accuracy, it is adaptable to application in many other fields.

For full information write or wire . . .

CHECKS TACHOMETER "SYSTEM" ACCURACY. ADAPTS TO ANY FREQUENCY PROBLEM!

Explosion-proof TAKCAL for special applications. Measures 200 to 7500 RPM, direct reading, with ±0.1% accuracy.

B & H makes the *JETCAL*® Analyzer and *TEMPCAL*® Tester

B & H INSTRUMENT CO., INC.

3479 West Vickery Blvd. • Fort Worth 7, Texas

Sales-Engineering Offices:

VALLEY STREAM, N. Y.: 108 So. Franklin, LO 1-9220 • DAYTON, OHIO: 209 Commercial Bldg., MI 4563 • EL SEGUNDO, CAL.: 427 E. Grand Ave., EA 2-1644

There is a certain amount of hazard in any form of transportation, whether by train, bus, automobile, or airplane. We do not consider that our present air traffic control situation carries with it any undue risk. We simply will not accept into the system at any one point more aircraft than our present equipment permits us to handle safely. The excellent safety record of air transportation bears out the fact that this policy has been working effectively.

But when we limit traffic into New York, for example, it backs up westward to Chicago and Kansas City, and southward to Atlanta and even Miami. These multiple delays take a heavy toll, not merely in the form of inconvenienced travelers, but also in terms of millions of hours of wasted executive and engineering talent. Such losses come directly out of the national economy.

What are we doing about all this? I'm happy to be able to tell you that we're doing a lot about it, and we're doing it just as fast as we can move and still maintain a solid footing.

We have an Airways Plan which, as it takes effect, will give us the tools to handle not only the civil jet aircraft coming into service in 1959 but also the anticipated increase in other types of civil and military traffic. Congress voted us extra funds last year to get this program moving, and we confidently expect to be granted the money necessary to see the job through.

In traffic control, as elsewhere in America's burgeoning technological progress, the human mind is rapidly meeting problems which it cannot handle unaided. All sorts of amazing devices are being investigated at our Technical Development Center at Indianapolis, and being tested at selected points around the country. As soon as we can integrate them usefully into our system we will be installing such things as computers, memory drums, horizontal panoramic displays, and closed-circuit television.

But we can't wait for all these to be fully developed and coordinated. We're going ahead with tried and proven tools, and the greatest of these is radar, radar, and more radar. In November we placed an order for twenty-three long-range radars, costing some nine million dollars—the biggest single purchase of electronic equipment in CAA history. These will be delivered as rapidly as they can be produced, starting this summer. Each radar uses a forty-foot antenna, and effectively watches an area of more than 125,000 square miles. Eventually we expect that a network of seventy or more civil and military long-range radars will provide our controllers with a picture of everything flying at the higher altitudes within our borders. A CAA-Air Defense Command team is hard at work determining the locations where the facilities of each can serve a joint need.

Meanwhile, we're improving existing equipment in every possible way. For example, all our new radars will be equipped with something called circular polarization. With this device a controller, by throwing a switch, can remove much of the clutter caused by precipitation. In effect, he can see an airplane through a rainstorm which otherwise would obscure it.

While the new radars are being built, we're backfitting our present equipment with circular polarization.

Today's electronic wizardry always leaves me with a sense of awe and wonder. As the engineers explain it to me, circular polarization imparts sort of a corkscrew effect to a radar pulse—like "English" on a billiard ball. This requires a "phaser," "twister," and "horn." When the pulse hits a raindrop it bounces back to the "horn," this time with "reverse English." Then it is electronically canceled out. The rest of the pulses continue on, hit the flat surface of the aircraft, and come back to register on the screen.

This is effective because raindrops are round. Engineers never take anything for granted, I've found out, and when this matter first came up they wanted to know, "Is a raindrop round, is it tear shaped, or what? We have to know what we're designing for." Fortunately, somebody already had made an intensive study of raindrops and discovered that they "tend" to be round, so we could go right ahead.

In cooperation with the Air Navigation Development Board, we went through a fast test and development program at our Indianapolis Center and elsewhere. This was so promising that we ordered the first five pieces of production equipment built right in the model shop where the tests were going on so that we could install them at once on existing radars.

Interestingly enough, we found that while raindrops are round sometimes, they aren't always. Gentle rain has round drops. But in turbulence they get blown out of shape, and the center of the storm often remains on the scope. In some ways this is an advantage.

Circular polarization also cancels out snow, but only if the flakes are of the perfect crystalline pattern seen on Christmas cards. Irregular and lumpy snowflakes refuse to cancel.

Circular polarization somewhat reduces the range of the radar, so we permit the controller to use it or not, as circumstances demand. Generally speaking, however, it has proved a most useful improvement and has been enthusiastically received at Idlewild, Newark, Boston, Chicago, and Washington where it already has been installed. Thirteen other sites will have it by April 15, and we're going ahead with a program to install it not only on all surveillance radars but on precision approach radars as well.

Along a parallel front, we will be starting shortly to test experimental radar traffic control beacons at nine locations. These are ground stations which trigger a return signal from an aircraft equipped with "transponders." This is intended to permit radar tracking of planes at high altitudes, where a radar signal bounced off without "reinforcement" might return too weak to show on the traffic controller's scope. The beacon also is intended to allow immediate identification of a particular aircraft without making the pilot execute time-consuming maneuvers.

We hope to start the testing next month, using equipment furnished by the Air Navigation Development Board.

Under our present system we must rely largely on position reports from pilots for purposes of traffic control, and this will be true until we get our full radar coverage and certain other equipment we will eventually need. The manifold increase in flying has jammed our radio communications channels to a point where they are becoming a traffic control bottleneck.

Since the portion of the radio spectrum assigned to aeronautical communications is limited by international agreements, the only way we can get more channels is to space them closer. Our present spacing in the VHF spectrum is 200 kilocycles. Channel spacing of 100 kilocycles would double the number of available channels, and fifty-kilocycle spacing would quadruple it.

Channel spacing is determined principally by stability characteristics of the transmitting and receiving equipment. Present-day design techniques make it feasible to economically mass produce equipment which will function satisfactorily with fifty-kilocycle channel spacing, and we are considering ultimately using spacing of this magnitude.

As a first step toward creating more channels, the CAA has ordered about 2,500 narrow-band communications re-

(Continued on following page)

ceivers which will permit satisfactory reception of transmissions 100 kilocycles apart. The first of these are being put into service this month on frequencies most commonly used by the air carriers, since air-carrier transmitters have frequency tolerances which are entirely adequate for use with the narrow-band receivers.

The emergency channel of 121.5 megacycles, and the itinerant and military VHF channels, however, will continue to be guarded by the present broad-band type of receiver until January 1, 1958. After that date the CAA may assign narrow-band receivers to these frequencies as well. During the interval, those using the emergency, itinerant, and military VHF frequencies will have plenty of opportunity to make sure their transmitters are within the required tolerance.

So far, I have talked about our equipment plans and projects. But no matter how wonderful and helpful the new equipment may be, or may become in the future, we can't have traffic control without highly skilled people with good morale and plenty of sound training. To man this new equipment and keep it in repair, and to discharge its other increasing responsibilities, the CAA is going to have to expand from its present 16,000 personnel to about 24,000 in the next three years.

These new people will have to be turned into dependable, well-trained controllers and maintenance personnel in the shortest possible time. The recruitment of raw material is off to a good start, but the need is a continuing one, and we certainly will welcome your assistance in directing qualified candidates to the nearest CAA traffic control facility.

We are going in heavily for formalized training to make trainees more immediately useful than has been the case in the past. We were running about eighty students per class at the CAA Aeronautical Center in Oklahoma City. We've jumped that to 280 per class, and we will increase the numbers still further next year. These training classes do the basic screening, provide the basic fundamentals, and knock the rough edges off.

Our biggest problem is developing personnel from the assistant controller to the controller grade. We need more controllers, more supervisors, more in the regional offices, more in the Washington office, more in planning and thinking about the future.

As you can see, we're really pushing hard in all the areas affecting traffic control—existing devices like radar, new but untested equipment and ideas, trained people to operate our airways. I'm glad to report that we're making definite progress. But we aren't quite up to producing miracles, and much remains to be done. Edward P. Curtis summed it up very accurately in a recent speech when he said:

"We are fully aware of the fact there are current problems to be faced today and in the months to come before very much can be done to implement major improvements in the system. The best we can hope to do in the near future is to bolster the present system and get the most we can out of it."

QUESTIONS

Mr. Jones: Are the other sections of CAA going to be geared to take care of the aircraft that you are going to clear in aircraft traffic control? We need a lot of research and a lot more thinking on the part of the ground facilities.

Mr. Pyle: We have an airport planning group which will be in operation very shortly that can take care of just the point that you make. Actually, we are already going to feed the runways faster than they can absorb them right now, with our present system of traffic control. As a result, we are going to have to strengthen the airport complex and provide something that will have to be accurately engineered. We will also have to provide an assist in the planning of terminal facilities.

I think this is a definite responsibility the government has to undertake.

Mr. Abney: With respect to your comments concerning your accelerated recruitment and stepped-up training program for your controllers, it has been my impression that in the past the attrition rate has been rather high, both in your tower controllers and center controllers, due, I suppose, to relatively low pay and the type of work and the shifts and that type of thing.

I wonder what action has been taken to plug up that end of the funnel?

Mr. Pyle: Actually, I don't think it is entirely correct to say the attrition rate has been high. We have phenomenally less turnover than any other agency in the government. I think it is because of the high caliber of the people. However, you can't blame them when they have to live and pay their bills, and support their families, if they at times have no alternative but to move. Very often the people who have moved, however—most of them—have moved out of the government.

One of the problems we have is the grade structure. We have worked closely with the Civil Service Commission in trying to straighten this problem out. They have helped us. We have received some initial and immediate relief. We are going right back after them again to see if we can get something more.

Mr. Abney: Several years back, the CAA did away with the means that it had for whipping this community relations problem, which was our main topic here today. That is, your excellent film libraries that you had and your public educational program. I wonder what your current thinking is on that?

Mr. Pyle: My current thinking is that if I could get some money I would be all in favor of putting it back just where it was.

However, trying to do what we can within our capability to go forward with a program in this area, particularly concentrating on the aviation education field—**is** a complex problem. There are a lot of people who know a lot more about it than we do at this stage of the game. And what we want to do is work with them and see where we, the CAA, can fit into this picture and see if we can't contribute toward better aviation education. I think this is one of the big needs of the country today. And I am very strongly in favor of it.

Mayor Hartsfield: Would it not be reasonable to sum up this whole afternoon's discussion with this observation: that the commercial jets will pose no greater problem than the planes now operating at large civil airports?

Mr. Pyle: I think insofar as the community itself is concerned, this is a fair statement. But I think the operator of the airport, and maybe the municipality, will have problems. As Mr. Jones points out, they are facility problems. This is an area we are going to have to give study to.

Mayor Hartsfield: I speak more as to the relations with people living around airports.

Mr. Pyle: If the noise suppressants are as effective as we think they will be, I don't think the jets will provide any more of a problem than the DC-7s or the Constellation.

Mayor Hartsfield: We would like to have this information go out from this Conference. It helps our local problems.

Mr. Pyle: You have some able representatives here who may carry it forth.—END

THE JET AGE

Manpower and Education

THE NATIONAL PROBLEM

Dr. Detlev W. Bronk
PRESIDENT, NATIONAL ACADEMY OF SCIENCES

Besides heading the National Academy of Sciences, Dr. Bronk is a member of the National Committee for the Development of Scientists and Engineers, and of the National Advisory Committee for Aeronautics. He serves on the AF's Scientific Advisory Board, and is President of the Rockefeller Institute. He is Chairman of the National Science Board, National Science Foundation, and is a past President of Johns Hopkins University.

IT IS A difficult and a challenging thing to speak on the manpower problem, because I presume there are few subjects more talked of in these times. It is difficult to think of anything that one can say that has not already been said so many times that repetition would be wearisome. But when one comes to a consideration of what is the actual evidence with regard to the problems which are involved in this question, one cannot avoid the conclusion that we deal with a very poorly documented set of considerations.

I feel continually that there is inadequate thought, in regard to our objectives and the real problems and ideals which are involved in this issue.

If I were to analyze the basic elements of the problem, I would say that we should consider in the first instance the present need, the supply, the procedures, difficulties, and opportunities for recruitment, the problems of training, the various issues involved in the more effective and better utilization of manpower, and finally: What is the future need?

When one considers the present need for manpower, I find that it is usually gauged in large part on the measurable demand. And the measure is made all too frequently in terms of the advertisements which appear, especially in the Sunday papers. Page after page after page of requests. Urgent appeals for more scientists and engineers in ever more specialized and limited areas of activity.

There is the obvious industrial requirement for expanded operations of American industry, and there are the very real and increasing needs of our expanding educational system.

But it is difficult to determine a satisfactory basis for ascertaining just exactly how many are really needed to sustain our industry and to maintain our educational system.

There is one basis for evaluating our need which I myself would hope never to be guilty of using, and that is a comparison with what the Russians are doing.

One of the reasons why we are facing this desperate manpower situation is because for too long we refused to face the problem in terms of our own objectives, our own potential needs. And then suddenly, because we became, of necessity, involved in this great ideological conflict, we let ourselves meet face to face a problem that existed long before, merely because we began to have fear of our competitor.

We will have a poor future, I should think, if our goals are to be determined by the Russians rather than by our own visions and our own objectives.

I recall very well, shortly after the last war, that the Associated Research Councils, the Social Science Research Council, the American Council of Learned Societies which deals with the humanities, the American Council on Education which is concerned with our whole educational structure, and the National Research Council in the field of natural sciences, fully recognized and started a great study on the specialized manpower problem of our nation. And it was then quite clearly obvious that we had given too little thought to needs for a developing scientific and technological and ever increasingly complex civilization. But this was a study to be made without reference to what the Russians were doing. It was a study to be made in terms of our own heritage and our own high ideals for the future.

In considering the present supply and drawing upon figures made available to me by the Secretary of the President's Committee, I might point out that in 1940 there were about 260,000 engineers in our national pool, and in 1950, 535,000.

Since 1870, our labor force has grown approximately five times, but since 1870 employment in science and technology has increased eighty-five times, or seventeen times as much as has the labor force. So that there is no question that there is a greatly increased supply of engineers available, and if one considers those who are sometimes differentiated from engineers and referred to as scientists, we find that that number has also more than doubled in the decade between 1940 and 1950.

The Bureau of Labor Statistics estimates that from 1940 through the early 1950s, the population of the eighteen to twenty-one years of age group showed a nu-

(Continued on following page)

merical decline of about 1,000,000. While the number has just begun to rise, it will be 1960 before the age group comes to the level of the early 1940s.

If one assumes that youth enter college at seventeen and graduate at twenty-one, it is obvious that our population at college age is still affected by the lowered birth rate during the depression. This lean generation is just emerging from college. And that is one of the basic reasons for the difficulty which I have just referred to.

But there are other problems involved about which one can do something much more quickly than with regard to the birth rate. There is the absurd inconsistency of deploring an inadequate supply of trained manpower while we force ever earlier retirement at a time when the expectancy of life has been greatly lengthened.

Perhaps it is a good thing to do, but I think the time has come for us to decide whether we are really short of manpower or whether we are not, whether we retire people earlier because they are less able and less effective at an earlier age, despite the increased span of life, or whether we have so many jobs unavailable to young people that we have to cut off men in the prime of their life in order to make more opportunities for youth.

I repeat: either we are short of manpower, or we are not. If we are short of manpower, I suggest we use it more effectively.

Going to the other end of the age spectrum, we find that we are making it more and more difficult for a young man to begin his creative period of activity. And not only that, but at the very time we talk about the great need for more scientists and engineers, we are making it more and more difficult to enable young men to go on for more advanced scientific and engineering training. Let me say just exactly what I mean.

When I left the Navy with an income of somewhere around $3,000 with flying pay and allowances, I felt that I was taking a big reduction in my economic status to go to the University of Michigan, having a teaching fellowship of $1,825 a year. That was in 1922. If you put that into the present value of the dollar, it will be in the neighborhood of $4,000.

Several years ago, at the Rockefeller Institute, when we began our program of graduate education as a graduate university, I determined that we wanted good people who were worthy of the training we were prepared to give under unusual circumstances. And I decided I wanted those people taken out of the poverty category. So we provided $2,500-a-year fellowships, with a small additional stipend to enable them to enjoy some of the rich cultural opportunities of New York. And then I began again to wonder whether we really had a shortage of manpower and wanted more scientists and engineers, or whether we didn't. I began to receive criticisms from my colleagues in other universities, who said that we were ruining the graduate educational picture—because we were giving people $2,500 a year, $1,500 less in cash value than I got in 1922.

As I say, we talk a great deal about the problems. We think little, and we act ineffectively.

Another matter involved in the recruitment of more and more young men for science and engineering is the broad aspect of the public information situation with which the President's Committee has been intimately concerned. If a young man is deciding what his future is going to be, it is not unreasonable for him to assess the relative social position he will enjoy. Because after all, the social esteem in which a profession is held is a measure of how badly society really wants people in various forms of activity. And so if I were a young man, and in reading the public press found that there was far less attention paid to science and technology than there was to other forms of human activity, I would begin to wonder whether the American society of scientists and engineers are really regarded highly and are really wanted.

Well, there are papers that are presenting the scientific and technical developments of our country in a splendid way. And I think one of the greater accomplishments of modern journalism is the development of science reporting.

At the same time, I think of a great newspaper, or a large newspaper, which is managed by an old college friend of mine. At the time of the engagement of a certain charming young American girl to a world figure about a year ago, I had a count made of the amount of space devoted in that certain newspaper to that engagement as compared with all references to science and technology throughout the whole year preceding. The ratio was something like four to one in favor of the engagement.

I hold no objection to the fact that there is far more coverage of the World Series than there is of all science in the United States during the same year. I think it is fine. I am an old sportswriter, and the more sports space the better I like it, because I keep seeing myself counting up the footage that I got on a per foot basis of compensation. But I still like to see about as much space devoted to science and technology as there is to the idle chatter of irrelevant personal matters.

Another matter involved in the recruitment situation is this: if a young man is deciding between a career in science and engineering or some other form of human activity, I should think he would consider the sort of people whom he comes in contact with in preparation for that profession, and those he comes in contact with in other forms of life. If he finds his teachers to be dull individuals, uninspired, reluctant to continue in their profession because of inadequate compensation, or because of inequitable social respect, I should think he would decide that it was far better, if he is to have a happy life in American society, to go into some other form of undertaking.

What I am pleading for is that we may have a more effective recruitment of young men in science and technology, more inspired teachers, more teachers who have the inspiration that they derive from a satisfactory position in our social system.

And so I go on to the question of training those who are already available as potential and certain scientists and engineers.

I have just said that one of the most important things in training the scientists and engineers of the future is inspiring teachers. There is more contact with able teachers needed. At a time when science and technology have made possible entirely new means of communication through television, through sound films, we still depend primarily upon the old method of education. It is heartening to see that institutions such as the Massachusetts Institute of Technology are spending much time and thought and effort on the development of new procedures for bringing the future really great scientists and engineers in the country and in the world into contact with hundreds of thousands of students through these new devices.

And I am always reminded of the fact that there are still books. The Vice Chancellor of Queens University in Belfast a few years ago, in a series of broadcasts over the

(Continued on page 87)

IMPORTANT REASON FOR AN EFFECTIVE AIR DEFENSE...

The kind of defense our Air Force is building
can halt aggression almost before it starts.
As IBM sees it–keeping America's skies untroubled
is the best way to help maintain peace.

IBM MILITARY PRODUCTS

MILITARY PRODUCTS • DATA PROCESSING • TIME EQUIPMENT • ELECTRIC TYPEWRITERS

Stroukoff C-134

The first Pantobase-BLC transport

SPECIFICATIONS

WING SPAN – 110 FT.

FUSELAGE LENGTH – 82 FT.

CARGO AREA – 4200 CU. FT.

Powered by two R 3350 – 89A Wright Turbo-compound engines

The usefulness of military transport aircraft has been extensively increased with the introduction of the Stroukoff C-134. Produced for the United States Air Force this rugged heavyweight requires extremely short take-off and landing runs and can operate from any prepared or unimproved surface–snow, ice, sand, water, etc. Advanced airframe design has been combined with Stroukoff Pantobase and Boundary Layer Control Systems to produce a new type of aircraft equipped for a variety of assault and logistic missions requiring operation without the limitation of conventional runways.

The Stroukoff C-134 is destined for an important role in modern military strategy.

Interesting opportunities for qualified engineers in many fields exist at Stroukoff. If your skills are not being used to full capacity, write us today. Your inquiry is confidential, of course.

STROUKOFF AVITRUC

Extending the Frontiers of Aircraft Performance

Stroukoff

AIRCRAFT CORPORATION

WEST TRENTON, NEW JERSEY

British Broadcasting System, pleaded for more contacts between students and genius. And I thought: this is idle talk. For how many of them are there that can be considered geniuses? And then he went on to say that there are a few Newtons and Darwins and Einsteins, but they all wrote. The student seldom comes in close contact with a great man through books.

I believe in the training situation there is one desperately important thing we need to do. I refer to the provision of a broader foundation on which the student can grow intellectually in order to deal with the unseeable problems of the future. Unless we do this, we are going to be guilty of a tremendous waste of scientific and technical manpower.

I realize that it is easier to train the student to do that which is immediately important, for which there is an immediate market, but that is a great ultimate loss. If a man has not enough foundation upon which he can build, ten, fifteen, twenty-five, or thirty years after his graduation, when he should be achieving the pinnacle of his career, he will be unable to contribute effectively, because the world of science and technology will have grown beyond his limited ability to grow.

I would also say that there is desperate need for more opportunity for our students to learn, and more opportunity to learn because they will be taught less. This will increase the effectiveness of our future manpower by making it more resourceful.

And that leads me to a consideration of how effectively we utilize our manpower.

I implied just now, in fact I said it flatly, that we would train our students better if we encouraged them to learn rather than be taught.

I recently presided at a meeting of the Association of Colleges and Universities of New York State and heard my educational friends deplore the fact that in the years just ahead there was going to be a tremendous increase in demand for places in our colleges and universities.

Well, it seemed to me there was one very simple way of taking care of twice as many students as we now have, with the same size faculty. And that was to have each teacher teach half as many hours and give the student twice as much time to learn on his own, which he must do if he is going to be the successful scientist or engineer of the future.

If we are going to utilize our scientific manpower better, we must somehow revive the realization in our population that there is a joy and a zest in hard work. Our nation did not become great on shorter hours and fewer days in the working week. It became great because men had things they wanted to do with devotion. Unless we can recapture that love of hard work, we will utilize our manpower badly.

In thinking about the total utilization of the total manpower for problems such as ours, one continually comes back to the question of motivation. We all know, if we refer to the figures, that one half of those entering schools of engineering and science fail to go on and make a career. We know that one half of our most able high school graduates never attend college.

And here I would raise this question. In thinking about the educational picture of the future—college for whom? At a time when there is going to be a greater and greater competitive demand for supply, I would challenge you to ask who is to decide who will be admitted, and on what basis. Are we going to leave the basis for admission entirely in the hands of those who think of replacing themselves as professors?

I think of the president of one of the great forward-looking, imaginative industrial institutions in this country. He was refused admission to one of our great universities. Thank God, one that is referred to as somewhat lesser admitted him. He is a great American and a great American industrialist, with imagination. I think of one of the heads of one of the great automobile companies a few years ago, who said he had told his institution of higher learning that the sooner he and they parted company the better. He became the head of the alumni association after he became the chairman of the board of that company. All I hope is that we will never deny to these who have determination and desire, high moral courage, and staunch personalities, the opportunity to develop just as far as they can.

And now, finally, what about the future need? Who can say? We hear it said that if there were to be a depression, we would have an oversupply of scientists and engineers. We hear it said that if there were to be a reduction in military requirements we would have far too many scientists and engineers.

If I may take just a moment more, may I tell you of the first time I saw the great pyramids of Egypt? I had flown across from Mitchel Field during the course of the war. I came in, in the early morning, and the flight sergeant aroused me. I looked out the window of the plane, and I saw the long drawn shadows of the pyramids cast by the rising sun. I suddenly realized, with this terrific contrast, that those monuments had been erected by thousands of slaves at terrific effort. I had flown across an ocean and a continent in less than two short days. I had come as I had come, not because of what I had done, but because of the background of scientific discovery, engineering development, and industrial production through which it had been made possible. It had been made possible to maintain this great new achievement of mankind by the efforts of scientists and engineers, our industrial leaders.

What is our need for scientific and technical manpower? It is just as great as our vision.

We need more scientists to enable man to develop the divine spark of curiosity and the will to know. We need more scientists to teach more people something about the scientific civilization, the man-determined environment in which he lives. We need more scientists to solve the growing problems of an unfolding scientific age. We need more engineers to apply the new knowledge. We need more scientists and engineers to keep alive the spirit of our industrial pioneers who are not content to maintain a status quo, who are looking ahead with the desire to grow.

So I think we need just as many opportunities as we can provide for men to grow and the capacity to understand nature and to shape it for the better use of mankind.

I think it was Edwin Markham who once said:

"Why build these cities glorious if man unbuilded goes?

"In vain we build the world, unless the builder also grows."

We need scientists and engineers to maintain our relative position to our competitors in this fierce international conflict. We need more scientists and engineers to maintain our wonderful scientific civilization. We also need more scientists and engineers as a means of exploring the unexplored world all around us.

To travel hopefully is a better thing than to arrive.

(Continued on page 89)

NONLINEAR CONTROL discussed by *Charles Taylor*

It may seem to be inconceivable that nonlinear control can be applied to complex dynamic processes. Excellent examples of such processes are to be found in the petrochemical industry. Paradoxically, however, nonlinear control is implied if optimum control of such processes is desired. Optimum is defined here in the sense that maximum efficiency, or economy, of plant operation be achieved for specified product quality in the face of changing plant conditions.

Even the word nonlinear has a bewildering connotation. If a system is nonlinear it is frequently assumed that the system transcends human understanding or control. To actually apply nonlinear control to a process (linear or nonlinear) seems further out of the question. A basic reason for this awesome stature is the fact that the familiar tools of linear systems design and analysis no longer apply. The principle of superposition (i. e., the sum of effects being simply related to the sum of causes) is not valid in the nonlinear realm. The mathematical foundations upon which engineering practice may be based are weakened without the generality afforded by the principle of superposition.

To understand why nonlinear control is implied in optimizing processes, it is necessary to appreciate the fact that a linear control system is, by definition, non-adaptive. Once the control parameters have been chosen in a linear system they are fixed (until manually changed). These control parameters may be visualized as weighting coefficients ascribed to the past, present, and future states of the system. The overall dynamic system behavior is determined by summing up these weighted past, present, and possible future system states regardless of the type of inputs or disturbances. In simple single loop-control systems this selection of the control parameters or weighting coefficients of past, present, and future behavior corresponds respectively to choosing the amount of integral, proportional, and derivative control action. This means that, at best, a linear control system must always be a compromise. If the past is heavily weighted, the system will tend to be sluggish. If the present and possible future states of the system are weighted more heavily than the past, the system may be capable of adjusting to sudden changes, or correcting for major disturbances, but there is the danger of erratic, unstable behavior. In practice "middle-of-the-road," or compromise, control parameter values must be chosen.

On the other hand, one form of an adaptive control system will have an ensemble of sets of control parameters from which to choose. The particular set chosen at any instant will depend upon the state of the process variables. The system will continuously switch from one set of parameters to another in order to satisfy an optimizing criterion in terms of maximum efficiency or economy as mentioned above. This type of control system will "learn from experience" and adapt to many different situations. By definition, adaptive control is of necessity nonlinear control.

Dr. Charles F. Taylor discusses nonlinear adaptive control for optimizing processes.

A useful by-product derived from this nonlinear control concept is that system performance becomes nearly independent of process conditions, such as weakening of catalyst activity in a petroleum process. An advantage of nonlinear adaptive control is that a detailed analytical description of the process is not required in order to achieve optimum performance. This benefit is of particular importance in petroleum processing where it is exceedingly difficult to obtain valid transfer functions or analytical models of the processes.

Fortunately, with the advent of reliable digital computers that can be "married" to complex processes, the future for nonlinear adaptive control is bright. Digital techniques are well suited to this method of control since the ensemble of sets of control parameters are finite and discrete. Further, sampling (in time) techniques may be employed.

Enter nonlinear adaptive sampled-data control systems!

QUESTIONS

Dr. Evans: I wonder if Dr. Bronk would be willing to take one phase and enlarge on it a little, when he talked about the lean years in the universities to be followed by the bulge. And you did indicate that one way that can be handled is to enlarge the governmental authority. Haven't you other suggestions whereby we can meet this impact?

I understand the great engineering schools are already refusing admittance to qualified people because they haven't the space. Would you mind talking a little more about that?

Dr. Bronk: The President's Manpower Commission has a special subcommittee dealing with this. And that which I referred to is the two-year college.

We feel, as do so many of those who have thought about this problem, that we have been too rigidly divided with regard to the beginning and the end of preparation.

Eight years in elementary school, four years in high school, four years in college, three to four years in graduate school. It may well be that many would be benefited more if they worked more intensively for a period of two years rather than continuing four years in college. Others, on the other hand, might do well to continue longer.

We feel, and as you know most states are actively considering the possibility of introducing more two-year colleges, more colleges located in municipalities, where the individual will be able to live more cheaply and benefit from the total educational resources of the country. This certainly is one way in which we can provide more educational opportunities to a larger number of people.

As to the advanced students in the college and university, one way in which they can have more access to more who are able to give them what they want would be to provide greater flexibility for the exchange of students from one institution to another. One of the problems in the two-year college program is that if a student goes through a two-year college and has shown that he has great capacity for continuing his intellectual development, it is very difficult for him to enter a four-year college, because the two are not adapted, one to another.

In the old continental system, the student wandered from university to university, and got what he could best get in this university or that. Try and encourage the student to go from one college to another in this country, and you will find vast difficulties, difficulties with regard to records and grades and all of the less important aspects of our educational system.

Mr. Knox (from Moses Lake, Wash.): What is the government doing in regard to setting aside some channels for TV, to have a sort of TV university, so that the minds that you are talking about of the genius variety may be dispersed through the whole country?

Dr. Bronk: I do not have definite information on that. I know the problem. We know the limitations on the total available students for this. But it has been my experience, especially in connection with the development of the Johns Hopkins Science Review, that at least for some time ahead there are opportunities for imaginatively conceived programs. What the ultimate future is, I regret I do not have the precise information.—END

Manpower and Education

MATERIEL AND MANPOWER

Lt. Gen. Clarence S. Irvine, USAF
DEPUTY CHIEF OF STAFF, MATERIEL, HQ., USAF

TODAY'S theme, "Manpower and Education," is significant for two important reasons: first, it isolates and thus emphasizes our most vital resource—people. Second, it underscores the sole process through which we can develop the full potential of this resource. Continued effective coupling of these factors is the ultimate key to national security and a sound economy, now and in the future.

As you notice, I used the word *continued*. I did so for a definite purpose. To date, we possess a high degree of security through airpower which is unequaled by any other nation on earth. Concurrently, we enjoy a level of economy and well-being without precedent in world history. In fact, these conditions have been so comfortable that they have tended to foster an atmosphere of complacency and self-satisfaction among our citizens.

That is an atmosphere which we can ill afford to live with. If we are to project world peace and a high standard of living into the future, we must continue the process of

(Continued on page 92)


SUNDSTRAND
First in Constant Speed Drives . . .

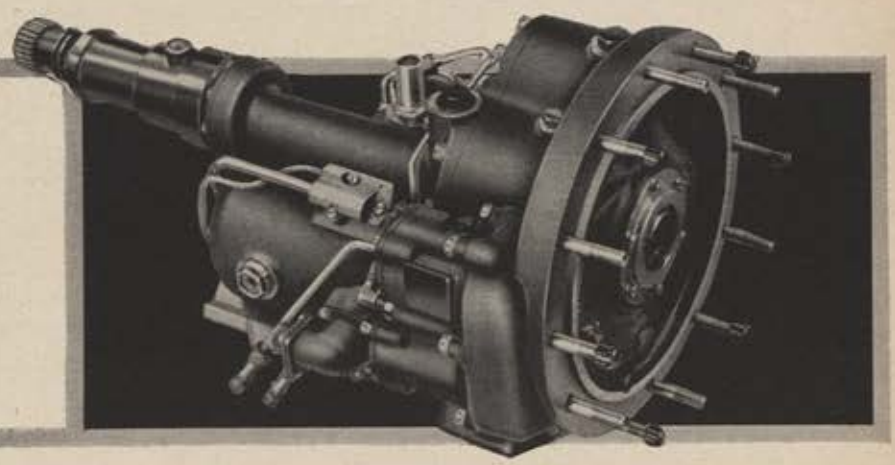
SUNDSTRAND DRIVES

are going on more B-47's because of their record for reliability

Sundstrand Drives have now logged over 400,000 flight hours in the Air Force's Boeing B-47E aircraft. Look at the record and you'll find: (1) A dramatic increase in trouble-free flights compared with aircraft equipped with earlier electrical systems. (2) A drastic reduction in number of flight aborts. This results from the dual benefits of improved system reliability and improved reliability of electrically powered *components*. This record for reliability is such that active consideration is being given to the retrofit of many earlier model B-47's with Sundstrand-driven electrical systems and the addition of a third drive generator unit to E-model aircraft to provide for additional electrical load. The record attained with the B-47E installation, first automatically paralleled, constant-frequency electrical system in a production aircraft—typifies the combination of reliability and performance that make Sundstrand *first* in constant speed drives.

WIDE RANGE OF MODELS

The "Package-Type" unit at right is designed to fit into the nose cone of the jet engines. Close control of frequency and voltage permits automatic navigation, identification, and bombing systems to operate at optimum levels. Other Sundstrand drives are also custom-engineered to fit your space, weight, mounting, and kva requirements.



SUNDSTRAND AVIATION

Division of Sundstrand Machine Tool Company • ROCKFORD, ILLINOIS

Sundstrand Aviation-Denver: Denver, Colorado • Western District Office: Hawthorne, California

CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

equipping our people to meet the challenges of this technological era.

Now, generalities with regard to the education of people are meaningless unless they are related to the purposes for advanced education. In other words, with regard to science and technology, it is necessary to relate the requirements for the manpower resource to the requirements of the materiel resource.

Therefore, in my remarks this morning, I intend to bring these resources into proper perspective. Specifically, I shall first discuss materiel in terms of its creative and operational requirements; and with this as a backdrop, I shall indicate the resulting impact in terms of personnel requirements.

In sequence, there are four general aspects to the creation of materiel: research, design, development, and production. Of these, research is probably the least definitive and the least tangible. Nevertheless, it is a prerequisite to any degree of progress in our technological and scientific fields.

In our current surge toward the outposts of knowledge, it is essential that we conduct both pure and applied research projects on a broad front. At the present time, improved performance of industrial products is limited to degrees of refinement, primarily because we have not sufficiently applied new knowledge to create radically new materials and equipment.

For instance, we have recently acquired much information with regard to metals, plastics, ceramics, and combinations of these. Concurrently, we have made recent discoveries regarding such items as photon, solar, electronic, and anti-gravitational energy which could be transformed into power sources for propulsion systems. But current knowledge of these elements will remain limited until we can break through the existing barriers to discoveries undreamed of at the present time.

However, research alone is useless until the knowledge is applied. This brings us to the second aspect of materiel creation—radically new, unthought of designs, with performance different from anything we presently know. For instance, configuration of a new aircraft could stem from some as yet unacquired fact or scientific breakthrough.

As an example of what *has* happened, research showed us that when certain metals are bonded together in sandwich form, the resulting product is stronger and more heat resistant than any one of its elements tested singly. We have translated this discovery into an airframe skin—a type of which, incidentally, has been incorporated into the B-58.

Again, as a result of extensive research, printed circuitry was proved to be a possible forward step in the field of electronics. As a result, compact, reliable systems have been designed which are lighter and far more adaptable to space limitations.

Clearly, almost every new discovery of research becomes the gene of a new design. In terms of long-range technological progress, the significance of these applied designs is tremendous.

Beyond research and design of individual components, systems, and subsystems, the third creative aspect, development, has progressed to a stage where intricate engineering requirements are an absolute must. The weapons of tactical units represent a deliberate, exacting compromise of the maximum performance features of individual components, skillfully integrated to obtain optimum effectiveness within the operating environment.

In many instances, redesign and re-engineering are necessary in order for the subsystems and components to be most effectively integrated with the whole end item. As a case in point, a particular electronic system was known to work exceedingly well within the environment of laboratories. But when placed in proximity to other functioning units, reliability fell off very sharply. As a consequence, major modifications were called for.

This problem extends from bombers to satellites, from complex milling equipment to electronic data processing machines, from communications networks to fire control systems. It calls for a degree of coordinated engineering for which we must continually strive to attain perfection.

The final creative step, quantity production of the end items, poses equally severe engineering demands. Designing jigs, dies, and fixtures for machine tools, and other major manufacturing equipments, and phasing these into an efficient parts and subassembly production line calls for an extremely broad grasp of engineering and production techniques. At the same time, there is an impending need to phase in, as early as possible, advanced modifications of tools, parts, and subsystems which are proved essential to meet the original or more advanced standard as the result of service testing.

Companion to the creative aspects of materiel are those requirements pertaining to the effective use of end items. These requirements fall into three general categories: operating the equipments, maintaining them at a high level of readiness, and training people to operate and support them.

Today, tomorrow, and in the years ahead, items of both military and industrial equipment will demand increasingly high degrees of skill from those who operate them. Electronically activated controls require operators to understand not only the controls themselves, but also the intricate systems which activate them.

Pilots of manned aircraft and operators of guided missiles must acquire such a store of knowledge that their entire beings are integrated into the systems.

This requirement is not limited to operators of airborne vehicles. Rather, it must be extended to include the operators of our radar outposts and those specialists who alone can guarantee the effectiveness of our defense detection and alert centers. In addition, most involved opera-

(Continued on page 94)

General Irvine is Deputy Chief of Staff for Materiel, US Air Force. He was born in St. Paul, Neb., on December 16, 1898. He enlisted in the Air Service in November 1918 and was graduated from flying school at Kelly Field, Tex., in 1921. In 1926 he received his Regular commission. In World War II he served as Deputy Chief of Staff for the 21st Bomber Command in the Pacific, and as Deputy Chief of Staff for the Pacific Air Command. In 1947 he joined the Strategic Air Command, and the following year became commanding general of SAC's 509th Bomb Wing. In 1950 he took over command of SAC's 7th Bomb Wing, and in 1952 was assigned to Eighth Air Force headquarters. Later that year he was reassigned to headquarters of the Air Materiel Command in Dayton, Ohio, and in 1955 was assigned to USAF headquarters. In May of 1955, he received his third star and was named to his present assignment. Rated as a command pilot, General Irvine was at the controls of the B-29 "Pacusan Dreamboat," which made a non-stop flight in 1946 from Honolulu to Cairo, Egypt.

NEW TOOL FOR THE ALL-JET AIR FORCE!

Cessna's T-37 jet trainer, now in operation, combines outstanding high-altitude performance with unique side-by-side instruction, high to low speeds, easy handling ...fits the new concept in USAF training: a quicker, safer transition into combat jets! Cadets learn faster, USAF realizes time-money savings.

Cessna®

Be an Aviation Cadet. Inquire today about the future your Air Force offers from your Air Force Recruiting Office.

CESSNA AIRCRAFT CO., Wichita, Kans.

tional requirements are being levied by our information relay and storage devices which are fast becoming the key to our versatile supply and logistics systems.

Similar operational complexities are becoming common with regard to our plant tools and production equipment. Units such as electronic systems for machine tool control and the like are clear evidence that our plant workers are no longer manual laborers as we have known them in the past. Precise control, deliberate manipulation, and alert decisions are demanded as much by plant equipment as by long-range bombers and sensitive communication systems.

Concurrently, as we increase the complexity of these numerous systems, requirements will be placed on the maintenance specialists to a degree comparable to those placed on the operators. Wrenches, screw drivers, and pliers, historically used for trouble shooting and repair, are being replaced by complicated electronic inspection devices and reliability test equipment.

True enough, we are continually urging the manufacturers to increase the degree of reliability of the products which they manufacture. I am sure that they can do much more than they have done already in this respect. But the perfect machine has not been invented yet. Consequently, the tasks involved in maintenance and repair work will increase in numbers and in complexity in the years ahead.

The impact of these use and maintenance requirements manifests itself in the third operational aspect—intensive, immediate, practical training. We can expect that many of our future equipments will call for skills which are unknown to us today. Since we cannot predict them exactly until the equipments are available, it may be impracticable to integrate them with the regular education and school program. Therefore, to use these equipments effectively, we will have to improve our in-plant, on-the-job, and in-service training programs.

Considered together, these creative and operational aspects of materiel result in a terrific impact on the skills and capabilities of people. Along a broad front, demands for highly trained specialists and technicians are immediate; they are increasing; and they will be long-lasting. Failure to meet them will cancel out our present achievements and nullify our prospects for projecting security and prosperity into the future.

This is not to say that we should rush blindly toward a manpower solution. For one thing, we do not have an unlimited supply of people. For another, we do not want to concentrate our efforts in one direction to such an extent that we disrupt the economic soundness and stability of our nation.

Rather, if our efforts are to have a lasting and productive value, our approach toward the manpower problem must be one of selectivity—in the sense that we must appraise our specific areas of endeavor and proceed to match those endeavors with qualified people.

In other words, we cannot afford to educate engineers by the wholesale without first breaking down these engineering requirements into specific activities and types. For instance, from my numerous contacts with industrial leaders, I understand there is a need for metallurgists. But more importantly, there is a crying demand for imaginative research specialists who can work beyond the known materials such as plastics, metals, and ceramics, and come up with an entirely new material. Similar conditions exist in the fields of electronics and fuels.

Moving a few steps closer to the end product, which is a complex system, we have an urgent demand for design and systems engineers with the ability to grasp a total need and integrate components and subsystems without loss of individual performance or reliability. Experience has proved it is at the integration stage that reliability and effectiveness begin to suffer.

Time does not permit me to enumerate every specialty and every selective skill which we must equip our people for, if we are to fulfill the obligations placed on our nation and our economy. But an examination of my earlier remarks concerning the materiel aspects should pinpoint our specific requirements.

We need capable jet aircraft pilots, and operators for our up-coming guided missiles. We need technicians to operate our intricate production machines and our assembly line tools. We need electronic specialists who can produce the equipment which the engineers have drawn up for them. Across the board, we have a continuing and urgent need for every type of maintenance specialist and technician to support the end items.

And equally important, it is absolutely essential that we develop well-trained, extremely capable teachers for our public schools, our colleges, and our trade and technical institutes. Unless we do, the total of our technological advances can be stifled to the point of complete deterioration.

To meet these personnel requirements, certain efforts are already in full swing. For instance, as recently as last month President Eisenhower reiterated his keen interest in the Federal Aid to Education program. Also, the Department of Labor is conducting a skills-of-the-work-force program in an effort to get a clearer picture of our skilled manpower requirements.

Important contributions are also being made by industry and colleges, through summertime indoctrination programs being conducted in factories, plants, and laboratories.

Scholarships sponsored by industries and by groups such as the Ford Foundation are materially assisting to relieve the scientific and engineering requirements. Also plant training programs such as General Motors Institute are filling a real need for individual companies and corporations.

To underscore industrial interest in this problem, last week Gen. Orval Cook, new president of the Aircraft Industries Association, told the National Aviation Club there exists "A crying need for physicists, nuclear scientists, electronics engineers, metallurgists, tool engineers, and scientific personnel."

As a step toward solving this problem, large business organizations could survey their immediate and future skill needs and make these known to the colleges and trade schools.

In fact, AIA and other manufacturers' associations could perform a valuable service by organizing such surveys and by compiling and publishing these statistics.

Right here let me make it clear that the Air Force is not excluded from these responsibilities. In fact, we are participating in two programs which should reach into every community. First, there is Operation Home Town—through which the Air Force sends selected officers back to their home towns to talk to high school students, encouraging them to study physics, science, and math. They also work with local educators and civic leaders, urging them to impress on young people the requirements for technical studies and the importance of going to college.

Second, we are participating in a Kiwanis sponsored plan to achieve the same results. In this endeavor we are offering guidance and training materials to the Kiwanis

(Continued on page 97)

close support

by Reeves INSTRUMENT CORPORATION

helps USAF BOMBING CHAMPIONS set new record

Strategic Air Command's annual Bombing-Navigational competitions are the "World Series" of bombing tests. B-47 teams from Strategic Air Command bases throughout the country, flying thousands of miles in simulated bombing runs, performed remarkable feats of navigation and precision bombing. The culmination of long months of ground and air training, the bomb scoring results obtained were the best in the history of the competition. SAC teamwork, highly trained crews, and the most advanced navigational and bombing equipment all contributed to the gratifying results obtained.

Data for determining the accuracy of the bombing runs was computed by the MSQ type of Command Guidance System, designed and built by Reeves Instrument Corporation. Tracking by radar, the system provides a continuous plot of the plane's ground position. The point of bomb release is plotted, and from it the point of impact determined to a very high degree of accuracy. The MSQ type of system can also be adapted to Command Guidance of fighter bombers for close support bombing and strafing of enemy positions.

Reeves has designed and manufactured guidance and control systems for all branches of the Armed Services. We invite inquiries on projects where our experienced engineering and production facilities in the fields of missile guidance, radar, gunfire control and computing systems can be of service.

Reeves INSTRUMENT CORPORATION

IRVST

RESEARCH and DEVELOPMENT ENGINEERS . . . find a rewarding career in Reeves expanding program in the fields of guidance, radar, automation, and computers. Positions available now at all levels. Write to Engineering, Personnel Dept., Reeves Instrument Corp., Roosevelt Field, Garden City, Long Island, New York.

REEVES INSTRUMENT CORP. *A SUBSIDIARY OF DYNAMICS CORP. OF AMERICA,* 215 East 91st ST., New York 28, N. Y.

Mark of a New and Deadly Guided Missile

"Sidewinder" is the Navy's newest air-to-air guided missile. Flight tests have proved the missile to be as vicious as the desert rattlesnake for which it was named.

In brilliant performances against airborne targets at China Lake, "Sidewinder", Navy's new air-to-air guided missile, has captured the attention of the entire missile industry.

Simple in operation, small and light enough to be carried in quantity by single-seat Interceptors, "Sidewinder" can be fired singly or in salvos. It requires no complex launching system or special pilot training, and it maneuvers deftly at supersonic speeds. The missile displays extremely high single-shot accuracy —and even more important, *it can be launched well beyond reach of the target aircraft's defense.*

"Sidewinder" was developed by the Naval Ordnance Test Station of the Navy Bureau of Ordnance at China Lake, California. Philco assisted NOTS in the research and development program, and performed the subsequent engineering required for manufacture of the missile. "Sidewinder" is *now in full production at the Philco Government and Industrial Division.*

Philco is proud to have made this important contribution to the development of more effective electronic systems for our national defense.

PHILCO®

GOVERNMENT AND INDUSTRIAL DIVISION
PHILADELPHIA 44, PENNSYLVANIA

leaders, and we will furnish as much broad assistance as they can use effectively.

Additionally, universities and colleges should take certain steps to fulfill their obligation to our technological progress. First, they should survey their course requirements to make certain that their instructors are presenting both current and forward looking information. Second, they should equip their laboratories and work shops with the most recent training aids available.

Third, they should acquaint themselves with the specific types of engineering and scientific skills needed, and use this information to guide and counsel students. Fourth, they should make every effort to obtain and keep highly qualified faculty members by paying salaries comparable to those in industry.

In conclusion, this era of technology is not a thing of short duration. I am confident that it will continue to grow in geometrical proportions. Furthermore, its demand on the capabilities of people will increase numerically and in complexity in the years ahead of us.

As these remarks have indicated, progress with our materiel resources hinges directly on the output of our personnel resources.

The only approach to this progress lies in one clear-cut direction: to educate our people thoroughly and selectively, and to apply their skills in a productive manner. To accomplish this solution, we must make a specific survey of the creative and operational tasks which lie before us; and, also, we must meet the requirements of all of those tasks through dynamic and revitalized educational processes.

Only by matching materiel requirements with individual capabilities can we guarantee an ability to project our current security and prosperity into the future.

Manpower and Education

INDUSTRIAL REQUIREMENTS

Gen. Orval R. Cook, USAF (Ret.)

PRESIDENT, AIRCRAFT INDUSTRIES ASSOCIATION

Before becoming AIA President in January 1957, General Cook had spent thirty-eight years in military service. Before his retirement in May 1956, he was Deputy Commander-in-Chief, US European Command. From 1951-54, he was USAF Deputy Chief for Materiel. In WW II he served with the Far East Air Forces. After V-J Day he commanded the 7th Air Service Area in Japan. He graduated from West Point with the Class of '22.

TODAY, airpower is the base on which America's military strength is built. Air vehicles—both manned and unmanned—dominate our national defense structure.

Our Air Force with some 26,000 planes in its inventory has only one challenger—the Red Air Force—for world air supremacy. At the same time, it is interesting to note that our naval air arm is numerically the third largest Air Force in the world and that the US Army operates some 3,500 aircraft.

This quantitative expression of the nature of our national airpower is an interesting, but not accurate, index of our air capability. In fact, it can be misleading. Compared to the air armadas mobilized in World War II, these numbers are insignificant. Much more to the point is the capability of our modern airplanes and aerial weapons when compared with their World War II predecessors. Such tremendous progress in weapon development has been made over the past ten years or so that, today, one Air Force bomber can carry more destructive power in one mission than the combined air forces of all combatants could carry in World War II.

Thus, of greater significance than numbers of planes and weapons, is their capability. This applies not only to the machine itself, but to the men who service and fly them. It is the crews and planes together that comprise America's military airpower and make it, *today*, the most powerful military force in history.

I would like to emphasize the word *today*.

To be candid, we are now engaged in an arms race. But this is not a race that follows historical patterns. In the past, an arms race was measured in terms of numbers—thousands of cannons, millions of rifles, hundreds of ships, and so forth. Then the objective of military mobilization was to create more *battle-proven* weapons than the opposition. Now we are developing and producing weapons which we *believe* will be effective and decisive.

These new weapons are fantastically destructive and travel at such speeds that the decisive phase of any future war might well be measured in terms of hours or days rather than months or years. In all probability, the decision in any future conflict will be reached with the weapons on hand at the time the first blow is struck. More and more every year, in organizing and equipping our military arms, the emphasis is shifting from quantity to quality. With each increase in the performance and capabilities of our new weapons, we must readjust the total number of weapons required.

(Continued on page 99)

THE BIRD
THAT'S ATTRACTED TO STRANGERS

Audubon never observed it—this new species that won't tolerate intruders in the sky, tracks them down, destroys them.

Raytheon has pioneered in the development of electronic missile guidance systems for more than a decade. A technical milestone was reached when the Navy's experimental Lark, equipped with a Raytheon guidance system, achieved history's first destruction of an aircraft by a guided missile.

Today Raytheon, alone among electronics companies, is prime contractor for two missiles of advanced design: the air-to-air Sparrow III for the Navy, the ground-to-air Hawk for the Army. Here, once again, Raytheon's "Excellence in Electronics" is contributing to the security of the nation.

RAYTHEON

RAYTHEON MANUFACTURING COMPANY
Waltham 54, Massachusetts

In short, then, from the standpoint of the planner, we must have on hand sufficient weapons to destroy any potential enemy—with sufficient additional strength in reserve to take care of attrition and to provide a margin of safety in case the issue is prolonged—and these weapons must be qualitatively superior to those of any potential enemy. As a corollary to this premise, we must eliminate from our inventory—as rapidly as possible—any weapons which have been by-passed by the rapid march of technology.

In this age of weapons of vast destructive capacity, we cannot afford to be lulled into a false sense of security based on numbers of obsolescent weapons.

So we are confronted with two major problems in this grim race for military supremacy. First, to conceive, design, develop, and produce weapons qualitatively superior to those of our enemies and, secondly, to provide adequate numbers to the military services so that they can carry out their assignments. For all practical purposes, the second point needs only time and money to be resolved. The first point, unfortunately, does not lend itself to such an easy solution.

In general terms, all of you know the type of work we are engaged in today and the direction of our research and development activity. We are producing aircraft and missiles with ultrasonic capabilities; we are designing new weapons in the hypersonic speed range. We are building vehicles which will leave the earth's atmosphere. New power plants with thrust ratings of 1,000,000 pounds are under development. We are experimenting with new fuels, with chemical- and atomic-powered aircraft, with airborne electronic position indicators that will virtually replace the pilots' entire instrument panels. We are engaged in projects looking toward the control of the force of gravity—and, of course—well publicized is the space satellite program for the International Geophysical Year.

These are but a few of the vast array of *active* projects now under way in the aircraft industry. They are perhaps the most dramatic but, nonetheless, they are only a sampling of the over-all effort. I am sure that others of equal or even greater significance are still so top secret in the minds of our scientists and engineers that even the military is unfamiliar with them. I say this facetiously but there is a great deal of truth in the thought. More than ever today, and increasingly so in the future, the military capability—and especially the airpower elements—will be determined by the close liaison between the industry's scientists and engineers and the military planners and leaders.

With this background and with the scope of our industry's assignments identified, the manpower problem would have to be identified as one of our primary worries at this time. It is true, we are having and will continue to have materials problems—not like those of World War II, but rather problems resulting from our urgent need for materials with high heat-resistant qualities, to cite but one example. The solution to this problem is not priorities or controls; rather, it will come from the researches of our scientific-engineering teams—and this is a part of the manpower problem.

The same situation confronts us when we talk about new requirements for tooling, for new machines, for new research and testing equipment—these, too, must be conceived and designed, and again we are back to our manpower problem.

In identifying the manpower situation as a most critical area of concern to the industry at this time, I would like to point out that I am not talking about masses of people. What I am talking about is the shortage of *qualified trained people*. This situation is true not only for engineering and scientific personnel but our shop and production people as well. We demand an accuracy and uniformity of work that in the past was unthought of. The old comparison of "the precision of the watchmaker" is outmoded. The watch is a piece of Swiss cheese compared to some of our new electronic systems. The various complex parts and pieces that make our modern aircraft have become so expensive that we cannot afford careless or unschooled workmanship; nor can we afford careless use of the wide variety of new machines and tools—costing as much as $250,000 each—which are indispensable in modern aircraft manufacture.

Quality of personnel and supervision is paramount at virtually every station in the production line. The need for greater skills and more accurate workmanship will continue to increase as far ahead as we can see.

This aspect of the over-all manpower situation is one which is being tackled by our industry and prospects for continuing improvement are bright.

The competition for technically qualified production personnel in our free labor market has prevented our industry from attracting all the employees needed for various categories of skills. As a consequence, most aircraft companies have organized elaborate in-plant training programs.

In 1955, a "representative group" of aircraft and engine manufacturing firms (not the entire AIA membership) spent some $13,750,000 for formal classroom technical training of more than 230,000 employees—over and above apprenticeship programs, "vestibule" training, and on-the-job training.

In addition, there is in-plant, paid-time training for proficiency in certain critical skills, which not only increases the number of skilled technicians needed to meet the demand created by the expansion of the industry, but also prepares the skilled worker to perform new jobs created by technological advances. During 1956, the representative AIA firms in the sampling collectively conducted some 1,500 courses for management supervisors, engineers of all types, draftsmen, technicians in laboratories, electronics, hydraulics and instrumentation, tool designers and planners, field service representatives, data transcribers, and technical writers and illustrators.

From this, it may be seen that the industry has gone in for this particular sort of training in a big way. Just how big becomes apparent when one realizes that these courses were taken by 200,000 employees and represent more than 6,400,000 man-hours of training—an average of thirty-two hours of technical training for every employee participating.

Another type of training effort, and one of much more recent origin, is the encouragement of employees to attend local schools for the additional and more up-to-date knowledge they need to perform their jobs more efficiently, under a tuition refund plan in which the company reimburses the employees, in whole or in part, for the cost of tuition, books, and related items.

In the near future, most companies believe they will have to expand their training practices. First, because of a declining skill level in the open labor market, many firms must be content to hire personnel with potential skills and then design the necessary training programs to provide these people with appropriate knowledge and skills.

Secondly, technological advances have out-dated the

(Continued on following page)

training of many who were previously considered well-schooled in their respective fields of endeavor. Again, this technological advance has been marked by drastic changes in methodology of work, which in turn will require the learning of new skills and techniques.

Unfortunately, we have not been so successful in the solution of our major headache in the manpower field—the shortage of qualified engineers and scientists.

Here the problem is quite different. While the over-all national manpower supply is adequate, there is a shortage in the field of engineers and scientists. It is my belief that this shortage is acute only in the category of specialized scientific and engineering talent which always has been in great demand. This demand has been greatly intensified by rapid technological advances in defense industries and in industries producing consumer goods as well.

In coping with this acute shortage it appears to me that there are two fundamental approaches to solving the problem, both of them simple to state. One is to increase the supply; the other to reduce the demand. At long range, I cannot foresee any reduction in demand. In fact, I am certain that there will continue to be increasing requirements for specially qualified and talented scientific and engineering personnel. We are committed in that direction and there is no way of stopping the trend or slowing it down even if we wanted to.

In the immediate future, however, there are some things that can be done which will have the effect of reducing the demand. In fact, within the aircraft industry, the current technician training program is upgrading qualified personnel into assignments that will relieve engineers from routine tasks so that their efforts and talents can be applied to work of a more advanced nature. This approach to a reduction in the demand is widespread among our companies and is on the increase.

Another effort now getting under way is a review of the boards, committees, engineering societies, technical associations, and other similar groups in which there is a possibility of duplication of effort which absorbs the time of scientific and engineering talent. Elimination or reduction of overlapping and duplicating activities of this type appears to offer some possibility of savings which will release some of our high quality talent for more fruitful activities, in addition to the industrial savings in travel costs, administrative, and other correlated expenses.

As I mentioned earlier in this talk, our weapons and weapon systems are passing through a period of change in which pure numbers alone no longer are terribly significant. It is quality that we emphasize. I would like to suggest to the military services that if they judge the competence of potential or prospective development contractors upon the numbers of people on their engineering staffs, they might well consider quality to be more important than quantity.

Efforts to reduce the demand for highly qualified engineers at best is only a short-range solution to the problem. I stress the word "qualified" here because the engineering and scientific needs of our industry are rapidly becoming very specialized. Development of advanced weapon systems is projecting us into a whole new world of science. For our current needs, we do not have the time to train people for the critically needed specialties.

The basic remedy for the shortage of specialized scientists and engineers is to educate and train more people in these fields. It is too big a job for industry to take on by itself, but the industry is trying to improve the situation both through encouraging promising people to take advantage of opportunities for more advanced work and by freeing engineers from work that can be performed by trained technicians.

Because of recent publicity on the subject of recruitment costs, I believe that a few words on this subject are in order. The aircraft industry is now engaged in appraising its recruiting practices which, of course, include costs. If the industry finds that its need for specialized scientists and qualified engineers can be filled at lower cost, I am sure that current practices will be altered for that purpose.

I am just as certain that there will be no diminution of efforts to obtain the qualified people that are necessary for the military services to maintain their present scientific and technical leadership. The people of this country would not tolerate a situation in which scientific and technical advancement in the interests of national security is inhibited by arbitrary limitations on employment of highly qualified scientific and engineering personnel. Neither would there be any sympathy for intemperate and runaway competition for the service of such people. I believe that industry and the highly intelligent and competent people we are discussing can be trusted to keep this situation in hand.

In the years ahead, to prevent the current shortage of highly qualified people from becoming more acute than it is today, ways must be found to interest grade school children in scientific knowledge and to motivate them with the curiosity that is needed to sustain their interest through high school and college and beyond, so that while the supply of these very essential people may never quite satisfy the demand, we will be assured of a sufficient supply to keep our country from being overtaken by others who are anxious to see us fail.

QUESTIONS

Mr. Jones: General Irvine, the Air Force now employs the largest number of research and development professionally trained people. What is the Air Force doing to increase their own professional competence to face the new and ever increasing complex problems?

General Irvine: We have the normal newspaper system, where we circulate information around to our people. We have placed great emphasis on sending people back to school. But the problem of keeping our people up to date on the new weapon systems—we have a very direct means of accomplishing that end—and we are spending a good many millions of dollars a year of the taxpayers' money toward this end, by hiring technicians and engineers and specialists for the contractors who normally first assist us in our schools and assist in the on-the-job training of the people after they have received the weapon.

Dr. Stever: Both General Irvine and General Cook mentioned that industry in some cases seemed to have an engineering staff which isn't too busy. It seems also that industry tends to use a very large number of engineers to solve a given problem. One of my friends in the industry said that when his company had an engineering problem, it was simple to solve it. They just smothered the problem with engineers.

I would like to ask both General Irvine and General Cook—with regard to the R&D and materiel system which the Air Force manages, and the industry carries out—isn't it possible to build up an excess engineering staff on those military problems? And if it is, is there anything that can be done about it?

(Continued on page 102)

CURTISS-WRIGHT

powerplants and missiles set new performance standards for tomorrow

A Curtiss-Wright Rocket Engine recently powered an aircraft higher and faster than man has ever flown before. A Curtiss-Wright supersonic Ram Jet Engine was the first controlled supersonic ram jet to be successfully flown – and advanced versions are now being developed for piloted aircraft and guided missiles. A Curtiss-Wright hypersonic test vehicle – the HTV Rocket – recently reached supersonic speed in a fraction of a second . . . developed several times the speed of sound in just two seconds.

These developments—all capable of several times the speed of sound – are the advanced guard in America's defense, and in America's research toward the high speed, high altitude air travel of tomorrow. They are dynamic evidence of Curtiss-Wright's leadership in the aviation industry – setting the pace for aviation's progress in *every* category of air power.

CURTISS-WRIGHT
CORPORATION • WOOD-RIDGE, N. J.

World's Finest Aircraft Engines

General Irvine: The solution to this problem is not more laws, more regulations, more directives emanating from our Congress to the administration or those of us in the military.

It is a combination of two things. First, public knowledge, our free press, writing out the facts of life about people who are abusing the American system, and second, the great American enterprise system, the great leveler. "Can you meet the payroll?" It is the deal across the bargaining table at the business level, between the Air Force contracting officer and the representative of the company. If any company is running around with the silly idea that they can long continue with ten or fifteen percent more engineers than appear necessary for the problem, they are going to find themselves justifying this solution twice—first to the contracting officer, and secondly the long wait for the Renegotiation Board, which takes a second look.

So in this area I think we have a self-policing system that will eventually reward the people who are doing their job properly and provide, we trust, in the end, proper castigation for the others.

Dr. Walkowicz: General Cook, do you have a thought on that?

General Cook: The industry is just as interested in getting the greatest constructive and productive effort out of the existing scientific and engineering talents as are the services. Both of us are in this thing together.

Dr. Evans: May I ask this question, please? This is directed to General Irvine.

General, you quoted a friend as saying that this education should begin at the eighth grade. The National Aviation Education Council is devoting its interest and energies now to materials for the elementary schools and encouraging elementary teachers to use them.

How do you feel about where this interest should begin, where we should begin starting the interest of the boys and girls? And a second question is:

I presume aviation will stay with us long enough to know that by the time these elementary school children get through college and university they will still have an employment period.

General Irvine: I trust that we will have a long future and we will have an Air Force of some sort in the years to come.

I have a little boy who is seven. I think that is about the right age. If they are big enough to go to school, they are big enough to start learning about the facts of life, to learn about what you can buy with a quarter and the fact that somebody has to provide the food and the clothing. You can't start too soon in trying to train this little limb into the kind of a tree you want it to be.

You can't begin too soon, and you don't dare ever stop.—END

Manpower and Education

SCIENCE IN THE UNITED STATES

Dr. Edward Teller

PROFESSOR OF PHYSICS AND ASSOCIATE DIRECTOR, RADIATION LABORATORY, UNIVERSITY OF CALIFORNIA

Dr. Teller, who is often called the "Father of the H-Bomb," came to this country from his native Hungary, and was naturalized in 1941. He has taught at George Washington University, Washington, D. C., and at Columbia University. During WW II he served on the Manhattan District, which produced the A-bomb. He is a member of the AF Scientific Advisory Board and the Atomic Energy Commission General Advisory Committee.

TEN YEARS ago there was no question where the best scientists in the world could be found—here in the United States. Today, our leadership in science is challenged by Russia. Our contacts with Russian science and Russian scientists leave no doubt about this challenge.

If you extrapolate, you will have to say that ten years from now the best scientists in the world will be found in Russia. I am not saying that this will happen unless we take this or that measure. I am simply saying that this is going to happen.

The lead time in designing and making a plane is several years. The lead time in educating a scientist is longer. The men who will be the young productive scientists ten years hence are today in the schools at a reasonably advanced stage. Their ideas, their attitudes, their abilities, have taken root, and are developing.

Of course, I do not know for certain whether I am correct. It is not possible to predict the future. But I will try to put before you the reasons which lead me to such a gloomy prediction.

We know something about the Russian system. We know that they want to change the world. We know that they want to change the world by forceful methods, that they want to change it into something that is repugnant to us. We also know that they are convinced that they are right.

Theirs is an idea: To change the whole structure of society in an age of technological development. Technology, in my opinion, is something different for them from what it is for us. For them, technology is an absolute necessity at all stages and at all levels. And at the same

(Continued on page 104)

ACCURACY!

CLIFTON PRECISION SIZE 8 SYNCHROS

LOOK TO CPPC FOR SYNCHRO PROGRESS cppc

CLIFTON PRECISION PRODUCTS CO. INC. Clifton Heights, Pa.

time, and more importantly for them, technology and the scientific basis of technology are a complete justification of their system.

The result is that in their society the best technical people, the best scientists, occupy a very high position indeed, high in the material sense and high in prestige.

I have no doubt that in their development they make mistakes. Some of these mistakes are very great. And I will mention one mistake: They are considering science almost as they would consider religion. As a religious question, Russian science is not free from really heated controversy. Those scientists whose ideas do not conform to the philosophy of dialectic materialism are treated roughly.

In Russia there is no freedom of thought in science any more than there is freedom of thought in politics. You know of some of the manifestations. You know that there has been a purge of those biologists who believe in Mendel's laws. It is less well known that those physicists who taught and publicly discussed relativity, quantum mechanics, the fundamental ideas about the structure of matter, have also been considered heretics. In a philosophy which is based on materialism, it appears to be very dangerous to get any new ideas as to what matter is. What Marx did not know about matter is necessarily wrong in Russia.

Now, lest you carry away a mistaken conclusion, I have to inform you that this point of view, this completely crazy attitude, has been recently corrected. Since Stalin's death one can talk in Russia about quantum mechanics. There also appears to be some evidence that in the last two years no Russian scientist was sent to Siberia.

I do not think that the basic Russian system has changed. If anybody should have doubted that a few months ago, there is plenty of evidence now that things have not really changed. But the worst mistakes in the restriction of scientific freedom of thought apparently have been corrected in Russia.

There is no doubt that scientific development in Russia was fast in the past years. There is little doubt that with greater freedom for scientific thought, the development will be faster from now on.

Now, let us turn around and look at the scene in our own country. We are faced with a difficulty. In my opinion the difficulty is great, and the difficulty is deeply rooted in the way this country is put together. And I should say the difficulty is deeply rooted in the very virtues of this country, which I would be the very last to want to change.

This country is a democracy. It is not only a political democracy; it is also an economic democracy. The most important things are the things that can be enjoyed by everybody. The most important production is the production which makes goods for every one of us. This is how it is. And this is, in my firm opinion, how it should be. I have seen other parts of the world, and none is better than this country. None comes close to it.

But you now take a look at science. In fact, you take a look at any intellectual activity. To enjoy the fruits of science, to enjoy art, literature, the best that the intellect can offer, you cannot just come and take it. You have to work for it. You have to have some education. The more education you have, the more you enjoy all the things that others have done in science, in art, or in literature.

When it comes to intellectual and scientific accomplishments, to say it very simply, and perhaps slightly to understate it, the enjoyment that the scientist can offer to the public is not quite as great as the enjoyment that a movie star can offer.

It is natural that this should be so. Consequently scientists, and other intellectuals as well, are regarded in this country in a somewhat peculiar way.

Now, let me make quite clear what I mean. The statement has been made, and repeated, that America is anti-intellectual. I do not believe this is true. Such a statement has nothing to do with truth. But something else is true, in my opinion, which is perhaps as serious, perhaps even more serious. Americans as a whole, the great number of people who determine the future of the country and who *should* determine the future of the country, are an-intellectual. "We are here; you are there. We don't really care for what you are doing."

This is not the atmosphere in which the highest accomplishments can flourish.

It has been stated that our children should study science. How shall we persuade them to do it? I have a boy. He is fourteen years old. He knows that I get a lot of enjoyment out of the work I am doing. So he is interested in science. He also appears to be quite a clever little boy. And I mean not just in scientific lines. I found out that in school he hides his interest in science. He explains to me—and I am afraid that he is right—that if he would let his fellow students know that he is interested in science, they would tease him.

I asked him: "If you should be better than the others in football, would you be reticent about it?"

"No, that would be all right," he said.

Well, I think with that attitude we should create the best football teams in the world. The kids learn techniques from each other. Their interest will turn in that direction.

But as far as science is concerned, if someone is more interested than the other—he is a "square"!

Now, let's take a look at the squares, or to use an older and more expressive term, the "high-brows." The American public has added this beautiful word to the language, and thereby invented not only the word but the high-brow himself.

You see, if a person is interested in an intellectual pursuit, it takes quite a bit of energy. It cannot be done except with a lot of love, with a lot of emotion.

If he finds that most people are not interested in what he is doing he is only too frequently driven to say: "You don't give a hoot what I am doing. I don't give a hoot what you think of me. I will talk only to people who are similar to myself, and I will talk to them in the way in which I please to talk. We are the high-brows. We are not particularly interested in how to get practical things done. We are even less interested in explaining what we are doing. We are only interested in talking to each other and we talk in polysyllables."

Not all of us think in this way, but unfortunately many of us do.

What should be done? What is the remedy? The answer is clear but it is not an easy remedy to take, and I do not offer the prescription very happily.

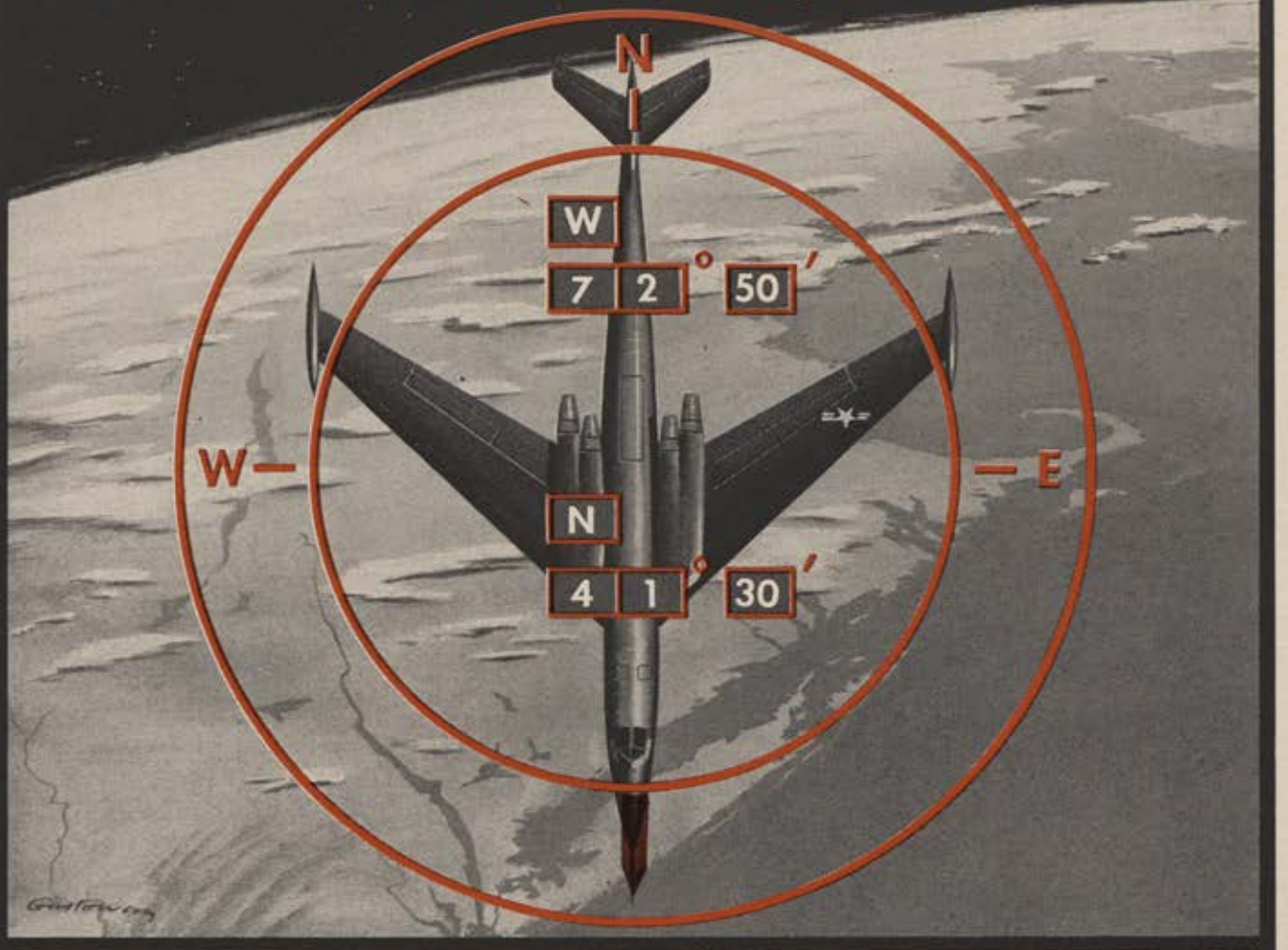
Somehow or other, we must bridge the gap, the great separation, the schism, between the intellectuals on the one hand and the man in the street on the other hand.

Many things have to be done, and one important point is to raise the salary not only of the scientist who is working for industry but the salary of the teacher, particularly of the science teacher in high school.

I would like to tell you what I think about the teachers and who are the best teachers. It has been argued that

(Continued on page 107)

another example of how **RYAN BUILDS BETTER**



NOW! AUTOMATIC NAVIGATION FOR GLOBAL JET FLIGHT

An advanced system of aerial navigation, with the speed and precision demanded by high speed jet flight, has been developed by Ryan under sponsorship of the Navy's Bureau of Aeronautics. Using continuous-wave radar, in which Ryan is a recognized leader, the Ryan AN/APN-67 navigator will enable fast-flying military planes and future commercial jetliners to travel to any point on the earth's surface with new accuracy and speed.

Instantaneous in operation, the Ryan navigator gives the pilot his position (latitude and longitude), *ground* speed, *ground* mileage, drift angle and *ground* track in continuous, readable form. No computations are necessary. The equipment is compact and self-contained. No ground facilities are employed—no wind information or aerological data are needed.

This significant contribution to jet navigation is typical of the work which Ryan and the military services are accomplishing in other fields of electronics research such as supersonic missile guidance for the Air Force and helicopter hovering devices for the Navy.

Electronics engineers will find a challenging future with outstanding opportunities at Ryan

BUILDING AVIATION PROGRESS SINCE 1922

Aircraft • Power Plants • Avionics

Ryan Aeronautical Company, San Diego, Calif.

Ryan

THE "EYE" *that sees in the dark is* INFRARED

Hayes Aircraft Corporation has a competent staff of infrared scientists and engineers which is conducting research and development programs calculated to advance the frontiers of infrared physics. Much of this work of course is classified, and Hayes respects the needs of national security.

However, if you have an unusual technical problem which might lend itself to a solution utilizing the tools and techniques of infrared physics, we invite you to present your problem to the Hayes infrared radiation staff for consideration and analysis.

Hayes is a fully competitive company, employing more than 8,000 people. Without a doubt, it is the fastest growing aircraft company in the United States.

TO SCIENTISTS AND ENGINEERS

Infrared physics is but one of the sciences presently being explored by the Hayes scientific staff. There are many challenging positions open here to personnel qualified in the fields of infrared physics, spectroscopic analysis, physical chemistry, kinetic molecular theory, semi-conductor research and development, thermodynamics, fluid dynamics, and kinematics, to name a few. Mail a resume of your training and experience to Director of Personnel.

Hayes
AIRCRAFT CORPORATION
BIRMINGHAM, ALABAMA

ENGINEERS • DESIGNERS • MANUFACTURERS

the best teachers are those who know best how to teach. They do not need to know their subject. I think this is nonsense.

I have also heard that the best teachers are those who know their subject. This helps, of course.

But I think the best teacher is one who is thoroughly interested in his subject, and who can transfer to his students the feeling that one can enjoy science. If the student is confused, it is not half as bad as if he is bored.

We men, so I hear, are descended from monkeys. If we see somebody having fun, we try to imitate him.

On the part of us scientists, it is absolutely necessary that we put our ideas in simple, understandable, clear-cut terms before the general public. I know we are going to be given the chance. And I hope that many of us will take advantage of it.

I often wondered about the expression "exact science." What a forbidding word! Bookkeeping should be and is exact. Science in a way also must be. Because some of the things that we discover in science are so fantastic that nobody would believe it, not even a scientist, if one would not be exact about it. To this extent, exact is the word. But to some extent words like "imaginative" and "amusing" should enter.

I promised that I was going to be brief, and I am afraid I haven't quite lived up to this promise. I am talking about things which are perhaps farther in the future. I am not talking about keeping the lead in science. For that, I am afraid it is too late. I am talking about recapturing the lead.

And I would like to say one thing, not as a definite plan, not as an argument. Probably it is an idea which does not really need support at present. But I want to mention it as an example: I am talking about space travel, about going to the moon. Why should we? I haven't found a good practical reason. I haven't found a good military reason. I don't know how good and practical Columbus's reasons were. In the end something practical came of them.

I myself would be most interested in such an enterprise. Maybe from the moon one could see the rest of the universe a little better. We would not be so much impeded by the smoggy atmosphere. Maybe we could find out something more about the origins or rudiments of life. But most important there is the interest in the unknown which is the mainspring and the true justification of all adventures.

Such an expedition will cost many millions of dollars. There is no military requirement. I ask you the question: Shall we do it? Shall we propose to spend billions of dollars of Air Force money without a clear-cut military reason? The budget is tight. Shall we leave it to free enterprise? Maybe some association? Or shall we perhaps say that while there is no military requirement, the methods are so closely tied up with military work that nobody outside the armed forces should be permitted to work on space travel?

So far, I haven't obtained a clear-cut answer to such disturbing questions. I am a little worried that if scientific development continues along the present lines, the first close-up pictures of the moon will be brought back by others than Americans!

QUESTIONS

Mr. Jones: What you say is very sobering.

I would like to have you dwell a little bit upon this freedom of thought. Much is said about the engineering approach and this freedom of examining the problem. Many people have said that this freedom is what will save progress.

You have said this is not going to happen. I would like you to enlarge upon this.

Dr. Teller: I would not dare to say that this is not going to happen.

I did say that it has not happened yet. What is going to happen is perhaps a little hard to predict. I am sorry that I did not bring a certain book along. Had I known that question would be thrown at me, I would have.

Many of you probably have it. De Tocqueville wrote, as you know, a beautiful book about democracy in America approximately one hundred twenty years ago.

Will you look up the last page of the first volume, in which he says approximately this: "The time will come when 150 million people will live in the United States." He does not say when. He describes that time a little bit. And from the number of people, we recognize that it must be close to our time that he is talking about.

Then he says, "All countries in the world have slowed down in their development, only to go ahead without any abatement of speed."

He speaks of the United States and Russia. And this was written in 1835. "The two countries are very different. The Russians' enemy is man. The American's obstacle is his nature. The one will develop in the direction of tyranny, the other in the direction of freedom." The rest is uncertain. But this thing is certainly true, says de Tocqueville, "that the time will come when each of these nations will sway half the globe." This is something which a careful political observer predicted many years ago.

Dr. Walkowicz: General Irvine has a son just about the age of Dr. Teller's son. Do you want to discuss the question of motivation?

General Irvine: I think Dr. Teller has covered this quite well, and much better than I could.

I do feel, though, that the motivation of our children, as soon as they are able to understand, is necessary in this country if we are to play with the competition. They have their methods of motivation, their methods of regimentation of the minds of people. And there must be some limitation.

In ours there is none but the skill and the intelligence of the parents.

Art Adams (American Council on Education): I believe that there is general acceptance of the conspicuous truth of the statement that a central job in providing more highly qualified people is to give more pay and status to teachers, both in the schools and in the colleges.

It strikes me as being equally clear that the only source of the money to do so must come from the American people, either in the form of gifts or in increased taxes.

The question is: Do you think people, like the individuals in this room, are sufficiently convinced of the importance of the issue to take some real initiative and action in providing the necessary funds?

Dr. Teller: I do not feel myself competent to say precisely how the necessary money should be provided. I have too little experience in matters of this kind.

I certainly hope—and I think I can answer with some confidence—that we are all convinced of the necessity of a scientific foundation, without which a future technology cannot be imagined.

I believe that the American people will find the necessary money, once the right kind of ideals are put before them. And I hope that you will feel that the right kind of ideals have been put before you, and that all of you will have them.—END

THE JET AGE

Flow of Information

DEFENSE DEPARTMENT POLICY

Philip K. Allen

DEPUTY ASSISTANT SECRETARY FOR PUBLIC AFFAIRS, DEPARTMENT OF DEFENSE

Mr. Allen has held his present position since February 1956. He joined the Defense Department in 1955 as executive assistant to the Assistant Secretary of Defense for Legislative and Public Affairs. Born in Walpole, Mass., he was graduated from Yale University in 1933. He served in the Army in World War II and was separated as a lieutenant colonel. From 1946 to 1948 he served as a member of the Massachusetts State Senate.

THE matter of assuring the free flow of information is of vital importance to all of us—whether inside or outside of government. This flow of information, directly or indirectly, affects the thinking and actions of people in all segments of our society, both as individuals and as participants in federal and local government, industry, the professions, and our schools.

Certainly, it is essential to the survival of our democracy that the public be kept adequately informed about the activities of its government. The fundamental policy of this Administration and the Department of Defense in this regard is to exert every effort to make available the maximum amount of information, and to restrict access to information only in those instances where, after careful consideration, restrictions authorized by law are required in the national interest.

I believe that the attitude of the department as to its basic responsibility in this matter is well summarized in the following statement of Secretary Wilson, which was issued to the entire department in March 1955.

"The people of the United States are properly interested in the Department of Defense and the steps it is taking to protect the national security. The Department of Defense has an obligation to inform the public, within the limitations of security and policy, with respect to the department's activities and to provide the public with accurate, factual and other proper information regarding the Army, Navy, Air Force, and Marine Corps."

This obligation we are trying to carry out with maximum effectiveness. We know that we are not batting a thousand. We would like to improve our batting average more quickly than we are, but we also know that we are not as bad as many of our critics would make us believe.

The fundamental dilemma faced by all agencies of the government—the Congress and the Judiciary, as well as the Executive branch—is how to make the maximum amount of information available to the general public without at the same time jeopardizing the security of the nation, impairing the operations of the government, or improperly benefiting or injuring particular groups or individuals. Therefore, to start with, we must recognize that, throughout government, a balance must be maintained between two inherently conflicting principles, neither of which, I am sure we would all agree, can be ignored.

Next, it must be recognized that there is, unfortunately, no scientific formula which will automatically separate all the items releasable for publication from those that are not. Generally, case-by-case handling is required, because the ultimate decision depends upon many factors. These include not only the subject content of the information, but also the status of the would-be recipient of the information, the purpose for which the information will be used, the time of its release and sometimes other factors. The permutations in these cases are almost infinite. For example, a particular item might, *at exactly the same point in time*, be made fully available to Congress, fully or partially available to another government agency, not available at all to the general public, and yet partially available to certain industrial firms or scientists.

With no mathematical formula for automatically testing information and confronted by complex and intangible factors, the exercise of judgment becomes the decisive factor. This judgment is all important and cannot be overstressed. Yet it must be recognized that, as Congressman Moss stated during recent hearings on this subject—"You can't legislate good judgment." I might add that neither can you obtain it by mere administrative command.

Now let us briefly examine this judgment factor. I think you will agree with me that reasonable and intelligent individuals, having possession of the same facts, can and will honestly differ as to what constitutes proper judgment in any given situation. Yet, I am sure it is just as clear to all of us, that a government official having responsibility for making the decision cannot abdicate this responsibility just because there exists a difference of opinion.

In cases limiting access to information the likelihood of misunderstanding is increased by the fact that one of the parties—the would-be recipient—cannot always be given all the facts entering into the judgment. To do so would—

as a practical matter—nullify the decision. This is especially true where information is limited for reasons of military security.

At this point—and perhaps at the expense of assuring my location "inside the boiling pot"—I would suggest that the extreme disappointment of a person failing to obtain the requested information accounts to a large degree for the conclusion so often reached that the judgment rendered was bad, uncalled for, and arbitrary. This reaction is understandable and natural since information would probably not have been requested if the person thought publication would be improper. I submit that it does not necessarily follow, nor do I believe that that person would so contend, that all such denials were actually erroneous.

I believe that there is one additional basic matter as to which a great deal of honest misunderstanding and confusion exists on the part of the general public—as well as of some members of the Congress and of some information media. This is the assumption that the only valid and appropriate limitations upon access to government information are those required by military security.

This assumption is fallacious. It ignores the responsibility of the government, to which I briefly referred earlier, for safeguarding certain non-military information to avoid either impairing the operations of the government itself or improperly benefiting or injuring particular groups or individuals. I am sure that if we will stop and reflect, we can all agree upon the soundness of requiring such protection with respect to several types of information.

For example, as the Congress has recognized by many statutes—and some of them contain criminal penalties—information received in confidence from industrial firms concerning their trade secrets, finances, and methods of operation must be safeguarded. Likewise, advance information on proposed plans of the government to acquire real estate must often be protected in order to avoid improper speculation or special benefits to private or personal interests. Additionally, there are types of information primarily affecting individuals whose right of privacy should normally be protected, as in the case of income tax returns, medical records, and loyalty investigation data. With respect to the government's operations, aside from such obvious matters as avoiding improper speculation resulting in a loss to the taxpayers, there are matters of protecting information, the release of which, at a particular time, might jeopardize the government's own interest in investigations or litigations.

I am not attempting here to detail all of the situations concerning the non-military type of information which requires protection, and, not being a lawyer, I do not intend to engage in discussion with respect to the various legal nuances involved. The important point I am trying to make is that I believe a great deal of confusion would be eliminated if people, in discussing this problem, would recognize that an area of non-military information requiring protection does exist and would therefore cease giving support to the contention that the only type of information requiring protection is that involving military security.

It is my personal opinion that this very basic misunderstanding has been responsible for the unfortunate tendency, on the part of some disappointed would-be recipients, to characterize the exercise of judgment by the responsible official as an illegal or improper act.

Another important fact—which is often lost sight of and which applies not only to non-military information not available to the general public but also to classified military information—is that practically all of such information *is* available to the people's elected representatives in the Congress. Thus, while this information cannot be made available to the general public, Congressional committees, to whom the information is made available in executive session, are able to protect the public's interest by checking on whether the government's activities are being conducted with propriety and efficiency.

I said "practically all" since, of course, there have been occasions, beginning in President Washington's administration, and there undoubtedly will continue to be instances in the future, where some information in the Executive branch is withheld even from the Congress pursuant to the Constitutional doctrine of the separation of powers.

The doctrine of separation of powers, of course, applies equally to all three of the great branches of our government—the Legislative and Judicial—as well as the Executive. Hence certain information as to the internal operations of each branch may be denied to the others where such denial is deemed necessary to preclude encroachment by one of the branches upon the powers and prerogatives of another and to protect the public interest. Thus, for example, internal discussion among members of the Supreme Court in reaching a decision, or by members of a Congressional committee in executive session, are normally not publicly disclosed, nor would they have to be furnished upon demand to one of the other three branches.

In connection with this matter a great deal of publicity has been given to the President's letter of May 17, 1954, to the Secretary of Defense. Among other things it has been characterized as "one of the greatest threats to freedom of information in our times." In my opinion, a calm reference to history will show that the letter merely reflects basic principles which have been asserted and followed in our government since Washington's time.

These principles existed and were well known on May 16—the May 17 letter merely reaffirmed them. Furthermore, even a casual reading of the May 17 letter will show that the President placed primary emphasis on the policy that the Executive branch must expeditiously furnish information to assist the Congress in achieving its legislative purposes, and upon the great importance of full cooperation of all branches of the government with each other.

Another matter, which in my opinion also contributes to the general confusion by being overlooked, is the frequent failure to differentiate between (1) the situation existing as to dissemination of information in response to public request, and (2) the dissemination of information generated by a government agency itself in fulfilling its own affirmative obligation to keep the public informed as to its activities. In other words, distinguishing between cases of requests for information by newspapers and magazines as contrasted with speeches and press releases generated by the department itself.

In the latter situation, naturally, any government agency must, for several reasons, be somewhat selective in the information it generates for publication. First, is the fact that it must not engage in "propaganda." Second, its activities must fit the limitations of funds and manpower permitted it for information activities by the Congress. Accordingly, within the framework of the two above principles it must exercise some judgment as to the matters which should, on its own initiative, be brought to the attention of the public.

Certainly, in some cases, one will find on looking back that some information of general interest was overlooked or incorrectly considered unworthy of publication. Yet, I do not believe it is fair to characterize such lack of publication as deliberate withholding for concealment purposes. It is a difficult problem especially in a large agency like ours. I might also point out that, often, when much information is disseminated, charges are made that the particular government agency is "papering the walls"

(Continued on page 111)

Trouble wasn't spelled that night

. . . THANKS TO ALL-STEEL DURABILITY!

When someone inadvertently turned off the cooling system, it surely spelled trouble for this Jet Test Cell Silencer! It glowed *cherry red* (approx. 1500°F) and lit up the area like a christmas tree! But, although mufflers made with fibrous materials would have been *totally destroyed*, inspection the next morning showed that the DURA-STACK was *totally unharmed*, proving that –

The DURA-STACK Jet Engine Silencing System is available for Ground Run-Up Mufflers, Jet Engine Test Cells, Overhaul and Repair Test Stands, Experimental Engine Facilities and Aircraft Enclosures. It is adapted to meet particular government requirements.
Acoustically, IAC DURA-STACK performance is designed specifically for the jet engine noise spectrum. With a nearly flat response, it is no longer necessary to buy unrequired amounts of attenuation to obtain the low frequency noise reduction needed for good community relations.

the DURA-STACK

All-Steel Jet Engine Silencing System is the only system devised to take the high temperatures and velocities of modern jet and rocket engines!

Full Details Will Be Furnished Upon Request

Aviation Division

INDUSTRIAL ACOUSTICS COMPANY, INC.

341 Jackson Avenue, New York 54, N. Y. Tel: CYpress 2-0180

with a lot of useless and worthless information at a waste of the taxpayers' money. So, you see, there are dilemmas within dilemmas. To paraphrase Gilbert and Sullivan—an information officer's "lot is not a happy one."

The other situation to which I alluded—the matter of responding to requests for information—is something else. Here, obviously, the only limitations applied should be those authorized by the Constitution and statutes to protect national security and safeguard other information, the publication of which would be against the public interest. Obviously, no other information should be withheld solely because it would reveal error or otherwise be embarrassing.

Now with respect to the Department of Defense, I think there are several special matters to be considered, which I will attempt to outline briefly.

First, I think you must agree that the very nature of the mission and operations of the Department of Defense must, of necessity, result in its possessing a great deal of information affecting military security which cannot be given general publication. Moreover, the large number of its employees—think of the millions of the personal files involved—and the diversity of its operations result in its possessing much non-military information which must be protected. In addition, we, like other government agencies, must adhere to policies established outside of our department such as those set forth by the President himself, the National Security Council, or similar authority.

Consideration must also be given to the fact that today military plans and programs are inextricably intertwined with foreign policy. We cannot overlook, in evaluating information from a national security standpoint, the factor of possible jeopardy to our foreign relations and the collective security arrangements in which we participate in our own defense interests. This factor requires that we obtain the advice of the Department of State in formulating many of our decisions.

Another special factor, which, of necessity, affects Department of Defense application of safeguards for information, is the existence of the "cold war." While we are not engaged in a "shooting war" we are certainly not now enjoying "peacetime" in the normally accepted sense of that word. Present international tensions, the nature of modern warfare, and the telescoping of time and distance in the military sense, have all created circumstances where information itself can be a vital weapon. Here, obviously, possession by a potential enemy of information as to our plans and capabilities could be a most decisive factor and of more value to such an enemy than its actual possession of military hardware.

We have one last and very special problem—one unique to the Department of Defense—which stems from the fact that we have three great military departments with separate traditions and differing missions. The natural and healthy competitive spirit on the part of these members of our defense team in maintaining and furthering their respective service's loyalty, tradition, and efficiency creates certain difficulties in the information area, the existence of which we have all experienced.

I do not believe it is any secret, and I believe it is most reasonable, that the Department of Defense insists that the zealous spirits of a particular service not be carried beyond the bounds of security, dignity, and propriety. Such a policy is necessary to protect our defense interest and maintain our defense team in an effective state. I am sure that no one would contend that freedom of speech includes the right to breach security. Neither do I believe that it is a violation of freedom of speech to expect employees of a government agency—or a private business firm for that matter—while employed—to support the policies of their agency or their firm and to conduct public discussions of policies and activities with the propriety normally to be expected of employees of any organization.

I should also like to make a few observations with respect to a frequent charge that the Department of Defense pursues a deliberate policy of "keeping the lid" on public utterances by its key officials—particularly in the military departments—and of "arbitrarily censoring" substantial amounts of proposed speeches, etc., of such officials.

In my opinion, this charge is without foundation. For the reasons I have outlined above, obviously, material which would violate military security must be eliminated from such proposed speeches. Likewise, other material of a non-security nature, release of which would be incompatible with the public interest, must be removed. In an organization as large as the Department of Defense, it is not possible for every individual to be conversant with all the policies of the department on all subjects. It takes the review of specialists to provide assistance to top officials in covering these numerous and varied considerations. Accordingly, they rely upon a final review by our office, which effects such coordination as may be appropriate.

It is my sincere belief that more light and less heat is needed by all parties concerned. Successful accomplishment of the objective of meeting fully the public's "right to know" depends upon effective cooperation by all of us —the government, the information media, industry, and the general public itself. Cooperation in any field, in my experience, cannot be achieved in the absence of an atmosphere of mutual understanding and respect for the other fellow's problem.

I do not believe that we have achieved such an atmosphere as yet. I think this is primarily due to certain of the basic factors which I mentioned earlier. One, the failure to recognize the existence of valid limitations required to protect certain non-military information. Two, the failure to recognize the important part the judgment factor must, of necessity, play. Primarily as a result of both of these failures, there has been an unfortunate tendency too often to characterize the valid exercise of considered judgment by responsible government officials as an illegal or otherwise wrongful act.

I do not wish to be misunderstood. I am not quarreling with the disappointment on the part of a person to whom information is denied nor with his disagreement as to the correctness of a decision. I am in no way contending that all judgments exercised by government officials are the best judgments, or even correct judgments, or that their decisions should not be questioned. I do feel very strongly, however, that in the absence of supporting facts, it is dangerous—in the long run for all of us—to impair the people's confidence in its government and to impugn the character and motives of responsible and loyal public servants merely out of a sense of disappointment or disagreement on a matter of opinion or judgment. Certainly, there has been much of this, and I do not believe that such an attitude is conducive to obtaining the atmosphere required for calm and considered study of the problems which do exist and the mutual understanding without which they will never be solved.

There has been, and undoubtedly will continue to be, differences of opinion with respect to the judgment exercised in these matters. This is healthy, and alertness in this respect, on the part of the information media, the

(Continued on following page)

Congress, and the general public keeps our government officials on their toes and helps to prevent abuse of authority. It is, nevertheless, a very human trait in all walks of life for us to think that we can do the other fellow's job better. Occasionally, we find ourselves in the other fellow's job and things look a little different. At least that has been my own personal experience in changing from a desk formerly situated in the legislative branches of federal and state government to my present one in the Executive branch.

In conclusion I should like to re-emphasize that the Department of Defense is very conscious of its responsibility to make the maximum amount of information available to the public. As you probably know, many of the specific matters touched upon here today are under active study at this very moment by the department in connection with implementation of the recommendations made to Secretary Wilson by the Coolidge Committee on Classified Information. I can assure you that the department will continue its efforts to improve wherever possible the means and methods necessary to assure the free flow of information to the public.

QUESTIONS

Mr. Koop: I do not think any of us can disagree completely with what Mr. Allen has said. In fact, if his speech were put out as a directive of the Defense Department, I would feel somewhat happier about the situation than I do today.

He read us a portion of Secretary Wilson's directive in March 1955, but he did not read the portion of the directive which said "only constructive and interesting information can be released," and as far as I know, that regulation is still in effect. I wonder whether Mr. Allen would not think of turning the situation completely around, instead of taking a negative approach to the release of information, which I feel the Pentagon has taken, take an affirmative approach and have the department release all information except that of a security nature, involving certain scientific categories and things of that nature.

Mr. Allen: This so-called constructive contribution clause in the Wilson directive applies, of course. However, it only applies to matters which are generated in the Defense Department and not outside.

The question of an affirmative stand with respect to the information which governs the Department of Defense, I will agree with you, is an extremely important one, and I think if you read all of that directive, it is pointed toward that particular fact.

I think you have taken out of that directive—it is a phrase—"the constructive contribution" phrase. Yet, if you will look at the rest of that directive, I think you will find that it sets out just what you suggest.

We put out all the information we can within the bounds of security, and that is the non-military information of which I have spoken.

Mr. Greene: My question in no way implies any criticism of any individual. I hope they are all friends of mine. It pertains to the system.

I recall when President Eisenhower was stricken with a heart attack. I think the last thing he said before he went to the hospital was to tell Jim [Hagerty] to take over.

Now, if the need for information is so great—and we all agree it is—why is it not possible for the Defense Department to set up an information office—an information system of sufficient capacity and capability to handle the situation?

The situation as it exists today would not be tolerated for five minutes by some of your larger corporations, such as General Motors.

I think the public is entitled to have an information officer who has access to his chief and who can speak for him as Jim Hagerty speaks for the President.

Now, if the President can do that, why can't the Defense Department?

Mr. Allen: In my year in the Defense Department, I feel that Mr. Wilson has had press conferences where he has been completely open to questioning, and all of his conferences have been unmonitored.

I believe, as far as being close to him, I have perhaps not occupied exactly the same position with him that Mr. Hagerty does with the President, but I can tell you that I can be with him whenever I wish to. I think that perhaps his system is slightly different from the President's, but I think Mr. Wilson in his press conferences is open and available for any questions and all questions.

Mr. Greene: It is not a matter of press conferences. President Eisenhower has gone weeks without press conferences. It is a matter of day-to-day business policy. I am not talking about little things. We can reach Mr. Hagerty when we want him and get a policy decision. We do not have that same system in the military establishment.

Mr. Allen: Well, I have no answer really for that, except to say that certainly as long as I am in the position I now occupy, I will do as much as I can to bring this about.

Mr. Ellington: The basic point, so far as our end of this is concerned, is the inconsistency in the Defense Department, and I think the newsmen will agree with that also.

What I have in mind is that we are able to give a subcontractor or a supplier certain information about a project and at the same time we are required to keep that information from the public.

Now, the subcontractor or supplier may not have anyone in a security classification, and that information which we transmit to them may become general knowledge to people who may be security risks. We are in a position of withholding this information from the general public, and at the same time we are giving it to other sources.

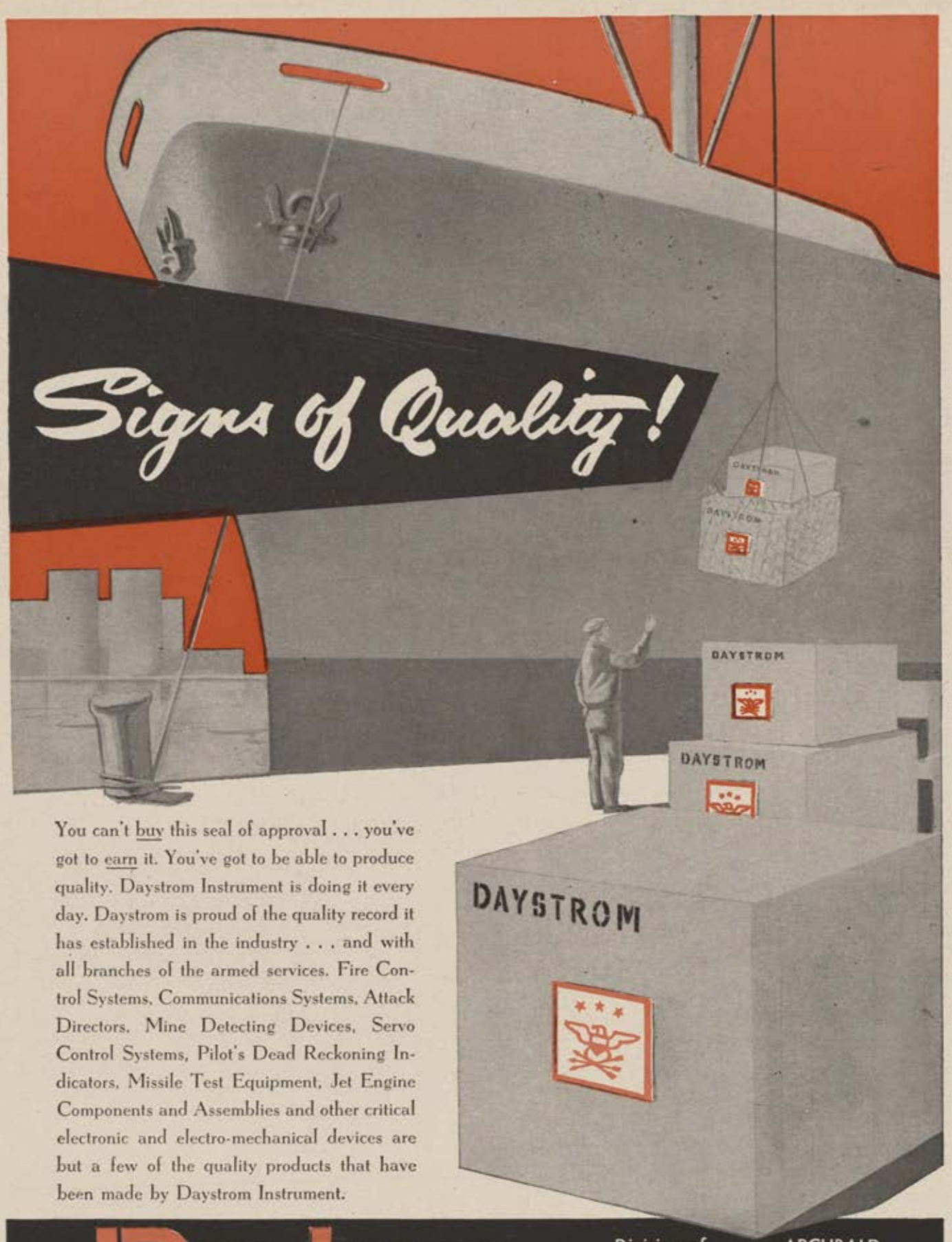
Another point involves a situation which I think has become prevalent more recently. I met this week with a number of my colleagues, and we are faced with a concept which involves a change in the method of procurement. Instead of having one or two or three experimental planes going into production we may have fourteen or fifteen, and even sometimes they are still classified as an experimental plane under the weapon system concept, even when we have the plane in production, and we have to withhold all information on those fourteen or fifteen planes. It may be true that eight or ten different bases around the country are doing various types of tests on the plane, and then they get down to the public airfields and are transported around the country.

This whole idea of withholding this information seems to be inconsistent, and I would like to ask Mr. Allen what his feeling about the system is. . . .

Mr. Allen: The only thing I would say in connection with that particular matter on subcontractors' information, as opposed to giving it to the general public, I suppose you take a calculated risk—that information is not such that it would be extremely harmful. There may be a difference in the information so that it might not be extremely harmful and therefore you could give the information to a unit which is perhaps not cleared.

Is that what you are talking about? The subcontractor has people in his organization who are not cleared or the

(Continued on page 115)



You can't buy this seal of approval . . . you've got to earn it. You've got to be able to produce quality. Daystrom Instrument is doing it every day. Daystrom is proud of the quality record it has established in the industry . . . and with all branches of the armed services. Fire Control Systems, Communications Systems, Attack Directors, Mine Detecting Devices, Servo Control Systems, Pilot's Dead Reckoning Indicators, Missile Test Equipment, Jet Engine Components and Assemblies and other critical electronic and electro-mechanical devices are but a few of the quality products that have been made by Daystrom Instrument.

DAYSTROM INSTRUMENT *Division of Daystrom Inc.* ARCHBALD, PENNA.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS

IN ASIAN WATERS—Aboard the U. S. Navy aircraft carrier *Boxer* off the coast of Japan, sonar-equipped Sikorsky HSS helicopters carry out anti-submarine exercises. The commercial version of this helicopter, the S-58, is active offshore in the Gulf of Mexico flying men and material to oil drilling rigs.

ANTARCTIC OPERATIONS prove the ability of versatile Sikorsky helicopters to work under extremes of climate and under unusually difficult maintenance conditions. Here a Sikorsky HO4S, one of four with Task Force 43, lands beside the icebreaker *Glacier* to pick up cargo.

AT FORT RUCKER, Alabama, the Sikorsky H-37A is being service-tested by the U.S. Army Aviation Board. Data on maintenance and logistics will be gathered, in preparation for the time when the Army flies large fleets of these twin-engined helicopters, each able to carry 26 combat-ready troops.

SIKORSKY AIRCRAFT
BRIDGEPORT, CONNECTICUT
One of the Divisions of United Aircraft Corporation

information which is given to the subcontractor is not classified?

Mr. Ellington: I must work on the basic assumption that was presented by Mr. Koop.

There is a positive approach to security releases which states that all material should be released which does not have a specific security application. This is an important basic philosophy which we veer from by enabling a certain group of people to have information, and this information is subject to being generally known, and yet the newsmen can't use it, even though they already know it.

Actually, we have people in our organization, engineers, people who have worked on projects over a number of years, and know that knowledge on these projects is available to the public, and yet they know that they cannot publicize the information on the projects themselves. This factor alone affects the morale in the company and it is a very important thing to us.

Mr. Allen: If you will permit me I would like to discuss this more fully with you and I will see if it is not possible to re-examine this thing, particularly this situation.

I would like to point out in regard to yours and Mr. Koop's remarks about inconsistencies—we have tried to put that into the releasability directive, 5236-12, which attempts on a factual arrangement to bring an item to the point where it can be released.

Mr. Ellington: Technically at least, all World War II airplanes are still classified.

Mr. Allen: We are doing everything we can to modernize our directive system.—END

Flow of Information

CONGRESSIONAL STUDY

Hon. John Moss
CHAIRMAN, HOUSE SUBCOMMITTEE ON GOVERNMENT INFORMATION

Mr. Moss, a Democrat, was elected last November to his third term as Representative for California's Third District, which includes the state capital of Sacramento. In addition to his chairmanship on the House Subcommittee on Government Information, Committee on Government Operations, he is a member of the Interstate and Foreign Commerce Committees. He served in the Navy in World War II and is a member of the Disabled American Veterans.

NEVER before in the history of American democracy has it been so necessary to lay before the people all possible information for making life-or-death decisions affecting the security of our nation. The complexities of the new age of jets, H-bombs, intercontinental ballistic missiles, and man-made satellites make it ever more imperative that the picture be clear and undistorted.

Survival itself is at stake.

Without all the facts as well as a full expression of conflicting views, control of the nation's defenses might go to the service with the best publicity bureau. The nation's survival could become the pawn of demagogues and propagandists.

Without a free flow of facts and opinions, Congress and the public can no better evaluate our national needs and policies than the housewife, bombarded by TV commercials, can determine the best brand of soap!

I do not believe the security of the nation can be gained through a negative attitude which says that all information of a remotely potential military nature should be secret unless proven otherwise. The best security is the security attained through superior achievement.

We are free men, living in a free nation. We grow and our nation prospers best in the atmosphere of freedom.

We cannot produce the foods, fibers, and machinery necessary to national security unless our scientists and technicians can trade ideas. If the stamp of secrecy hides the facts of science, our nation will not gain the technological breakthrough we are spending billions of dollars to achieve.

Subcommittee testimony has shown that the excuse of security currently is being carried to such extremes that the lid of secrecy is clamped on some ideas the moment they are born in the mind of a scientist. This effectively stifles the conversion of new basic scientific discoveries—like Einstein's—into practical applications such as atomic power. Many scientists have expressed the opinion that if present security regulations were in force in 1939, there would have been no atomic bomb to end World War II.

I want to make it abundantly clear that the Government Information Subcommittee most certainly does not advocate the disclosure of any information which would endanger national security. No one suggests that details about weapon systems or war plans should be disclosed. Rather, we feel the most reliable security system is limited to those items directly bearing on real military secrets. Unfortunately, the overzealous government censors, in an effort to avoid disclosure of information which might possibly give aid and comfort to the enemy, spend most of their time trying to halt information which would give aid and comfort to the American taxpayer.

The label of military secrecy must not be placed on non-military information merely because its release might embarrass a government official or cause a "controversy." The abuse of the privilege of security classification is not only poisonous to democracy, but it weakens the effective security required for true military secrets. It creates contempt for the entire classification system. It clogs the free

(Continued on following page)

exchange of ideas which nourish America's scientific progress.

The availability of sound information is the guiding thought behind the current study of the House Government Information Subcommittee of which I am chairman. Two series of hearings with Defense Department witnesses have shown that the Pentagon, which spends two-thirds of every tax dollar collected by Uncle Sam, has the most restrictive and confused information policies of any major branch of government.

Hearings will be resumed soon to find ways to overcome these serious shortcomings. Where legislation cannot do the job, the glare of publicity may force reform. To expose the abuse of secrecy may do more for our American form of government than all the laws Congress can write.

The misuse of security restrictions applies not only to military information but also to industrial and technological developments which have helped make our nation the world leader. Recently a Texas oil company wanted a special drill that had been developed by Russian scientists. In exchange for the drill, Russia wanted some technical information on drilling processes developed in the United States.

The Department of Commerce stepped into the picture. The department is not noted for its security agents, but whatever expert was assigned the problem decided it was more important to keep Russia from learning our drilling processes than it was for United States oil companies to get the special drill. The oil company scientists said the drill would help in explorations. We will never know, for "security experts" in the Department of Commerce refused to permit the exchange of information for the drill.

If the misuse of security restrictions had been applied to the transistor, many of today's compact defensive weapons would not be possible nor would industry have been able to develop some of today's products. If the transistor had been stifled by the cloak of secrecy, we might be using the small units in a missile or a space satellite, but the vest pocket radio and the hidden hearing aid would not have been developed.

Even the ideas of the theoretical scientist fall under the oppressive cloak of secrecy. A Massachusetts Institute of Technology scientist began work on an equation to show how long it takes a moving line to pass a given point. The line might be shoppers passing through a supermarket check-out counter, automobiles going through a turnpike toll gate, or airplanes stacked up over the National Airport.

He worked out a formula which showed what would happen to the moving line if a delay occurred—a delay like a housewife dropping her bag of groceries or a car getting a flat tire in the toll gate line. His formula wasn't perfect so he wanted to discuss the theories with a fellow scientist who had been working on the same subject in the mathematics department at Columbia University.

He couldn't. The Columbia scientist had thought up a similar mathematical equation under a Navy contract. A supercautious "security expert" in the Navy had classified the whole job—even the pure scientific reasoning—so every idea on the subject which popped into the Columbia scientist's head was automatically classified.

Overclassification may be a natural tendency among military men, whose business makes them prone to secrecy. But the decision to refuse information is made in many cases by non-military officials. Frequently the decision to restrict information runs directly counter to the advice of military experts who favor release of it.

In other cases, information has been withheld by dereliction rather than design. There is no penalty in the government for refusing information—no penalty for overclassifying information. But there are penalties for giving out sensitive information. Inevitably this leads to widespread abuse of the classification privilege.

Secrecy, the subcommittee has discovered, most always reflects the "attitude" of government officials who fear disclosures which might provoke controversy they prefer to avoid. Such an attitude was evident in the testimony before the Subcommittee of Assistant Secretary Robert Tripp Ross, presently on leave from his post as director of the Defense Department's public affairs.

Mr. Ross's reluctance to identify the government installations where liquor is sold to military personnel is a case in point. It wasn't an earth-shaking issue in itself, but it was indicative of an "attitude" which could strangle the democratic process.

Ross, in reply to subcommittee questions, conceded that the location of installations which sell liquor was not a military secret. But he said the information should be given only to persons with a "legitimate" interest in it.

The subcommittee takes no sides in controversies between the Women's Christian Temperance Union and the liquor industry. But it does insist that a Defense Department official must not invoke secrecy, even of an informal kind, to avoid controversies. Later, when called upon by the subcommittee to defend his "attitude," Ross conceded his error and made this particular information available to all comers—even the WCTU.

The Defense Department policy against telling the public the profits of concessionaires at the Pentagon is another indication of the "attitude" which seeks to hide potentially embarrassing or controversial information which is clearly non-sensitive. The department refuses to make public the contracts with department stores, drug stores, jewelry shops, and other firms which rent space in the Pentagon. The department claims that the contracts would reveal "trade secrets" which should not be given to the taxpayers who built the building and provide 30,000 "captive" customers for the stores in the Pentagon.

The "attitude" which permits unjustifiable secrecy is nowhere more evident than in the Defense Department's classification of military information. At desk after desk in the Pentagon, arms are moving up and down wielding rubber stamps to classify documents. There are very few—if any—Pentagon offices where a conscious effort is made to declassify the documents which no longer have military security value.

The subcommittee, in a recent report, warned that if the failure to declassify continues, the Pentagon may some day become no more than a huge storage bin protected by triple-lock safes and security guards. The subcommittee was told that at least 100,000 file drawers are stuffed with classified documents from World War II and before.

Not only do these documents contain information which may help prevent the horrible repetition of mistakes of previous wars, but their custody is a heavy cost to the taxpayer. The Defense Department has promised to see what can be done about removing the secrecy from this invaluable treasure of evidence and advice from the past.

Reversal of the attitude of secrecy which results in the censorship of history is easier said than done. An Army officer who was an expert in the history of the Intelligence Corps, wrote a book after World War II on that subject. Because of a general directive barring discussion of cur-

(Continued on page 119)

THE
AERO
COMMANDER

SPREADS ITS WINGS

IN THE NEW 560-E

This newest AERO COMMANDER provides the long range comfort and high speed performance demanded by today's busy, "on-the-go" Executive.

The COMMANDER's soaring, extended wing span teamed with new, powerful Lycoming High Compression Engines stands ready to whisk the flying Executive farther and faster . . . covering the miles coast-to-coast with but one stop.

The versatility of the AERO COMMANDER 560-E makes the necessity of long concrete runways a thing of the past.

As the latest member of the COMMANDER business fleet, this new long-range model incorporates advances in aircraft engineering coupled with the peak performance, beauty, and comfort that has made AERO COMMANDERS the most preferred executive aircraft in the industry today.

To obtain complete information concerning the 560-E or any of the 5 to 7 passenger business fleet AERO COMMANDERS . . . write or wire, AERO DESIGN & ENGINEERING CO, Box 118, Bethany, Oklahoma.

Those who know aircraft best
fly COMMANDERS

AERO Commander

AERO DESIGN & ENGINEERING CO

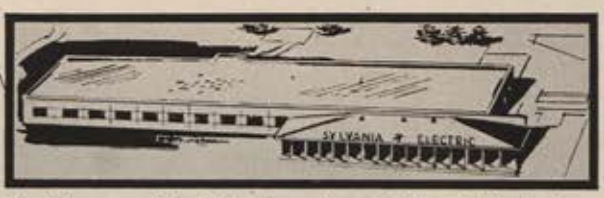
From the idea...

...to automated mass production

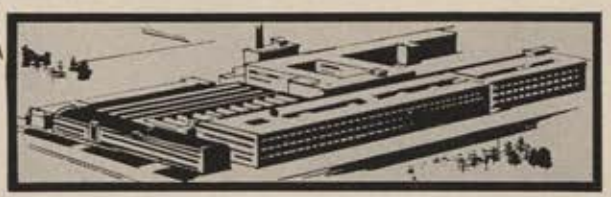
Headquarters for the Division, the Waltham Laboratories, in Waltham, Massachusetts, specialize in advanced systems related to guided missiles, avionics, radar, data processing and electronic warfare.

The Electronic Defense Laboratory, Mountain View, California, is a special development facility devoted to research, technical development and rapid fabrication of ground-based electronic warfare systems.

The Microwave Physics Laboratory, at Mountain View, California, is devoted to the investigation of new magnetic materials and ionized gaseous media for microwave control devices used in radar, communications and electronic countermeasures systems.



The Microwave Tube Laboratory, Mountain View, California, is engaged in developing and producing special tubes such as klystrons, traveling wave tubes, backward wave oscillators, and related devices.



Buffalo Engineering Laboratory and manufacturing facilities for the Division occupy some 170,000 square feet of floor space in this industrial center. The Laboratory specializes in the development of advanced communications techniques and equipments.

The Sylvania ESD family is equipped to carry out your electronics development programs . . . large or small.

Backed by the corporation as a whole, Sylvania's Electronic Systems Division has a long record of successful problem solving in both military and industrial electronics. It has made many important contributions in the fields of avionics, guided missiles, countermeasures, communications, radar, computers and control systems.

Staffed with top-ranking scientists and engineers, backed by extensive research facilities and modern automated mass production capabilities—the Sylvania Electronic Systems Division is a major contributor to our national arsenal for defense. Intensive specialization in the Weapons Systems concept has resulted in utmost organizational efficiency, as well as the highest order of technical and management competence.

Whether your project requires management or technical experience for complex integrated systems, subsystems, equipments or special components, from initial concept through mass production, Sylvania engineers will be glad to discuss methods of solving your specific problems.

SYLVANIA

SYLVANIA ELECTRIC PRODUCTS INC.
Electronic Systems Division
100 First Avenue, Waltham, Mass.

LIGHTING • RADIO • TELEVISION • ELECTRONICS • ATOMIC ENERGY

rent intelligence methods, the Army was asked to clear the book. The Army told the author it could not approve publication. He offered to cut out the section on World War II, and when this offer still did not result in removal of the ban, he promised to cut that portion of the history dealing with World War I. Still a flat denial. In the end, the author deleted the intelligence history war by war clear back to the Revolution, but the Army censors still were adamant in their refusal to approve.

The effort to censor history is further illustrated by the Navy's refusal to clear a recent story about the sinking of the cruiser *Indianapolis* which occurred during World War II. The Navy contended firmly and officially that publication of the story on the tenth anniversary of the sinking might discourage enlistments from youths too young to remember the tragedy. Apparently the youths of today do not know that a Navy ship can be sunk.

In the classification of legitimate security information, neither the Defense Department nor any other federal agency is following the procedure outlined by the President to declassify documents when they no longer have security value. Executive Order 10501, which outlines the procedure for classifying security material, requests that wherever practicable, classified documents must specify a date to be downgraded or stripped of secrecy. This Presidential requirement is almost wholly ignored by federal agencies.

Another indication of the widespread abuse of secrecy in government agencies is the use of restrictive stamps supposedly outlawed by the President's order defining specific secrecy classifications. The subcommittee found that since the Presidential order, federal agencies have dreamed up some thirty new terms to tag information to be withheld from the public. These include the stamp, undoubtedly familiar to most of you—"For Air Force Eyes Only."

The President's order abolished all classification categories except "Top Secret," "Secret," and "Confidential." What happened to all the documents which used to be labeled "Restricted"?

The testimony of subcommittee witnesses indicates that resourceful officials have found other subterfuges. Witnesses said that only a small part of information formerly labeled "Restricted" has been made public. Even a smaller part was found eligible to be stamped "Confidential" under Presidential rules.

It may seem like a small matter to complain about the many terms used to identify non-security documents kept from public view. But this welter of new terms again exemplifies the attitude of many government bureaucrats. Too often the attitude is similar to the ship captain's who wanted only silence—and damn little of that—and the government official dreams up a new label to put the attitude into effect.

When security regulations are continually abused, the system becomes a sham. This problem is worrying some of the top intelligence men in the Pentagon. They complain that uninformed administrators—often in other agencies, but sometimes in the Pentagon—are becoming "rubber-stamp happy." They say over-classification by unqualified censors creates contempt for the entire process.

The result of this attitude was shown in the subcommittee's study of the Office of Strategic Information in the Department of Commerce. The agency was created to handle the problem of information which couldn't legally be classified but which might be of strategic value to a potential enemy. Although the agency was directed to deal only with non-secret information, it adopted a cloak-and-dagger attitude. It claimed that the National Security Council order setting up the agency was so secret it couldn't be discussed.

National Security Council officials agreed with the subcommittee that it looked foolish to make secret the directive setting up a non-security agency. Officials of the Office of Strategic Information admitted they had no authority to make other agencies restrict the flow of information and that they weren't experts in the field, anyway. To end the confusion—and for other reasons—the thirty members of the House Government Operations Committee unanimously recommended that the agency be abolished.

And so the temptation to impose secrecy persists throughout the government. Its most fertile field, however, is in the military where the excuse of security can be used with comparatively little risk of challenge.

The subcommittee has found that too many Defense Department officials cannot resist the opportunity to brush controversy under the rug of security. If the security process is being misused to muzzle viewpoints which conflict with the false facade of unanimity in the Defense Department, the American people should know about it. Congress and the public cannot operate effectively on matters relating to the armed forces without the candid advice of the nation's trained and loyal military leaders. It may be too late if we must wait for a court martial, a dismissal from command, or a retirement in the tradition of Billy Mitchell, MacArthur, and Ridgway.

QUESTIONS

Mr. Greene: From my knowledge of the working press, you will find most of them in pretty general accord with what you have said today.

Now, this subject has been under discussion for quite some time, and recently one of the discussions on this situation was brought up when a representative of the Office of the Secretary of Defense went to the White House to get a document declassified. This document pertained to the Civil War, and it was vitally needed in the preparation of a memorandum of some sort, and the President said, of course, it would be declassified.

The representative from the Pentagon said, "Well, Mr. President, this involves some rather detailed accounts of a lady spy during the Civil War, who transferred her affections between the North and South rather liberally" and, he said, "I am not quite sure which side she was fighting for."

The President said that did not matter.

The Pentagon man said, "Well, Mr. President, we have checked this out and found that this lady has three lineal descendants who are now Democratic Congressmen."

The President then said: "Do not declassify it."

What I am trying to bring up now is, do you not think that any information on the Civil War now should be made known to the public?

Representative Moss: I can think of nothing pertaining to the Civil War or the Revolutionary War that would bear upon the security of our nation, and I think that there is very little of World War I that shouldn't be clearly in the public domain and available for anyone who has the ability or stamina to research the information.

Mr. Koop: If I were not trying to be an objective member of this panel I'd say three cheers to the Congressman.

I would like to raise a point, the point I raised with him in his hearing last fall, and I ask him again:

"Congressman, what are you doing as a Member of the House and of your committee, to permit radio and television coverage of the House hearings?"

Representative Moss: I will have to give the same reply as I did before—as a member of the two committees, I am without authority in law, by direction of the Chairman, who is also without authority in law, to do anything about the practices of the Congressional Committees. It is a jurisdictional matter for another Committee of the Congress.

Mr. Koop: As a Member of the House, would you not have the prerogative of introducing a resolution or bill which makes it necessary for the Speaker to open the hearings?

Representative Moss: I believe that is within the prerogative of the Speaker himself.

I, as a Member of Congress, would have no objection to the television or radio people covering the hearings. As a matter of fact there are certain times of the year when I would get a great deal of satisfaction out of that.

Mr. Ellington: My question concerns the right to know or need to know—how does one know how to apply for a security classification if he does not know what it is he is supposed to need to know?

Representative Moss: That was a problem which concerned a panel of very distinguished American scientists who appeared before the committee.

I have not gotten an answer from them nor from any of the officials in the Pentagon or from any other branch of the government. It is just a policy, and no one can tell you why it is there.—END

Flow of Information

SECURITY REQUIREMENTS

Dr. Louis Ridenour
DIRECTOR OF RESEARCH, MISSILE SYSTEMS DIVISION, LOCKHEED AIRCRAFT CORP.

Dr. Ridenour is an internationally known physicist and electronics expert who in WW II directed the development of all airborne radar systems, including the radar bombing system. He was the first Chief Scientist of the Air Force and served as chairman of the USAF Scientific Advisory Board committee to survey AF R&D activities. The resulting "Ridenour Report" led to the establishment of the Air Research and Development Command.

FOR THE purposes of this discussion, we can distinguish three main components in the flow of technical and military information: first, the intercommunication of such information within industrial and governmental groups who are directly involved in closely related work; second, the flow of such information to the US public at large; and third, its transmission to potential enemies of the United States. The aim of security restrictions imposed on information flow is to deny information of consequence to our potential enemies—which usually entails denying it to the public generally—while at the same time imposing as little restriction as may be on the dissemination of this information among those who are judged to have a need to know it. Because the generally established channels for publishing information do not permit distinctions in the treatment accorded the three groups mentioned above, the usual publication channels are not generally used for classified information. Not officially, that is—the energy and ingenuity of the aeronautical trade press in this and other countries have on some occasions surmounted difficulties in communication which have been imposed in the name of security.

At all events, the flow of aeronautical information is consciously manipulated in the name of security, and it is such manipulation that I propose to discuss with you.

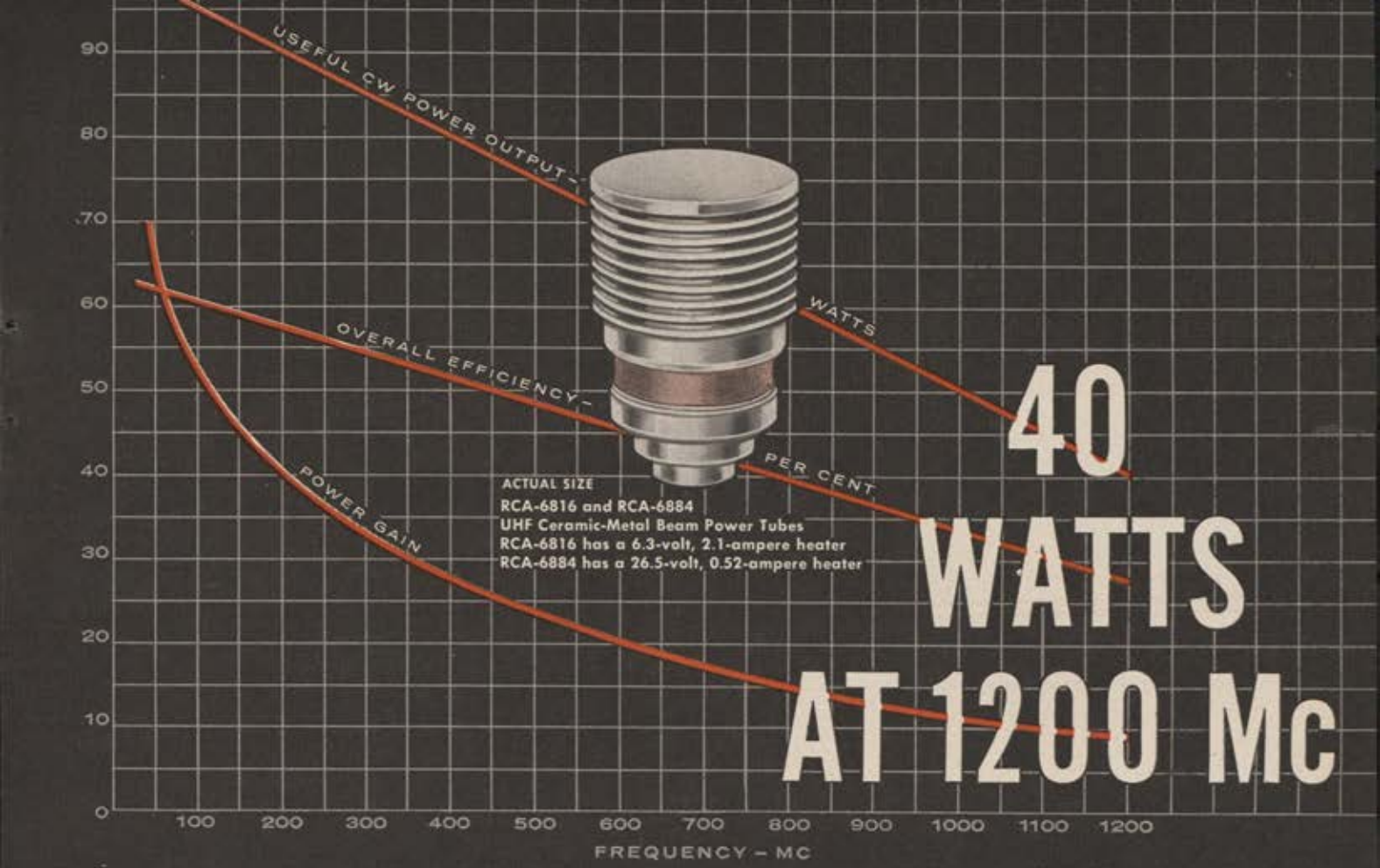
Let us remind ourselves first of all—and keep clearly in mind throughout this discussion—that the true goal of any alteration in the normal pattern of information flow is enhancement of the national safety. The use of the word "security" to describe restrictions on the flow of information has a tendency to obscure this point, since in other connections "security" is a synonym for "safety." It is not *necessarily* synonymous with "safety" in the present connection, and this must be remembered at all times.

Generally speaking, there are two main categories of aeronautical information which are subjected to security classification. These relate, on the one hand, to existing military capability, and, on the other, to research and development work which is mainly significant in terms of future military capability.

While I shall dwell principally on security requirements as they affect the latter class of information, a few remarks on the former may be made in passing. In times of nominal peace, such as we now enjoy, our national military establishment has as its main current value its deterrent effect on hostile actions of other nations. The supposed capability of this military establishment is presumably very carefully weighed when another nation is deciding whether or not to take steps inimical to our best interests. The deterrent effect of the Strategic Air Command has often been cited as the main shield of peace in the postwar world. Our preoccupation with the development of long-range ballistic missiles has as its goal the strengthening and improvement of our deterrent capability.

To have any deterrent effect, a military establishment must actually *communicate* to potentially hostile nations its approximate capabilities and order of battle. Otherwise, these total capabilities will not be taken into account when other nations decide on future courses of action.

(Continued on page 123)



ACTUAL SIZE
RCA-6816 and RCA-6884
UHF Ceramic-Metal Beam Power Tubes
RCA-6816 has a 6.3-volt, 2.1-ampere heater
RCA-6884 has a 26.5-volt, 0.52-ampere heater

40 WATTS AT 1200 Mc

...with driver-stage output of 5 watts!

For extremely compact and efficient UHF transmitter designs... RCA-6816 and RCA-6884, small-size, light-weight Ceramic-Metal beam power tubes have high power sensitivity and high efficiency at relatively low plate voltage.

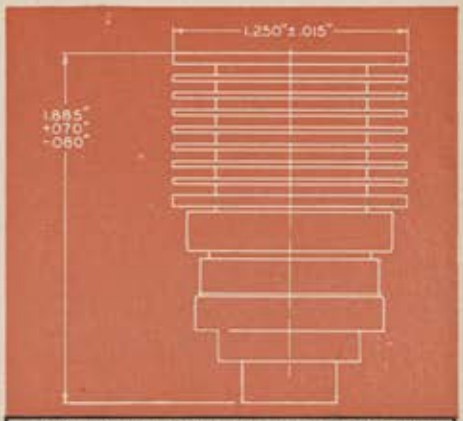
These tubes feature low-inductance rf electrode terminals—*insulated from each other by low-loss, high-strength ceramic bushings*—are particularly well-suited for UHF oscillator, frequency multiplier, and power amplifier applications.

Technical bulletin on the RCA-6816 and RCA-6884 is available from RCA Commercial Engineering, Section D53Q, Harrison, N.J. For sales information contact the RCA Field Representative nearest you.

East: HUmboldt 5-3900
744 Broad Street
Newark 2, N. J.

Midwest: WHitehall 4-2900
Suite 1181
Merchandise Mart Plaza
Chicago 54, Illinois

West: RAymond 3-8361
6355 East Washington Blvd.
Los Angeles 22, Calif.



TYPICAL CCS OPERATION OF RCA-6816 AND -6884
RF Power Amplifier, Oscillator—Class C Telegraphy
and
RF Power Amplifier—Class C FM Telephony

	at 400 Mc		at 1200 Mc
DC Plate Voltage	400	900	900 volts
DC Grid-No. 2 Voltage	200	300	300 volts
DC Grid-No. 1 Voltage	-35	-30	-22 volts
DC Plate Current	150	170	170 ma.
DC Grid-No. 2 Current	5	1	1 ma.
DC Grid-No. 1 Current	3	10	4 ma.
Driver Power Output (approx.)	3	3	5 watts
Useful Power Output (approx.)	23	80	40 watts

RADIO CORPORATION OF AMERICA
Tube Division Harrison, N. J.

guiding hand for tomorrow's power

Skilled hands coupled with keen minds made today's rocket powerplants a reality. Minds that formulate new theories in powerplant design . . . and hands that prove these theories by careful experiment, test and application.

Guided by such hands and minds, RMI has led the way for over fifteen years—designing and producing record-breaking powerplants for such supersonic vehicles as the X-1A, Skyrocket and the Viking missile. Today and in the future, RMI engineers and scientists will continue to blaze the trail toward advanced propulsion systems for manned and guided flight.

Engineers, Scientists—Perhaps you, too, can work with America's *first* rocket family. You'll find the problems challenging, the rewards great.

Power for Progress

RMI®

4872

REACTION MOTORS, INC.

A MEMBER OF THE OMAR TEAM

DENVILLE, NEW JERSEY

Thus we have the paradox that a genuinely secret weapon is absolutely worthless in peacetime.

All this is well known to our military leaders, of course. The recent epoch-making flight around the world by B-52s of the Strategic Air Command was simply a demonstration of the capability of our force in being, and was well contrived to dramatize our global retaliatory force. Unfortunately, however, this principle is sometimes lost sight of in the routine day-to-day regulation of the flow of aeronautical information. Secrecy is sometimes regarded as a virtue in and of itself, in disregard of the principle that a secret weapon has no value.

Sometimes this happens because there is a category of information regarding current military capability that genuinely must be kept as secret as possible. I refer to that information which, while having little to do with the total capability that we should tell potential enemies about, is of such a nature that its knowledge by a potential enemy would simplify his task of defense by giving him leverage for effective countermeasures. A good example is the precise communications methods planned for use by the Navy or the Strategic Air Command. If these were known perfectly by any enemy, he could prepare himself to disrupt such communications at a time of his choosing, with potentially disastrous results. Another example is the detailed operating doctrine of such a force. Knowledge of this could greatly simplify defense.

Even with respect to such vital sorts of information as those just discussed, it is worth noting that unremitting concealment is still not the optimum policy. The theory of games developed by the late great John von Neumann is able to prove conclusively that a mixed strategy—now bluffing, now telling the truth—is preferable to any fixed strategy such as that of attempting uniform concealment, in any situation such as the one obtaining here.

Let us now turn our attention from information bearing on current military capability, and discuss the effect of security requirements on the flow of technical and scientific information, which mainly relates to future military capability. The first observation to be made here is that, even without any impedance or restriction imposed on information flow in the name of security, great difficulties exist in establishing effective communication.

The vast growth of our research establishment and consequent requirement for an increase in the numbers of scientific communications have not been met by the classical medium of technical communication—the specialized journal. Publication delays of a year or more are common, and means for abstracting, indexing, and reviewing are inadequate.

Even though publication is lagging, the individual technical worker's task of "keeping up with the literature" is becoming ever more difficult. An important part of this difficulty is the growing bulk and significance of the Russian technical literature, which very few of our people are able to read. At the same time, the inadequate but still substantial growth of our own technical literature has placed severe financial demands on our technical societies, traditionally the sponsors of scientific and technical journals.

Thus, quite apart from security restrictions, our scientific and technical community is having great trouble in maintaining effective internal lines of communication. This is a matter of deep present concern. Experts in documentation are diligently seeking ways in which scientific communications can be improved. One recent effort of this sort was a conference held at Western Reserve University in January 1956 on "The Practical Utilization of Recorded Knowledge—Present and Future." It is interesting in the present context to note that some of the sessions of this conference were held behind closed doors, and that the full record of these "confidential" sessions was never publicized!

The basic reason for desiring prompt and effective dissemination of the results of scientific and technical work is that further rapid progress will thus be facilitated. When concealment of scientific work is considered in the name of security, it must always be remembered that the effect of such concealment will be felt both in our own development community and in that of our potential enemies. If our total technical competence is greater than his, then on balance we shall hurt ourselves by suppressing the free publication of technical information.

A good example of what I mean here is afforded by the Radiation Laboratory series of twenty-seven technical volumes describing the work done during World War II on radar and microwave electronics. This series, of which I had the privilege of being editor-in-chief, was dedicated to the proposition that the 5,000 or more technical man-years spent on wartime radar development should not have a transitory value, but instead should be preserved as a basis for further work. The resulting books, which appeared in the years 1947-1951, have sold very widely, both here and abroad. I have often heard them criticized by people who claim that we have "made a present" to Russia of everything we learned, by making so much effort, in this important field.

In my own opinion, this view completely overlooks the fact that we also made ourselves a present of the results of this work. And I think that no one can deny that we have made better use of this information than the Russians have done. Our advanced electronics progress is rapid and exciting; theirs has been somewhat slower and more perfunctory. The field in which Russia has given us our biggest recent surprises is that of nuclear physics. They exploded a thermonuclear device far earlier than they could have done on any timetable tied to espionage. At the Geneva conference on the peaceful uses of atomic energy, they startled our representatives by the scope of the thermonuclear work discussed. And this is a field in which we had been most cautious about publication.

Thus it is clear from the record that the technical interests of Russian science, far more than our own policies regarding the publication or suppression of technical information, have represented the major factor governing their progress. At the same time, our own progress was being slowed whenever we hampered or restricted publication of the results of our past work. In the interests of security by achievement, as opposed to security by concealment, we should probably communicate as widely and promptly and effectively as we can the results of our massive current research and development program. To do less is to confess that our total development capability is inferior to that of our potential enemies.

In deciding who shall have access to information handled under security restrictions, much is made of determining whether or not a proposed recipient has a "need to know" the information in question. The "need to know" is a meaningful concept with respect to the sort of operational information that we have already noted must be closely held in the national interest. It is far less meaningful in respect to engineering informa-

(Continued on following page)

tion. It is entirely without meaning in respect to highly creative engineering work or scientific research.

For a security officer to assert that such a man as Edward Teller, my distinguished predecessor on this distinguished program, does or does not have the need to know of the results of the scientific work of another man in his field is ludicrous and absurd. Teller, being a theoretical physicist, is engaged in improving our ordered understanding of natural phenomena. I am sure he has, before the fact, no way of judging whether or not the work of another man will help him in doing this. I am perfectly sure that no security officer could know; for, if he could, he could presumably replace Teller as a physicist, since he knows what discoveries Teller will make next.

Even though we thus can see that the concept of the "need to know" loses its meaning at the wellspring of fundamental science, still we must appreciate the justification for the concern of security people with even the most advanced scientific work. This concern springs from the hitherto unparalleled speed with which fundamental scientific discovery is translated into practical engineering application. Half a century elapsed between the discovery of electromagnetic induction, which made the electrical power industry possible, and the birth of the industry. Fifty years later, a quarter of a century separated the discovery of radio waves by Hertz from the memorable day on which Marconi transmitted the letter "S" across the Atlantic Ocean. Only some six years went by between the discovery of nuclear fission, which made atomic bombs conceivable, and the Trinity explosion in New Mexico.

Thus practical affairs, including military posture, are likely to be profoundly affected—and very promptly—by advances made in fundamental science. Therefore, much as we may deplore the meddling of security officers into scientific affairs, however inappropriate we know it to be, still we should appreciate the reasons which motivate this concern. The impossible task which the censors of scientific publication have undertaken is nevertheless one which—if achievable, as it is not—would be desirable.

Finally, we come to the obvious point that the results of the massive research and development program currently supported by military budgets are of the greatest possible use in developing the peaceful economy. A direct and immediate example of this is afforded by commercial air transportation, whose growth and development constitute one of the major technical phenomena of our age. It is not unfair to attribute a major part of the technical advance in our air transport capability to aeronautical developments sponsored and paid for by the military services.

These benefits to commercial aviation from military development work have come about only because of the timely release from security restrictions of the pertinent technical information. This illustrates how the general peacetime economy can benefit from technical development first made with military requirements in mind. Whenever the declassification and ordinary publication of such work is admissible from the military standpoint, there is no doubt of its desirability from the over-all point of view.

These remarks on security restrictions on the flow of technical information have been somewhat trite, and may have been superfluous, since there is evidence that cognizant agencies of the Department of Defense are aware of the dangers which inhere in the over-suppression of technical information interchange. It has seemed worth making them, however, because I have sometimes encountered the attitude that the suppression of information is beneficial and worthwhile for its own sake.

This, as I am sure we can all agree, is far from the case. We have seen that:

1. Information on present military capability must reach the potential enemy to give the military capability any peacetime value.
2. Certain classes of operational information must be most carefully safeguarded. These are defined by the leverage for countermeasures that they may afford.
3. Even with respect to such sensitive information, unremitting suppression does not afford the best concealment.
4. Scientific information is being propagated only with difficulty, even ignoring the efforts to impose classification upon it.
5. Suppression of technical information will benefit us only if our development capability is inferior to that of others.
6. There is no such thing as a meaningful definition of "need to know" in any scientific field.
7. The desire to regulate scientific communication understandably springs from the present immediate connection between science and technology.
8. When military considerations permit, the free release of technical information is always in the public interest.

This last point is true not merely because peaceful technology and military technology are closely related—though they are. It is also true because a democracy can choose wise courses of action only when the people generally are adequately informed.

QUESTIONS

Mr. Greene: What is your opinion on the Pentagon policies in regard to security? We have heard so much as to what has happened to American scientists in their work.

Dr. Ridenour: I have known cases of fellows who have written reports which they could not read afterwards.

Mr. Greene: Do you recall, or do you know of an incident where a newspaper has divulged classified scientific information?

Dr. Ridenour: Yes.

Mr. Greene: You do?

Dr. Ridenour: Yes.

Mr. Greene: Is it a common practice?

Dr. Ridenour: I don't know how often it has occurred.

Mr. Greene: You have no evidence of a widespread practice?

Dr. Ridenour: No; it has not happened often.

Mr. Greene: I am not talking about specific information which could be considered as hurtful to the country.

Dr. Ridenour: I hope you gathered from my remarks I feel there is no truly scientific information that need be classified or where suppression would be useful.

Mr. Greene: Congressman Moss has spoken rather frankly of the Office of Strategic Information. How do you evaluate the work of that agency? I assume you do not think too highly of it.

Dr. Ridenour: I am not qualified to make a statement in regard to that.

I remember one incident when I came to Washington in 1950 as the Chief Scientist for the Air Force. This involved a gentleman in the Department of Commerce, where the Department of Commerce did not have a sufficient budget to pay his salary for a certain length of time, and the work was of a confidential nature, and the Commerce people came up with the brilliant idea of holding up his clearance for six weeks until the budget could be amended.

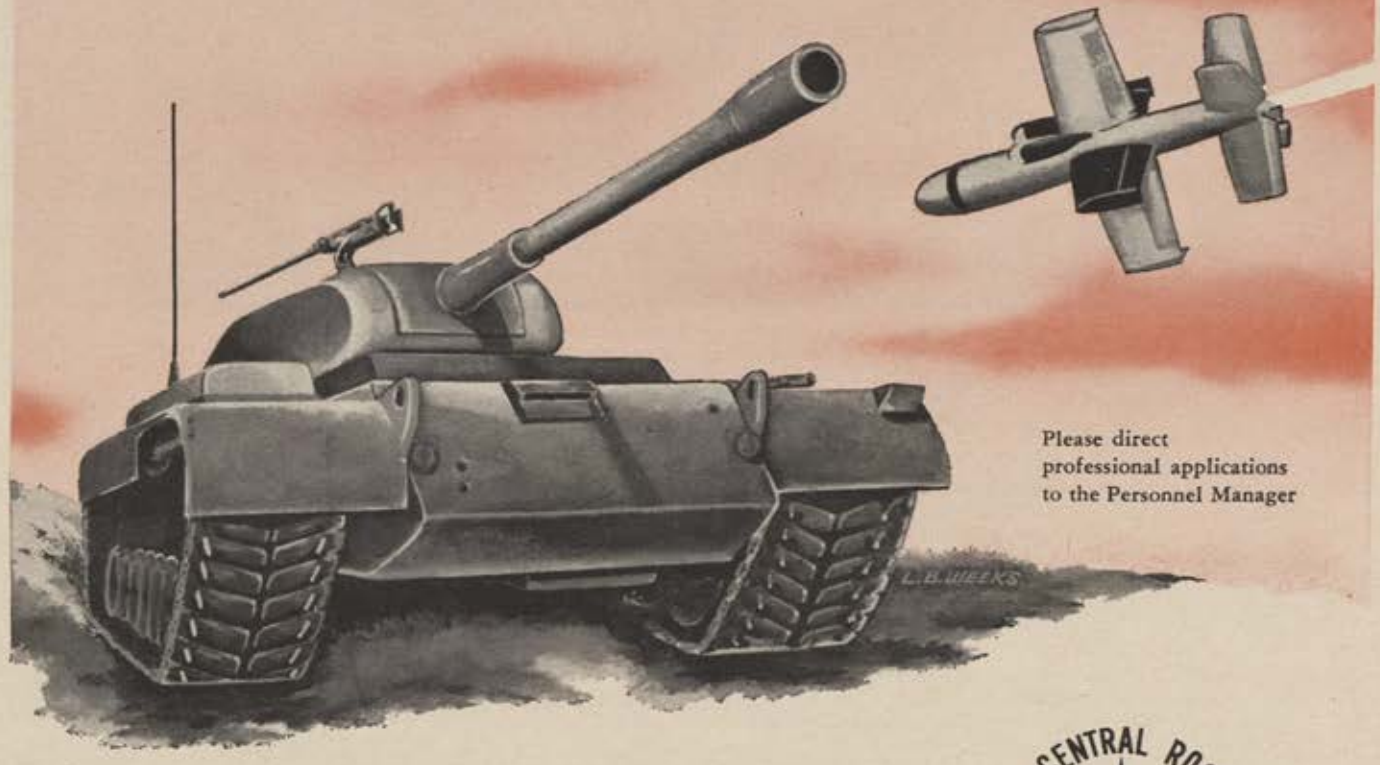
Now, I am definitely opposed to anything of that nature. I am opposed to it.—END

The Deadly DART Strikes Home!

The fast and powerful Dart is a rocket propelled surface-to-surface missile designed for Army Ordnance by Aerophysics Development Corporation, a subsidiary of Curtiss-Wright.

The smokeless – solid propellant rocket motor was developed by Grand Central under sub-contracts from Aerophysics Development Corporation and Army Ordnance. The deadly Dart is one more application of dependable solid propellant rocket power by Grand Central.

The Dart is but one of many interesting rocket projects currently under way at Grand Central. We invite qualified applicants to join this congenial and highly-skilled team of scientists.



Please direct professional applications to the Personnel Manager

Grand Central Rocket Co.

REDLANDS, CALIFORNIA

GRAND CENTRAL ROCKET CO. ☆ REDLANDS CALIFORNIA

ANOTHER EXAMPLE OF HOFFMAN LEADERSHIP

WHAT GUIDES THE GUIDED MISSILE?

Air-to-air missiles must be guided from the mother plane during that brief interval between the closing of the firing switch and the instant the missile locks on its target. This is the critical moment when a success or failure depends upon the exactness with which computers in the mother plane direct the missile's flight. This is the moment when nothing is as vital to the kill as the precision voltage reference system controlling the computers.

For jobs like these, electronic manufacturers have learned to depend upon Hoffman Semiconductor Zener Reference Diodes. Engineered for use in all types of precision power supplies, these amazingly rugged silicon junction components typify the continuing leadership of Hoffman in the semiconductor field.

Hoffman subminiature Zener Diodes deliver predictable outputs to ±1 per cent over a temperature range from −65°C to +150°C—withstand ±15G vibration, 100G shock and 50G acceleration loads under the severest humidity and altitude environments.

Whether for analog and digital computers, missile control, telemetering, limiting, clipping, voltage regulation or power supplies where size, weight and stability are critical requirements—Hoffman Semiconductor Zener Diodes are the indispensable voltage reference source.

Hoffman engineers will be glad to supply additional information on request.

HOFFMAN ZENER REFERENCE DIODE

Today's most stable voltage control device—available in four basic types and a wide variety of electrical specifications.

Hoffman SEMICONDUCTOR

A DIVISION OF HOFFMAN ELECTRONICS CORP.

930 Pitner Avenue, Evanston, Ill. • 3761 South Hill Street, Los Angeles, Calif.
Formerly National Semiconductor Products • America's leading manufacturer of silicon junction solar cells, power rectifiers, diodes, zener reference diodes.

Flow of Information

CLASSIFIED INFORMATION

Gen. John E. Hull, U.S.A. (Ret.)

MEMBER OF COOLIDGE COMMITTEE ON CLASSIFIED INFORMATION, DEPARTMENT OF DEFENSE

Since 1955 General Hull has been president of the Manufacturing Chemists Association. He retired from the Army in 1955 as a full general after thirty-eight years of service. Before retirement he was commander-in-chief of the United Nations and Far East Commands. Born in Greenfield, Ohio, he served in the 4th Infantry Division in France in WW I, and was assistant chief of staff for operations on the War Department General Staff in WW II.

MANY of you have seen the report to the Secretary of Defense by the Committee on Classified Information which was submitted on November 8, 1956. Since Mr. Coolidge, the chairman of that Committee, could not be present today, I've been asked to discuss this subject with you as I was a member of that Committee. Much of what I have to say has been lifted from the Committee report. Although this may be somewhat of a repetition to those of you who have read the report, the importance of this subject is such that I feel it would not be a waste of your time to cover some of the highlights.

As a point of departure, I would like to read an extract from the report.

"At the risk of stating a platitude, this country is far different from a dictatorship, and the impact of that difference is strong on the problem of information security. Being a democracy, the government cannot cloak its operations in secrecy. Adequate information as to its activities must be given to its citizens or the foundations of its democracy will be eaten away. On the other hand, our democracy can be destroyed in another way, namely, by giving a potential enemy such information as will enable him to conquer us by war. A balance must be struck between these two conflicting necessities."

In the Department of Defense there are peculiar factors which make the striking of the proper balance difficult. The department spends roughly two-thirds of the national budget, at one time or another directs the lives of millions of our young men and women, and is charged with planning for the survival of the nation in case of war. These considerations center public interest on its activities and weight the balance in favor of the maximum disclosure. On the other hand, the activities of the department are of the greatest interest to a potential enemy. He can profit from disclosures of its activities to a far greater extent than disclosures of the activities of most of the other governmental departments. So the other side of the scales is heavily weighted. The result is that striking the proper balance is more important and more difficult than is the case with most of the other departments of the government. Which way these scales should be tipped depends pretty much on whom you are talking to. This is one subject upon which everyone seems to have an opinion and the variations between these opinions are quite marked.

Executive Order 10501 signed by the President recognizes the principles just outlined by prescribing a dual objective (1) to give the public full information up to the point beyond which national security will be damaged, and (2) to protect information beyond that point. This protection is given by controlling the circulation of sensitive information so that recipients will be confined to persons who have been determined to be trustworthy and who have a need to know the information in order to perform their duties properly. Some items of information are more sensitive than others and so need more careful handling. Executive Order 1051 prescribes that sensitive information should be classified in three categories: "Top Secret," "Secret," and "Confidential," and further prescribes a degree of protection applicable to each category.

From time to time the Department of Defense is accused of failing to accomplish both of the dual objectives of this system. It withholds too much information and too much leaks out. Both criticisms in the opinion of the Committee are justified. There have been both over-classification and harmful disclosures.

A fundamental difficulty in the problem of over-classification is that the criteria for determining whether information should be classified at all, and if so, what degree of classification it should bear, are necessarily general. Two reasonable men of similar background, possessing equal knowledge, could well disagree on the application of these criteria to a particular piece of information. When we realize that within the world-wide activities of the Department of Defense, hundreds of thousands of individuals must be authorized to apply these criteria in at least a confidential category, it is not surprising the results are often inconsistent.

There are other factors which aggravate the situation. A subordinate may well be severely criticized by his seniors for permitting sensitive information to be released, where he is rarely criticized for over-protecting it. There is, therefore, an understandable tendency to play safe and to classify information which should not be classified or to assign too high a category to it.

There is also a tendency to use the classification system to protect information which is not related to the national security. Perhaps the prime example is information dealing with administrative matters. Even though the Department of Defense is a governmental agency and cannot expect to operate with the privacy of a business organization, there are nevertheless certain matters which if made public would reduce the efficiency of the operations of the department below the standard which the public itself requires. Personnel records are perhaps the most frequently cited example of this type of information. An example of

(Continued on following page)

equal or perhaps greater importance is papers expressing the views of the staff to superiors. If these papers are not held private, then the written advice of staff members to their superiors may be such as they think will later look well in public print rather than their true opinion.

I had this brought home rather forcibly to me just a few weeks ago. From time to time I am asked to review manuscripts covering different phases of the history of the Army during World War II. In one of these a memorandum which I had prepared during the war and expressing my views on a certain topic was quoted. Frankly, it didn't read too well fifteen years after it had been written but since it was a small part of the data available on the development of strategy, I could not object to its use. I'm sure that at the time I wrote it, it did not occur to me that some day it might meet the public eye.

The necessity for protecting these administrative matters is often disputed. I think it is a necessity. Those of you in business know quite well that everything your company does is not put out to the public. You have your own processes and your own procedures which you feel should not be disclosed in every case to your competitors. Protection or security for this type information within the Department of Defense is covered by the Department of Defense Directive 5200.6 This regulation requires, among other things, that preliminary documents relating to proposed plans or policy development should not be disclosed when disclosures would adversely affect morale, efficiency, or discipline.

There is another real source of over-classification. It is the attempt to do the impossible—to keep as classified, information which can no longer be withheld. The physical appearance of a test model of a new plane which must be rolled out of the manufacturer's plant adjoining a public highway is an example.

Theoretically, over-classification can be remedied by declassification. Executive Order 10501 contains admirable provisions relating to classification. The act of classification, however, is simple and expeditious. Declassification is involved and tedious. In the battle between the two, the advantages are on the side of classification and declassification has fallen below the effectiveness envisaged by Executive Order 10501.

The amount of classified documents left over from World War II presents a tremendous problem to the services. All of this material undoubtedly should have been classified at the time. The need for continued classification status no longer exists for most of this material. A small portion of it might still qualify for classification. It would be very costly and require great effort to go through and sort it out. The Committee felt that the only solution would be to act on a time basis and, after an analysis of the general content, to fix an appropriate date when all of it would be declassified. The Department of Defense simply does not have the personnel or the funds to do a thorough job on this. Here's one place where a few good fires might be helpful.

Turning now for a moment to unauthorized disclosures, the seriousness of which, both in number and nature, cannot be determined because only those which come to light are available for evaluation. The unknown ones are probably the most vicious in that they are likely to include those involving real espionage. It is obvious that the weaker the protective system is, the greater the number of unknown compromises will be.

The Committee was very much concerned with deliberate disclosures of classified information or so-called "leaks." While in many cases it could be argued that the information so disclosed is not really of serious security significance, that is not always true and these leaks evidence a breakdown of the system and indeed of discipline itself, which, if unchecked, may have most serious consequences. There have been a good many instances of this type of unauthorized disclosure over a considerable period of time and the number appears to be increasing.

It was evident to the Committee that the two major shortcomings in the current operation of the classification system within the Department of Defense are over-classification and deliberate unauthorized disclosures. The trouble in both of these shortcomings does not stem from defects in statutes, executive orders, directives, or regulations. It lies deeper than that. Information security is a state of mind and not a set of rules. A state of mind is part of morale and as such is a facet of discipline, and discipline is a command function.

Generally speaking, it is very difficult in this country to enforce compliance with rules, if those rules are not widely accepted as both necessary and reasonable. The failure of prohibition in the 1920s is the classic example. In the case of information security, while the need for it is accepted in the abstract, the need is not so keenly felt as in many other matters, nor is the reasonableness of the security rules accepted as fully as it should be. On that score, over-classification plays an important part. When much is classified that should not be classified at all or is assigned an unduly high classification, respect for the system is diminished and the extra effort required to adhere faithfully to the security procedures seems unreasonable.

The Committee concluded that the basic classification system in use by the Department of Defense is a sound one if operated properly. But until the two major shortcomings of which I spoke could be corrected, it would not serve either of the dual purposes for which it was intended. To correct these shortcomings, the Committee made several recommendations. The first one was that a determined attack be made on over-classification. This attack should be spearheaded by the responsible heads within the Department of Defense from the Secretary of Defense on down.

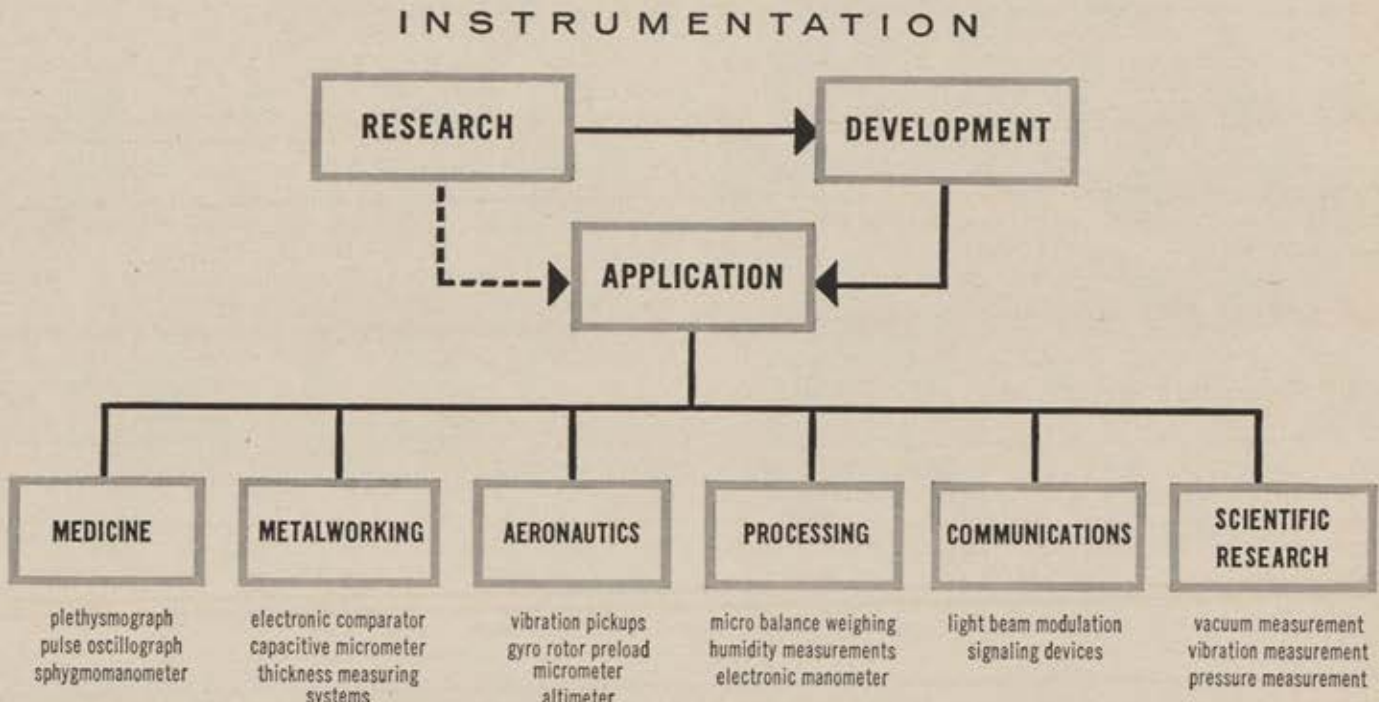
In any organization, particularly a military one, the example of the head of the organization has a potent influence on the whole organization. There are many ways by which this keen interest may be evidenced. An important one is for the responsible head to make a point of personally checking the classification of documents coming across his desk, sending back with displeasure those which have been over-classified. Another recommendation set forth several steps which the Committee thought should be taken to reduce over-classification. First, the use of classification guides now existing in several technical fields should be extended to other areas and the regulations which cover general classification should be supplemented by developing guide lines and listing typical examples for each category of classification. On general classification it should prove helpful to list certain categories as requiring a high degree of protection, such as strategic plans, future programs, design details, detailed performance data, new developments, operational methods, troop deployments, information as to our own specific weaknesses, and sources of our information regarding a potential enemy.

The number of those now authorized to classify information as top secret and to receive copies of top secret papers should be cut down.

Wherever possible an automatic declassification on a certain date or happening of a certain event should be required for all documents.

There should be a specific prohibition on the use of

(Continued on page 131)



an idea is the solution to every problem

Decker Aviation is a company of ideas.

Not long ago, for example, Decker took the idea of an ionization transducer and brought the idea to reality . . . then used it imaginatively to solve pressing problems in any number of far flung fields.

In medicine, Decker applied the transducer to the improvement of such basic instruments as the plethysmograph . . . giving medical researchers a new magnitude of sensitivity in their explorations.

For geophysical research, Decker ideas made possible instrumentation that, mounted in the nose of an Aerobee-Hi rocket reaching an altitude of 125 miles, continuously and accurately measured both ram and ambient atmospheric pressures at speeds in excess of a mile per second.

Applying new ideas to the micrometer comparator, Decker gave the production line an instrument for measuring an object without physical contact to within a few millionths of an inch.

All the examples listed on this page hardly begin to show the extent of Decker accomplishments. For one problem after another, we have found the idea . . . developed it into a solution . . . built prototypes . . . even manufactured finished instruments.

We would honor an opportunity to evaluate your problems. Our ideas may very well be their solution.

DECKER AVIATION CORPORATION

Philadelphia

TWO HEADS are better than one...

ARC's Course Director CD-1, Teamed with ARC's VOR/ Localizer Receivers 15-D, Shares the Work with the Pilot

More and more pilots rely on the ARC CD-1 Course Director to determine the exact headings required to intercept and fly a desired VOR radial or runway localizer. This electronic "co-pilot" helps them fly with pinpoint precision, greater ease and increased safety, and in four simple steps.

With ARC's CD-1, the pilot selects his VOR or localizer station, sets his Course Director to the bearing of the desired VOR radial or localizer, turns his aircraft until the vertical needle of the cross-pointer meter is centered and steers to keep it centered. His ship will intercept the selected track quickly and smoothly, simultaneously compensating for wind drift. The pilot performs no mental computations, and there's no chance of overshooting the desired course.

This reliable navigational aid adds only 10 pounds to your aircraft. Ask your ARC dealer to install the CD-1, along with a *dual installation* of ARC's Type 15-D VOR/Localizer Equipment. You'll discover how easy flying VOR and Localizers can be – and with new peace of mind.

Miniaturized Automatic Direction Finders
Omni/Loc. Receivers • Course Directors • UHF and VHF Receivers and Transmitters
LF Receivers and Loop Direction Finders • 10-Channel Isolation Amplifiers • 8-Watt Audio Amplifiers • Interphone Amplifiers • Omnirange Signal Generators and Standard Course Checkers • 900-2100 Mc Signal Generators

ARC

Aircraft Radio Corporation BOONTON, NEW JERSEY

Dependable Airborne Electronic Equipment Since 1928

the classification system to protect information not affecting the national security.

The Department of Defense should cease attempts to do the impossible and stop classifying information which cannot be held secret. This includes information which cannot be withheld because it is inevitably known to too many people. It includes, for example, the physical appearance and general performance data of new weapons when they have become widely known.

There's no doubt that the existence of differences of opinion between the services and their general nature is widely known. Any attempt to cover up their existence and general nature not only creates great pressure to leak but creates an undesirable and inaccurate impression in the public mind that the Secretary of Defense is trying to cover up grave issues which he cannot solve. That tends to shake the confidence of the public in our whole defense set-up. Some argue vigorously, and with justification, that the present procedures permitting disclosures of the issues are inadequate; that here are issues of great national importance on which the rightness of the final decision cannot be demonstrated short of war and, for decisions to be wholeheartedly supported, the public must be informed. On the other hand, decisions on war planning, for example, involve facts the disclosure of which would be most harmful to the security of the nation. Those decisions must be classified and must be left to the military experts under supervision of the civilians, made responsible by law, with proper Congressional participation.

As I stated earlier, the matter of classification is an easy process—that of declassification is very complicated. The Committee felt that in order to break through this barrier, it would be necessary for the Secretary of Defense to establish within his office an official who would be responsible for establishing, directing and monitoring an *active* declassification program both in the Office of the Secretary of Defense and the military departments. This official should be divorced from the direct influence of both security and public information officials in order to bring an unbiased, dispassionate, and realistic judgment to the field of declassification. Means must be found for simplifying declassification procedures and for eliminating the necessity of laboriously clearing each declassification action as is now the case. We felt that it might be well to resort to a simple circularizing process such as periodical bulletins or notification to all concerned that declassification of a certain item has taken place.

As a by-product of the classification system as it is presently operating, we have deliberate unauthorized disclosures of information. Some of these disclosures, as a matter of fact many of them, are not important but occasionally a very serious leak of classified information occurs and, by serious, I mean one which affects the security of this country. When these occur, the investigatory machinery within the Department of Defense is put into operation but it works rather slowly, partly, the Committee decided, because no one on the Department of Defense level is monitoring its efforts. In order to remove any allegation of bias, it was the view of the Committee that in serious cases, a court of inquiry composed in each case of representatives of the three military departments should be convened to carry on the investigation.

One recommendation which the Committee made brought forth some rather strong criticism by some members of the press. I would like to read this recommendation to you exactly as it appeared in our report and I quote:

"In case of a 'leak' appearing in the press which involves the disclosure of information which obviously gravely damages the security of the nation, and where the source of the 'leak' cannot be identified, we recommend that the author be summoned to testify in a grand jury investigation in order to discover the source of the 'leak.'"

Even Mr. Wilson gagged a little bit on this recommendation. I would like to say that, in my opinion, every member of the Committee believes in freedom of the press, but we also feel that the press has the same responsibility as every other American when it concerns national security.

I think the recommendation I have just read has not been clearly understood by all. Maybe it could have been better written but I would like to invite your attention to the phrase and I again quote: "The disclosure of information which obviously gravely damages the security of the nation." I'm sure no member of the Committee had an idea of grand jury investigation of what might be considered ordinary leaks.

In spite of the keen competition in the collection of news, and in spite of the resultant tendency of some to underrate the aid disclosures can give a potential enemy or the discomfort disclosure can give our allies, nevertheless, the press is fully as loyal to the nation as any other segment of our population. We ran across instances where information of high news value had been voluntarily withheld only to have it scooped by someone less scrupulous. Unfortunately, it is also true that we ran across instances where a member of the press has made it clear that he is disclosing the content of a top secret document. The Committee felt that this is a disservice to the United States which is wholly inexcusable, even after making due allowance for the existing tendency to over-classify.

The Committee felt and so recommended that when a member of the Department of Defense has been identified as the source of a leak, disciplinary action should be taken, and taken with the utmost promptness.

The Committee felt that industry is doing a satisfactory job in protecting classified information except in one aspect. Some companies are doing an outstanding job. The exception is that in their desire to build up prestige, some companies give out damaging technical information in their annual reports to stockholders, in advertisements, at business conferences, and to trade and technical journals. This is especially true in connection with the production of new weapons and it applies both to prime and subcontractors. The Committee recommended that more effective efforts be made to inform officers of offending companies on this matter.

Considerable evidence was given to the Committee of the real harm caused by information published in trade and technical journals. In some cases the data disclosed approaches complete specifications and detailed performance data of new planes or weapons, matters which are of the greatest help in enabling a potential enemy to attain superiority in that vital field by taking advantage of our progress or concentrating on countermeasures. The Committee felt that this should be corrected.

The Committee did not consider disclosures of classified information by members of Congress. While we believe damage to the national security can and sometimes does come from disclosure of classified information furnished Congress, Congress will not and, in our opinion, should not authorize the large appropriations necessary to support the national defense effort without adequate information. The problem of security is well understood by both Congress and the Department of Defense and procedures are available which, if followed by both branches of the government with understanding and good will, should produce

(Continued on following page)

a reasonably satisfactory degree of information security. The Committee felt that both branches of the government should keep in mind that unfriendly nations can glean a great deal of valuable information from the published reports of proceedings before Congressional committees. Granted that these committees should have a great deal of information, it seemed to us highly undesirable to publish to the world information of help to a potential enemy.

I would like to comment on one other aspect of press relations which has caused comment in the press. One proposal made to the Committee was that all information given to the press should flow through the Office of Public Information and that the present practice of permitting access by the press to members of the Department of Defense should be discontinued. We did not favor this proposal and thought it to be in the nature of a partial censorship.

The Committee believes that all interviews by the press with members of the Department of Defense in the Washington area should be arranged or coordinated through the Office of Public Information and, as I mentioned before, this is not intended as a form of censorship but rather as a form of cooperation.

Many of us I'm afraid, and this I think is true of some members of the press, do not fully appreciate the great difference between ordinary peacetime and the present so-called "cold war." While the Committee was confident that the press can be counted on not to publish information which they determine will significantly damage the security of the nation, it appeared to us that in making their own determination some of them tend to ignore this difference.

On April 16, 1948, Dr. Vannevar Bush, in speaking before the American Society of Newspaper Editors here in Washington, gave a fine discussion of this problem. What he said then is equally applicable today. Although Dr. Bush's remarks are full of meat throughout, there is one statement he makes which I'd like to quote. That is: "The problem is that of distinguishing between information which rightly and properly belongs to every man and information which for the safety and security of every man must be protected." This simple statement sets forth the problem. But the solution is not a simple one.

Our examination of the Defense Department security system leads us to conclude that there is no conscious attempt within the Department of Defense to withhold information which, under the principles I set forth at the beginning of my discussion, the public should have; that the classification system is sound in concept and while not operating satisfactorily in some respects, it has been and is essential to the security of the nation; and that further efforts should be made to cure the defects in its operation rather than changing the system.

QUESTIONS

Mr. Koop: I had the opportunity of appearing before the Coolidge Committee, and I was impressed with the sympathetic understanding of the members of this broad problem. I think many of the recommendations were on the right track.

However, I was shocked this afternoon about the recommendation of grand jury action in regard to newspapermen. I think that matter is open to considerable debate and discussion.

I suggest the present law on espionage is sufficient to take care of any of those cases. I am wondering, General, if you could elaborate on this point for us.

General Hull: Yes, I would be glad to do so.

The Committee did look into the problem of maintaining and protecting information and also into the Espionage Act. As you know, the Espionage Act provides penalties of a fine up to $10,000 and up to ten years' imprisonment upon conviction. It is a pretty tough law, and we did feel it was entirely adequate.

However, here is the problem: We had a few cases of disclosure of highly classified information where, if the individuals had been prosecuted under this act it would have had to have been open to the public.

Now, if the prosecution was open to the public, the information that the individuals are charged with giving out would be made known to the public, but not only that, other information of a highly classified nature would have to be made available to the jury and to the judge, in order for them to decide how serious the leak might have been.

Now, that has distinct disadvantages. First, it confirms the leak and secondly, it enlarges the leak and even confirmation of the leak could be very serious.

After the Battle of Midway in World War II, a newspaper in this country printed a complete and accurate order of the battle plans of the Japanese fleet.

Now, the only possible way that information could have been known was as a result of breaking the Japanese code.

Fortunately, the Japanese did not read this particular newspaper and did not pick up the fact we had broken their code. Had they changed their code we would have spent a lot more blood in winning the war than we did.

Had we prosecuted under the statute at that time the Japanese could still pick up the fact that we were reading their messages.

Now, we do not ask to prosecute. We only ask for grand jury investigation to discover the source, and a grand jury investigation would be secret, and any information disclosed would not be made known to the public. You could deal with a situation of this kind administratively in the armed services, because apparently any news break that would come from there would be from an individual connected with the armed services.

The Committee realizes there is one weakness in this recommendation. It could be defeated by the reporter failing to disclose or refusing to disclose the source of his news information, and much or all of the press all over the country would rise to his support.

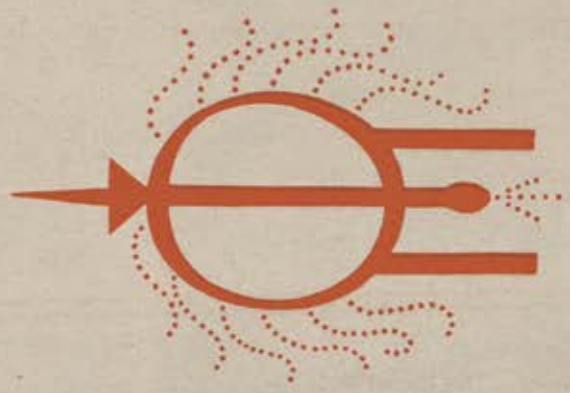
The reporter himself is not being prosecuted under this procedure. The recommendation is that he is not the real culprit. The real culprit is the individual who gave him the information, and he is the one who should be punished.

Mr. Greene: It has been my observation as a newspaperman—and after World War II—that a large majority, not all, but a large majority of the so-called leaks which caused the Pentagon so much pain, are leaks involving management and policy and not technical or military information.

Do you think actually and honestly that there is such a way to stop such leaks, keeping in mind a number of us reporters are Reserve officers—unless there is true unification?

General Hull: I will give you my honest opinion. I do not think you can stop them entirely. I do not think there would be so many leaks if there was a freer discussion of policy matters.

We have had leaks all throughout our history and a great number of them are not serious, but once in a while there is one that is serious, and it can be damaging to the security of the nation.—END



صفة بيضة تخرج وتحرق

er-Rammah's self-moving egg

Join two flat pans; fill with an incendiary mixture; add a tail; propel by two large rockets. In A.D. 1280, Arabia's Hassan er-Rammah, gazing centuries ahead, proposed this ovoid in his "The Book of Fighting on Horseback and with War Engines."

Today, rocket-powered ordnance is foremost in American defense...and Aerojet-General Corporation is foremost in rocket power. Aerojet's solid-propellant rockets are used on the Sparrow and Regulus and on the newest, most advanced American missiles.

Aerojet-General CORPORATION

A Subsidiary of The General Tire & Rubber Company

THE GENERAL TIRE

AZUSA, CALIFORNIA
SACRAMENTO, CALIFORNIA

We invite you—the engineer, the scientist—to participate at Aerojet in the creation of tomorrow's realities from yesterday's dreams.

where DEPENDABILITY counts most—

CONVAIR F-102A INTERCEPTOR

depends upon . . . .

VICKERS®

SMALL, LIGHT WEIGHT, EFFICIENT HYDRAULIC EQUIPMENT

Vickers Flow Sensitive Pressure Regulator permits ram air turbine to generate needed hydraulic flow down to minimum airspeed by regulating the pressure to that which the turbine can produce.

Vickers Thermal Operated Relief Valves protect the primary and secondary hydraulic systems from overheating by automatically depressurizing the circuit at a preset temperature.

Vickers 3000 psi Variable Displacement Piston Type Pumps supply power to the primary and secondary hydraulic systems on the Convair F-102A Interceptor.

Vickers 3000 psi Constant Displacement Piston Type Pump operated by ram air turbine supplies both emergency hydraulic and electric power through the constant speed motor driven alternator in event of engine failure.

Vickers Constant Speed Hydraulic Motor drives the emergency alternator from either the ram air turbine or the secondary hydraulic system.

The Convair F-102A all-weather supersonic stratospheric interceptor depends on Vickers Hydraulics for the following important functions:

- Primary and secondary hydraulic systems
- Ram turbine operated emergency hydraulic system
- Emergency electrical system

The components shown here were selected by Convair for their outstanding dependability and the additional advantages they offer in superior performance. Their technological advancement keeps pace with aircraft development. The pumps are characterized by minimum heat rejection and highest overall efficiency . . . all units shown have small size and light weight. For further information, ask nearest office listed below for Bulletins A-5200-D and A-5209.

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

ADMINISTRATIVE and ENGINEERING CENTER
Department 1526 • Detroit 32, Michigan

EL SEGUNDO DIVISION • Engineering, Sales and Service
2160 E. Imperial Highway, El Segundo, California

District Aircraft Sales and Service Offices: Albertson, Long Island, N.Y., 882 Willis Ave. • Arlington, Texas, P. O. Box 213
Seattle 4, Washington, 623 8th Ave. South • Washington 5, D.C., 624-7 Wyatt Bldg.
Additional Service facilities at: Miami Springs, Florida, 641 De Soto Drive
TELEGRAMS: Vickers WUX Detroit • TELETYPE "ROY" 1149 • CABLE: Videt
OVERSEAS REPRESENTATIVE: The Sperry Gyroscope Co., Ltd.—Great West Road, Brentford, Middx., England

7630

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Jet Age Luncheon

The Secretary Looks at the Budget

Hon. Donald A. Quarles
SECRETARY OF THE AIR FORCE

WHEN I spoke at your meeting a year ago, we were in substantially the same phase of our budget cycle as we are today. You will recall that at that time we were asking the Congress for an appropriation of $16.5 billion to cover Air Force programs in the year ahead. While this represented a sizeable increase over the prior year, it also represented a very considerable reduction from the earlier budget estimates which the Air Force had prepared.

This same pattern is repeated this year with variations, of course, and I feel that one of the first things you would like me to do is to outline the Air Force's Fiscal Year 1958 budget situation as I see it.

To do this one needs to have our recent budget history in mind. Last year, subsequent to our $16.5 billion request, the President asked the Congress for a supplemental appropriation to the Air Force of $376.5 million, largely for heavy bomber production acceleration and for dispersal of strategic bases. In addition to these requested sums, the Congress appropriated $900 million beyond the President's request, so our resources going into the present budget cycle were some $1.276 billion greater than we were talking about a year ago. Our present budget request for FY 1958 to the Congress is for $17.746 billion of new obligational authority, which is also some $1.246 billion more than we were talking about a year ago. Thus, taking into account the additional sums appropriated by the Congress last year, our position this year represents roughly, a $2.5 billion improvement over the original FY 1957 position.

We are counting on this substantial increase in appropriation as we made it clear we would have to do. At the same time, this request represents a substantial reduction in the original Air Force estimates of the new obligational authority that would be required to support our programs. Those of you who have dealt with budget procedures and prepared annual budget estimates either within the government or within industry will perhaps agree with me that there is nothing too surprising about this pattern. In my own experience, first budget estimates have always been considerably higher than final plans, largely because we all tend to plan optimistically to accomplish, say, fifteen months' work in the twelve months ahead.

In any event, the people that I come in contact with seem to be fairly definitely divided between those who emphasize the $2.5 billion increase and those who prefer to talk about the several billions that have been cut from the earlier estimates. Before telling you where I am in this argument, I would like to highlight some of the things the budget we have presented to the Congress does provide.

For one important thing, it provides for the purchase of all the additional B-52s required to convert the eleven heavy bomber wings from thirty B-36 to forty-five B-52 aircraft per wing, including aircraft for test, support, and attrition. It also provides for the continuation of the KC-135 jet tanker program to support the B-52s on a two-tanker to three-bomber basis. Beyond this, in the strategic bomber field we have provided funds to support production of the B-58 supersonic medium bomber as follow-on for our B-47s. Action on this program is contingent upon the results of the B-58 flight tests currently under way. If unforeseen problems are encountered in these tests and the B-58 program is delayed, the funds earmarked for B-58 production could be diverted to further production of B-52 bombers and KC-135 tankers.

Our FY 1958 budget will also provide for continued high-priority support of our ballistic missile program. I am glad to report that our progress in this area has been very satisfactory and that we feel these highly accelerated programs are on schedule. I might also note that the recent clarification of roles and missions, in which the Secretary of Defense assigned operational responsibility for the land-based ballistic missiles, IRBM and ICBM, to the Air Force and the operational responsibility for the ship-launched missiles to the Navy, will be very helpful in straightening out the programs of the three services.

The budget will also provide appropriate support for our other strategic aircraft and missile programs in line with the military values we now assign to them. Also, the planned dispersal of SAC heavy bomber bases will be continued and completion of at least operational facilities on these bases will be provided for in the FY 1958 budget.

While we have encountered some technical problems that had to be solved, our Century Series supersonic fighters —the F-100, F-102, F-104, and F-106—will be in production and many combat wings will have been converted to these modern aircraft.

As you know, the continental portion of the Distant Early Warning Line is being completed this year. Eastward and westward extensions are programmed and will be largely funded in the new budget.

The Semi-Automatic Ground Environment (SAGE) in-

(Continued on following page)

stallation is proceeding on schedule. Our long-range pilotless interceptor Bomarc program, is being supported on a sound schedule. The Talos program responsibility is being transferred to the Army in line with the roles and missions decision I mentioned earlier.

Our construction program will continue on the very substantial level of recent years. While this will be another long step forward it will still leave much to be done to round out the necessary facilities on our bases, particularly personnel facilities.

Full support of our Air National Guard and Reserve programs is provided for.

The new budget provides for a strong research and development program with continued upward trend in over-all development funding but with substantially level support of contract research and exploratory development.

Altogether, this is a strong program. It continues to build airpower not as rapidly as some of us would like to see but at what I believe is a sound rate, everything considered.

At your meeting a year ago, I reported that we were on schedule toward a 137-wing Air Force by June 30, 1957. As far as wings are concerned, we have changed this course. We are completing only 132 of the 137 wings then programmed, dropping five fighter wings in the process. We are, however, completing four assault-carrier wings and one Matador wing this year and will henceforth include these in our count of major combat forces so that while we will have 137 wings at the end of this fiscal year, they will not be the same 137 wings originally projected.

Our FY 1958 budget calls for dropping five strategic-fighter wings and four fighter-bomber wings to produce a year-end total of 128 wings. The strategic-fighter wings are being dropped since they will no longer be required to assist our new heavy bombers in penetrating enemy defenses; and the tactical-bomber wings are being dropped in consideration of the growing ability of the Army to provide itself with close tactical missile support. It is also pertinent to note that, with new weapons and equipment, our tactical-bomber squadrons are becoming more and more potent and our allies are becoming relatively more powerful in this category.

I said that in my opinion this new budget would provide for a continued build-up in airpower at a sound rate. I should have put in some provisos. My first and foremost proviso has to do with the technical manpower situation, particularly the problem of retaining highly trained pilots and technicians in the Air Force. As you are well aware, very substantial progress has been made in the last few years to improve our re-enlistment rate, largely as the result of career incentive legislation enacted by the Congress. While retention has reached much more satisfactory levels in some grades, it is still far from satisfactory in the skilled technician categories.

This matter was, as you know, the subject of very comprehensive study by a committee established by Secretary Wilson and headed by Mr. Ralph Cordiner of General Electric, whose report is now being studied by the Department of Defense. We are hopeful that legislative recommendations may be developed and may receive favorable consideration as a fundamental approach to this problem. It is apparent to all that as our business becomes more and more technical and our weapon systems more and more complex, success will depend increasingly on our ability to enlist, train, and keep in the service the necessary high skills to operate and maintain the equipment.

My next proviso is that we become sufficiently selective in the way we use our resources—in the projects we support, in the bases we construct, and in the kind of forces we maintain. This means that we must keep our eye on the main chance, that is, the threat of all-out air/atomic war. We must emphasize the strategic and tactical forces, bases, and arrangements that are required to mount an effective retaliatory strike; the defense forces and installations necessary to keep our striking forces from being knocked out on the ground; and all the auxiliary forces required to make these offensive and defensive forces most effective. In other words, we must make sure that first things come first; winning the initial violent air/atomic battle must always be our first priority.

While not directly tied in with our Fiscal Year 1958 budget, there is in a longer-range sense still another proviso. We must take seriously the technological race with the Soviets that we find ourselves in. We must build even more rapidly than we have built in the past a broader base of scientific and technical manpower to support our industrial programs, in civilian as well as military fields. All of us that have a deep interest in the Air Force Association can take real pride in its very constructive work along this line.

A final proviso that I should place on the adequacy of the FY 1958 budget is that we in the military continue to perfect the working relationship with science and with industry so as to maximize the contribution that these latter can make to military effectiveness within the bounds of our national resources. There is one problem here that has received considerable attention in recent weeks, that is the so-called drawing board to inventory lead-time in the development of our new weapon systems. Great point has been made of the fact that we are taking much longer than the Communists to bring a new concept into actual operational use.

On this point, I would like to say that drawing board to inventory lead-time is not in itself a good measure of the effectiveness of development effort. The real question is not how long it takes to do the job but how good the job is in relation to the state of the art and, particularly, the competitor's art, when it reaches the operational stage. The eight years that we took to bring out the B-52 bomber in comparison with an alleged four or five years required by the Soviets for their Bison bomber is a good case in point. In the first place, I doubt that we know what the comparable Soviet interval was. In the second place, the facts are that the B-52 is a substantially more advanced and higher performance weapon system than the Bison. It seems fair to conclude that the development interval, whether it is four years or eight years, is a minor rather than a major consideration. The important point is to be sure that the weapon system finally produced is at the forefront of the art.

Another point to keep in mind here is that emphasis on shortening the lead-time could result in frequent small-step improvements in our product lines, whereas less frequent, longer steps would be more economical production-wise and more effective operationally because equipment conversion is bound to interfere with ready combat capability.

Saying these things I may have given an impression of complacency about our present Air Force-industry teamwork. This would be quite a wrong impression as I certainly have no feeling of complacency. We are all well aware of the fact that if the Air Force could generate prompter and more permanent answers to program questions, industry could develop and turn out new weapon systems on substantially better schedules and probably at substantially lower costs. The Secretary of Defense recog-

(Continued on page 138)

the *NEW LORAL plotter!

*** providing**

- Permanent trace
- Unobstructed View
- Target Insertion and Location
- Position Memory
- Remote Control

The new LORAL airborne **GROUND TRACK PLOTTER**, provides instantaneous and permanent records of the ground track of the aircraft...and important new features consistent with Military requirements.

This and other developments in airborne electronic equipment extends further the forward looking *creative* policy in the fields of *countermeasures* and *weapon systems*. We have the answer to your airborne plotter requirements among our staff of experts in this field.

LORAL
Imprint of Integrity

New plant addition to LORAL. Over 100,000 square feet of air-conditioned working area devoted to creative engineering development.

Other recent LORAL developments are the

- LORAL AIRBORNE NAVIGATIONAL COMPUTER.
- LORAL AUTOMATIC SHORT-RANGE G. P. I.
- LORAL AUTO-CAL.

LORAL ELECTRONICS CORPORATION

NEW YORK 72, NEW YORK

Serving in AVIONICS • AIRBORNE NAVIGATIONAL EQUIPMENT • COMMUNICATION SYSTEMS • RADAR EQUIPMENT • TEST EQUIPMENT

SECRETARY QUARLES — CONTINUED

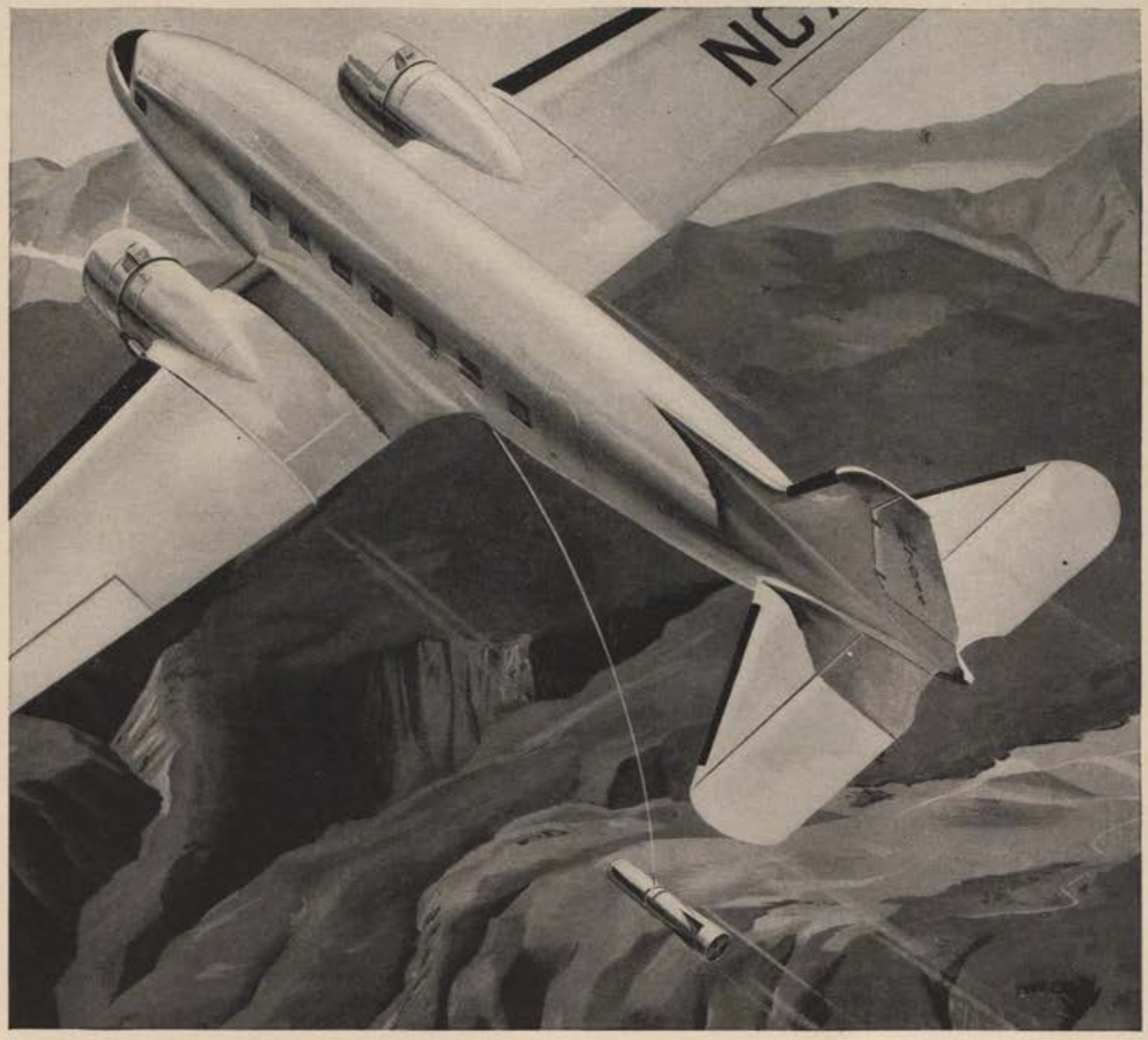
nized this as a defense-wide problem when he set up a high-level study group under the chairmanship of Deputy Secretary Robertson to go into all aspects of this matter and point up present deficiencies and areas for improvement. This study has made it clear that there are opportunities for improving organization, procedures, and planning within the services in the interest of more effective management of the material development and procurement functions. The study also makes it clear, however, that, while improving the mechanics of the business is important, this is overshadowed in importance by the much more difficult problem of reaching sound judgments about the course and scope of the program.

This is, of course, a great challenge and I can assure you that all of us in the Air Force take it very seriously. As one reflects on the complexity of the problem, however, it becomes obvious that planning ahead in this long pull competitive situation is an exceedingly difficult business. This would be true even in a period of relatively slow-moving technology. It is very much truer in this day of kaleidoscopic change. It seems to me that there is nothing in our materiel program that is more important under present extended cold war conditions than the long-range planning of the kinds of equipment we shall develop and standardize. The Air Force has elaborate staff mechanisms for this kind of planning. In this we are assisted by such organizations as RAND and by the very competent scientific and engineering staffs of our contractors. In spite of all of this, or perhaps one should say because of all of this, sharp differences of opinion develop as to the proper course to be pursued and courses of action that at one time and under one set of circumstances seemed optimum may at a later time and under changed circumstances drop into second or third place.

It goes without saying that wise planning will certainly preserve as much continuity and stability of program as possible. In spite of the best we can do, however, it may from time to time be in the best interests of national security to make sharp and expensive changes in our course. In fact, there are some changes of this kind that now seem unavoidable. All of this, to me, simply emphasizes the great need to be as wise and farsighted in our planning as possible. At the same time, it makes it clear that the shortest, straightest course from drawing board to inventory may not always be the optimum course.

In final analysis, what we are trying to do is to produce the greatest airpower we can with the resources the country makes available for this purpose. At New Orleans last summer I set forth the view that our air/atomic power should be considered sufficient *if* it carries, and *only so long as* it carries, conviction to potential enemies that aggression against us is futile. We must recognize, that this is a dynamic matter involving an ever-changing relationship between the attacker and the defender. Our problem is two pronged—first, to have strength in being that constitutes sufficiency today; and, second, to have programs in being to insure sufficiency tomorrow and for the foreseeable future.

I believe that we have this sufficiency of airpower today to act as a solid deterrent to Communist aggression. I believe we can maintain this sufficiency if the country continues to make available the resources required to support our essential programs; provided we can make further substantial progress on our skilled technician problems; and provided we can continue to improve our management of the business and our teamwork with science and industry in carrying it out. This gives us all plenty to do. The Air Force Association will be a great help in doing it.—END



TARGET...OIL

The target of the torpedo-like device hanging from this plane is not the land you see ahead, but the oil that may hide beneath it.

Spearheading the mission, this sensitive instrument, known to petroleum men as a magnetometer, records the earth's magnetic field, indicating which land is most favorable for the presence of oil.

It is a lucid illustration of the interdependence of the petroleum and aviation industries. For as petroleum supplies the power of aviation, so aviation supplies the means to search for this power.

Cities Service has long utilized aviation for this important work. Likewise numerous airlines, airports and the Armed Forces have long utilized Cities Service Aviation products. High octane gasolene and jet fuels are presently being supplied to the Air Force in huge quantities. Also, Cities Service Research is engaged in an extensive development program on fuels and lubricants to meet the needs of the jet age.

Cities Service research laboratories and multi-million dollar refineries have long served the Armed Forces and will continue to lend whatever assistance possible to achieve "Peace Through Power."

CITIES SERVICE PRODUCTS

New York • Chicago • In the South: Arkansas Fuel Oil Corp.

JET BLASTS

LET'S HAVE YOUR JET BLAST
In "Jet Blasts" you can sound off on any subject you want. We'll pay a minimum of $10 for each "Jet Blast" used. All letters must be signed but we'll withhold names on request. Keep letters under 500 words.

A Long Look at the 'New Look'

A long, long time ago military actions and forces came to be classified on the basis of physical environment. There were land wars and those on the sea. The former, reflecting the intimacy of the relationships between men, weapons, and land, developed along peculiarly specialized lines and led to the enormous growth and power of modern armies.

Navies with their own special needs and capabilities developed; ships and fleets grew both powerful and complex. These were involved with struggles for control of sea lanes of communication and for certain strategically located land areas which might assist in attaining these ends.

The specialized characteristics of land and sea wars caused armies and navies to develop in quite different directions so that the lines of separation were sharp. As time passed, however, these sharp lines became less so. Possibly due to the need in ship-to-ship boarding operations, possibly due to warfare at the land-water boundary, the need for certain land warfare capabilities led to the Navy's Marines—a kind of pluralistic force with capabilities on both land and sea. At the same time, the increasing scale and scope of land warfare brought armies up against prairies and deserts, mountains, rivers, and inland seas, necessitating on their part the development of additional and diverse capabilities.

Although, as did Icarus, we, too, have serious temperature problems in flight, technological advances over the years have brought us a long way toward mastery of the earth's atmosphere. As a result of these advances and the military potentialities in this new and third physical environment, we now have a new and third military service, the Air Force, with its claim to domination in the air and all its reaches. Today we have three services, based respectively on sovereignty in the air, on the land, and on the sea. Extending this reasoning forward, we should expect the creation of still another great military service upon the coming of age of spatial operations.

However, as the three services grew and changed and spread, the heretofore relatively clean lines of separation between them became fuzzy. While the newest service was established on the basis of uniqueness of environment, i.e., a new physical environment called for a new service, the apparently close connection between physical environment and service became much less apparent and therefore more controversial. In fact, the interservice boundaries had become in many places virtually non-existent.

But with all these developments we still cling to the environmental basis for determining service boundaries—long after the environmental influences have taken on many meanings and in places even approached a kind of homogenous heterogeneity. As evidence of the overlapping interests and difficulties in reconciling missions with jurisdictional boundaries, today we see the interservice rivalries and controversies—like a cold-war alliance of sovereign nations, each proud and jealous of its hereditary sovereignty.

I submit that the up-to-now accepted basic assumptions underlying the organization of our military establishment are no longer acceptable and that fundamental reorientation and reorganization are essential. I submit further that significant improvement in organizational structure and hence combat effectiveness can only be obtained by focusing on the military missions, i.e., the task or function to be performed.

The environmental basis for service organization was useful because of the earlier parallel between environment and strategic or tactical operation and not because of any intrinsic significance in the environmental parameter used. The environmental criterion for separation approximately coincided with the functional parameter. But the heart of the matter was and is the mission, the function to be performed. Because it is fundamental, it is still valid and applicable today. An old military axiom refers to this idea and runs about as follows: Given a particular task or mission, it is the prerogative and in fact the commander's respon-

(Continued on following page)

JET BLASTS——CONTINUED

sibility to plan and organize his forces in the manner calculated to best perform that job. Within certain and very general overriding rules of his society, the commander should and must be free to prepare for his task. In the case, for example, of a ground force commander, he must be free to choose the number and characteristics of the weapons which will most effectively and efficiently accomplish his mission. He must, therefore, have freedom to add or subtract from his command riflemen, artillery, armor, and aircraft in the numbers, shapes, and sizes which will maximize his ability to perform the assigned mission. Correspondingly, too, the Navy and Air Force must not be hamstrung by rigid or obsolete rulings but must be permitted, perhaps forced, to organize on a functional basis. Given a set of missions, each service must be free to concentrate on how best to achieve its objectives.

Dim outlines of such an approach are visible in the organization and operations of our Marines. An analogous but more embryonic situation is evident in the Continental Air Defense Command. Although there is still adherence to tradition and hence assignment of ConAD responsibility to one service, the task or mission cuts across all service boundaries. Continental defense is a big job and is likely to grow even bigger. If so, why not organize a Continental Defense Service, one which is not Air Force, or Army, or Navy, but a Force so organized as to maximize the probability of successfully accomplishing this job? This defines the "Mission Service."

For example, too, we might organize a Strategic Warfare Service. Surely a reorganized "SAC," integrally containing within it certain naval forces, would be a more complete and therefore powerful strategic striking force. It seems very unwise to develop a strategic force exclusively Air Force and thus implicitly to deny that the Navy can make any useful contribution in this regard.

A case can be made for a "limited warfare" service, a powerful, highly mobile, self-contained striking force designed to cope with the great variety and global distribution of the so-called limited-type wars, the brush fires and the police actions. There is no escaping the conclusion, in this "time of tempest," that there is no substitute for physical force on the spot. The achievement of this mobility and self-sufficiency and power would appear most accomplishable by a serv-

(Continued on page 145)

the heart of the jet . . .

— DEPENDABLE FORGINGS —

Ever since the beginning of the development of mechanical power, the heart of power producing machinery has been forgings.

The latest development in the field of mechanical power is the aircraft turbo-jet engine. Here again, the important highly stressed components — the turbine wheels and the compressor discs — are forgings and here also more of these forgings are produced by Wyman-Gordon than by any other company.

Entirely new problems, mechanical and metallurgical, are involved in the production of these vital parts — problems which require the maximum in experience, know-how and research facilities. Wyman-Gordon excels in all of these areas and continues today as for nearly 75 years in the forefront of new forging developments.

Seen through the porthole of this compressor disc is the finished forging — an example of the ultimate in quality and precision.

WYMAN-GORDON COMPANY

Established 1883

FORGINGS OF ALUMINUM • MAGNESIUM • STEEL • TITANIUM

WORCESTER 1, MASSACHUSETTS

HARVEY, ILLINOIS • DETROIT, MICHIGAN

THIOKOL SERVES

throughout the nation

HUNTSVILLE, ALA.

MARSHALL, TEXAS

ELKTON, MD.

BRIGHAM CITY, UTAH

MOSS POINT, MISS.

TRENTON, N. J.

Across the nation, the research and manufacturing facilities of the Thiokol Chemical Corporation are serving the needs of the rocket industry.

The versatility, ruggedness and power of THIOKOL rocket engines have been demonstrated by the **FALCON**, the **NIKE HERCULES**, the **LACROSSE**, the **NIKE-CAJUN**, and the mighty booster for the **MATADOR "B"**.

If you are a mechanical, electronic, chemical or aeronautical engineer, a chemist or physicist interested in joining the growing field of solid propellant rocketry send your inquiry to: **THIOKOL CHEMICAL CORP.**, Redstone Div., Huntsville, Ala.; Longhorn Div., Marshall, Texas; Elkton Div., Elkton, Md.; and Utah Div., Brigham City, Utah.

Thiokol®

CHEMICAL CORPORATION

780 North Clinton Avenue, Trenton 7, N. J.

® Registered trademark of the Thiokol Chemical Corporation for its liquid polymers, rocket propellants, plasticizers and other chemical products.

ice integrally containing within itself certain land, sea, and air components interwoven into a unified whole. The mission of this service: by physical force on the spot, to stop small wars directly, or in less direct fashion to seek to do so by raising the price of an aggressor's probable gains to a level he is unwilling to pay.

I submit that time and technological advances have obsoleted the original bases for determining service boundaries and upon which bases assignments for the development of particular military capabilities are still adjudicated. The magnitude and technical complexity of modern warfare means that any jurisdictional lines drawn on the basis of environment *per se* instead of on the job to be done are a built-in handicap to militarily obtaining "the most for the least."

Given the nation's over-all objectives and taking out those best achieved by the Department of Defense, we obtain the military missions. It is these military missions which we must possess capabilities for performing, and hence these missions must be focused upon in contrast to building up or down of the Army, Navy, or Air Force. They are, of course, related, but the correct orientation and focus is vital. A service in itself is of significance only so far as it contributes to performing these missions.

The really critical problem in all this is the selection and assignment of military missions. But this has always been critical and no amount of juggling and heated discussion will make it less so by one iota. Just what are our national aims, what should the Department of Defense do to assist in the achievement of these aims, what portion of our national budget should be allocated to the Department of Defense, what subdivision of funds for each of the military services will maximize the Department of Defense's over-all capabilities? Once these basic decisions have been made, burdening a service with arbitrary rules and restrictions must be eliminated, for it is incompatible with maximizing service capabilities.

—Norman Precoda

Mr. Precoda has been a member of the Weapons Systems Evaluation Group, and, from 1946-48, was a research engineer in the guided missile section of the Navy's BuAer research division. He received an engineering degree from Michigan State in 1941 and earned his master's degree from Johns Hopkins in 1950. He served in the Navy in World War II.

The READY ROOM

RESERVE AND AIR GUARD NEWS

This five-man team of the 8501st Air Reserve Navigator Training Squadron has won Tenth Air Force's first annual navigators competition. Left to right: Maj. David M. Goldsmith, Lt. Walter Zust, Jr., Lt. Robert H. Linneman, Lt. Richard C. Conklin, and Lt. William P. Butler. Unit is based at O'Hare Field.

The Air Force Reserve's **controversial match-merge program,** in which Reservists are matched against a specific mobilization assignment by grade, is under way and is scheduled to be **completed by June 30.**

Each **major command** has **compiled** a **roster** identifying mobilization requirements by grade. Reservists holding mobilization slots in the commands **have been given priority** in assignments within the commands. Slots which **cannot be filled** within the commands will be filled by individuals assigned to a specific job by the Air Reserve Records Center in Denver.

Reservists who **become surplus** as a result of the match-merge program **will be reassigned** after June 30. All surplus Reservists will be notified officially that they are excess to mobilization requirements but will be **urged to participate** in the non-pay portion of the Reserve program.

Reservists currently holding **mobilization assignments** who are made surplus by the program will be given **priority in consideration** for filling vacancies which occur in the future. Second priority for vacancies will be given to **qualified applicants enrolled in Reserve Center programs** who have a training designation to a major command.

Reservists assigned to **major commands** will receive orders notifying them of their selection and attaching them to **appropriate Reserve Center units** for training and administration. Their fifteen-day active-duty tours, however, will be spent with the command to which they are assigned.

° ° °

Continental Air Command this month will activate **ten Reserve medical units** with eventual facilities for **6,000 bed patients.** The new units will be manned by Reservists assigned to Center training programs, who will be authorized **forty-eight training periods** and **fifteen days of active duty** each year.

The training program will emphasize **instruction in individual specialities** associated with specific medical fields and will be accomplished, for the most part, through on-the-job instruction. It also will include basic military and technical school training for **non-prior service youths** between the ages of seventeen and eighteen and one-half, who join the Air Force Reserve under the six-months' option program.

Facilities will be provided through joint use of **ConAC's Reserve Centers** or other Air Force or Defense Department installations. In the absence of government-owned facilities, **municipal or civilian facilities** will be leased.

The new units will be activated in **New York, New Orleans, Chicago, Fort Worth, Boston, Tampa, Baltimore, Indianapolis, San Francisco,** and **Long Beach.**

° ° °

The **301st Air Rescue Squadron,** first such unit organized in the Air Force Reserve and based at Miami, last month accomplished the **first air rescue** since the program began.

Two squadron **SA-16s** were alerted following a mid-air collision of **two B-47s** on a practice refueling mission off the coast of Cuba. The three-man

(Continued on page 149)

Lt. Gen. Charles B. Stone III, ConAC commander, briefs John M. Ferry, left, USAF special assistant for installations, and Donald J. Strait, right, Deputy Assistant AF Secretary for Reserve Affairs, on the command's activities.

NEW OPPORTUNITIES FOR EX-SERVICEMEN:

Read why your service skills and experience are now worth more than ever to you

Your valuable service skills are needed in the U.S. Air Force. A new liberalized policy today offers you even greater opportunities: a wider range of skills accepted, choice of assignments, paid 30-day delay in reporting, a more liberal conversion list for *all* ex-servicemen. And if you don't have a usable skill, you may, *before you sign up*—on the basis of aptitude testing—be *guaranteed* technical training in a needed skill. You may also be eligible for a bonus, or a return to service in grade. Find out *now* how your service experience can "pay off" in the U.S. Air Force! Mail the coupon, or see your local Air Force Recruiter.

TODAY AND TOMORROW YOU'RE BETTER OFF IN THE U.S. AIR FORCE

PASTE COUPON ON POST CARD AND MAIL TO U-55-AF3

AIRMAN RECRUITING INFORMATION BRANCH
BOX 2202
WRIGHT-PATTERSON AFB, OHIO

Please send me more information on the Air Force Prior Service Program.

Name_____

Address_____ Age_____

City_____ Zone_____ State_____

TURNS "JET BLAST" INTO A WHISPER

You stand within a few feet of a blasting jet engine, but your hearing is protected from an ear-splitting roar that under ordinary circumstances would be intolerable and perhaps cause permanent hearing loss.

The reason is RCA's *Ear Protector*, a new and scientific approach to the problem of excessively loud noise. This device dampens out intense and penetrating sounds, permitting you to work comfortably in areas where-in the noise levels might otherwise be prohibitive.

Made of plastic, the Ear Protector surrounds the ear without actually touching it. Contact with the head is by means of a soft, replaceable, liquid-filled cushion that provides a comfortable, self-adjusting seal. It may also be adapted for intercom use, and for any other application where noise can interfere with efficiency.

Light in weight, highly efficient, sanitary, simple and inexpensive, RCA's Ear Protector belongs wherever noise becomes a menace or a nuisance.

Defense Electronic Products

RADIO CORPORATION of AMERICA

Camden, N.J.

Trade(s) ®

crew of one of the B-47s ejected successfully and reached the Isle of Pines, which is about 150 miles south of Key West.

The Reserve aircraft spotted the three survivors after a night of searching the collision area and returned them safely to their home base in Florida.

There are **three Air Rescue squadrons** in the Reserve program. In addition to the 301st, there are **302d at Williams AFB, Ariz.,** and the **303d at Long Beach, Calif.** All three operate under Continental Air Command, which recently was assigned as federal coordinator of all search and rescue activities in the US.

• • •

Notes on the back of a Form 175. . . . Field training for thirty-six Air Guard **communications and electronics units** will begin June 2 and continue through August 14. **Thirty sites** in this country, Hawaii, and Puerto Rico will be used to handle the training programs. . . . **ANG units** which have aircraft assigned **requiring enlisted crew members** and which do not have such positions authorized in their manning documents are being permitted to place airmen with appropriate AFSCs on **flying status orders.** . . . Guard units have been told to submit **selective assignment requisitions** to the Air Reserve Records Center in Denver **quarterly,** even if they have no need of selective assignees. This is the Air Force program which assigns airmen finishing active-duty tours, who have an obligation to serve in the Ready Reserve, to ANG units nearest their home of official record. . . . Air Force has allocated **twenty-five spaces** to the Air Guard for orientation courses at **Command and Staff and Squadron Officer Schools** this summer. The first course opens June 17. The Squadron Officer course opens July 29. Command and Staff course is limited to ANG officers in the grade of **major through colonel.** Squadron Officer course is limited to **first lieutenants and captains.** Both courses will be held at Maxwell AFB and applicants must have secret clearances. . . . **Air Materiel Command** will begin supplying Guard units this month with the **new shade 505 summer uniform** for airmen. The present cotton khaki uniform will be phased out on or before September 30, 1959. . . . Air Force has **cut back** the number of **pilot training classes,** which are available to **ANG aviation cadets.** There are only **eight** classes programmed in the next year.

—Edmund F. Hogan

E.D.O.S.

... A. O. Smith's proven method for fabricating aircraft that will

smash
the thermal barrier

✳ E. D. O. S. means Engineered Designs for Optimum Structures . . . offers significant savings in fabrication of hard, heat-resistant alloys.

BACK when airframe construction first switched from wood and fabric to light metals — the thin alloy skins were actually sewn together with piano wire. Manufacturing methods had not kept pace with materials development.

Today, with supersonic aircraft nudging the thermal barrier, there's another big switch underway . . . a change to heat-resistant, high-strength alloys (steel, titanium, stainless).

This time, however, there's no need to compromise with light metal methods in hard metal fabrication. No need for extensive, time-consuming machining...no need to turn costly alloys into scrap.

The answer is A. O. Smith's E.D.O.S. — redistribution of metal for maximum usefulness. Proved in the manufacture of jet engine parts and other aircraft components — the method consists of precision forging, contour rolling, flash and fusion welding. It's made to order for tough metals . . . produces a lighter, stronger product at lower cost than any other existing process.

WRITE A. O. SMITH TODAY FOR FREE, ILLUSTRATED BOOKLET

— Bulletin I-17A — complete with technical details. Also, arrange for showing of new 16-mm. sound color movie about this remarkable process.

Through research ... *a better way*

A.O.Smith
CORPORATION
MILWAUKEE 1, WISCONSIN
International Division: Milwaukee 1, Wisconsin

wing tips

By Wilfred Owen

The Air Force has approximately 1,000 planes in the air at all times of the day and night.

° ° °

The US has produced more than one million piston engines for aircraft in the past fifty years, and 90,000 gas turbine powerplants in the last decade.

° ° °

The turbine is actually an older form of power than the reciprocating engine, and a patent was granted in England as early as 1791 for a crude turbine. But actual gas turbine development work was not under way until 1929.

° ° °

One rocket engine now in use produces enough power to propel a Navy cruiser.

° ° °

There were nearly 15,000,000 landings and take-offs at major US airports in 1956. The CAA expects the number to increase by 7,000,000 in the next four years, and to double by 1965.

° ° °

The state of Utah finds that transporting prisoners in state-owned light-

planes saves on hotels and meals and reduces the temptation to escape.

° ° °

The giant spheres that store compressed air for a new wind tunnel contain 8,000,000 tin cans. They serve as a radiator to keep air temperatures nearly constant during a test blow.

° ° °

The Colorado State Game and Fish Commission uses lightplanes to keep the state's beaver population in balance. Two pairs of beavers are taken from crowded areas, boxed, flown to sparsely settled areas, and dropped by parachute. Spring doors release the beavers when they land.

° ° °

A big step toward the flying automobile was taken recently when the CAA granted an airworthiness certificate to the Taylor Aerocar. It took seven years of modifications between the original application and final government OK.

° ° °

Airline capacity for the European tourist season is being boosted thirty-nine percent above record 1956 levels.

° ° °

International carriers have agreed on a new third class service for transatlantic flights, to begin April 1, 1958. The fare will be $232 one way, New York to London.

° ° °

Cargo carried by the world's scheduled airlines in 1956 totaled one billion ton-miles. CAA estimates that air cargo in the US alone will reach one billion ton-miles per year by 1965, nearly triple its present volume.

° ° °

For US flag carriers, the ten most important cities, measured by number of enplaned passengers, are Berlin, Havana, Frankfurt, Montreal, Mexico City, Panama City (Panama), Toronto, Hamilton (Bermuda), London, and Paris.

° ° °

Berlin originates the largest number of air passengers for US flag carriers—five times as many as Paris.

RENDEZVOUS

Where the Gang gets together

CREW REUNION: The crew from the 1st Bomb Sqdn., 9th Bomb Group, 313th Bomb Wing of the 20th Air Force is planning a reunion this year. Most of the crewmen have been notified, but those who haven't, please contact *William K. Hargett, Jr., 7748 N. Haskins Ave., Chicago, Ill.*

STALAG LUFT III REUNION: The twelfth annual POW reunion of Alumni of Stalag Luft III will be held in the Van Cleve Hotel, Dayton, Ohio, on Saturday, April 27, at 6:00 p.m. For further details contact *David Pollak, Box 513, Marion, Ohio.*

81ST FIGHTER WING REUNION: The 81st Fighter Wing is planning its annual reunion at the Brown Palace Hotel, Denver, Colo., on May 24, 25, and 26, 1957. At this time, the Wing will present to the USAF Cadet Wing its Memorial Trophy to be presented to the most outstanding Summer Squadron. All members of the 81st who are not on the current loading list, please write to *Col. Benjamin B. Cassiday, Jr., USAF Academy, Lowry AFB, Denver, Colo.*

3D ATTACK GROUP REUNION: Ellington AFB is planning a reunion of the famous 3d Attack Group, 3d Bomb Wing. It's tentatively set for April 26, 27, 28, 1957. For a plans brochure, send a self-addressed envelope to *"Spot" Heard, Box 650, Ellington AFB, Tex.*

'BIG JOB' CREW: I would like to contact former crew members of the B-24 "Big Job." Lts. Alexander, Rasmussen, Street, and Sgts. Magee, McDermott, and Renk parachuted into "The Coal" on July 9, 1943, after hitting Comiso. *Clint D. Forhan, P.O. Box 16, Bellingham, Wash.*

398TH BOMB SQUADRON: Wonder if any of your readers were members of the 398th Bomb Squadron at MacDill Field in Florida during World War II. I certainly would like to hear from one and all. *Burnham S. Smith, Jr., 49 Derby St., Waltham, Mass.*

WHERE ARE YOU, MEL: I'd like to locate 1st Lt. Melvin K. Ferrin, of Mesa, Ariz. Anybody know where he is? *William Mamel, 308 Wayside Rd, Hopkins, Minn.*

AiResearch servo-controller for a pilotless guidance system

Simple servo-amplifier... actuator system achieves maximum speed of response with high stability

Because most missiles and drones are self-destructive, it is important that the components in their guidance systems be both highly accurate and dependable and be producible in quantity at low cost. The AiResearch servo-controller meets the above requirements.

Its servo-amplifier weighing less than .7 of a pound amplifies electric signals from an inertial guidance source and converts them to command signals. These in turn are transmitted to an AiResearch electrically-powered light weight linear actuator which adjusts control surfaces of missile or drone to maintain a predetermined course.

The servo-controller can operate from either a DC or AC power supply. It can also be designed to take signals from celestial, telemetering or pre-programming sources to maintain or readjust the course of its pilotless air vehicle. It is another example of the AiResearch Manufacturing Division's capability in the missile field.

Inquiries are invited regarding missile components and sub-systems relating to air data, heat transfer, electro-mechanical, auxiliary power, valves, controls, and instruments.

THE GARRETT CORPORATION

AiResearch Manufacturing Divisions

Los Angeles 45, California... Phoenix, Arizona

Designers and manufacturers of aircraft and missile systems and components: REFRIGERATION SYSTEMS • PNEUMATIC VALVES AND CONTROLS • TEMPERATURE CONTROLS CABIN AIR COMPRESSORS • TURBINE MOTORS • GAS TURBINE ENGINES • CABIN-PRESSURE CONTROLS • HEAT TRANSFER EQUIPMENT • ELECTRO-MECHANICAL EQUIPMENT • ELECTRONIC COMPUTERS AND CONTROLS

In Control–with U. S. TIME GYROS

Poised on their launchers, the Navy's Terrier guided missiles. Official U. S. Navy photograph.

SUBMINIATURE!

Roll, pitch and yaw rate control gyros in one compact package weighing less than one pound!

United States Time Corporation offers the systems manufacturer the long sought after optimum performance/weight ratio in Gyroscopic Instruments. The 3-Axis Rate Sensor package achieves high performance in one third the weight and volume of previous rate gyros. Flight proven under severe environmental conditions, subminiature gyros and gyro packages can be supplied in production quantities to satisfy your specific requirements.

More than seven thousand of these precision-built rate gyros are currently in use.

U.S. Time's Research Staff and facilities are engaged in research, design and development directed toward new products and optimization of the performance/weight ratio in the following fields of precision instrumentation.

• STABLE PLATFORMS • FLOATED INTEGRATING GYROS
• ACCELEROMETERS • RATE GYROS • 2 AXIS GYROS • DAMPER SYSTEMS
• INERTIAL INSTRUMENTATION • GUIDANCE SUB-SYSTEMS

A new edition of our technical data handbook available upon request.

THE UNITED STATES TIME CORPORATION

Manufacturing Plant: Waterbury, Conn., *Research and Development Division:* Irvington, N.Y.
Sales Offices: 500 Fifth Avenue, New York, OXford 5-5050
346 Tejon Place, Palos Verdes Estates, California, FRontier 5-9526

WORLD'S LARGEST MANUFACTURER OF WATCHES

an **AFA NEWS** *feature*

Big Doings at UTAH Wing

At one of Utah Symposiums, from left: Percy A. Wood of United Air Lines; AU's Col. John Meyer; AFA's Bill Farmer.

At Kick-off Luncheon, Utah Wing Commander Joseph Jacobs greets Symposium delegates. From left: Mayor Adiel F. Stewart; Ray Mertes of United Air Lines; Mr. Jacobs; Dr. Ray Olpin, the toastmaster; and Utah's Governor, George D. Clyde.

LAST year's Airpower Symposium staged by AFA's Utah Wing was so successful that the Wing won the 1956 AFA "Unit of the Year" trophy. This year's repeat performance, held in Salt Lake City, February 1 and 2, was not only bigger and better but prompted AFA President John P. Henebry, when he saw the trophy on display in the lobby of the Hotel Utah, to say, "It's going to be tough to get this away from the Utah Wing this year."

The program began January 31 when President Henebry addressed 500 civic leaders, representing the combined Kiwanis Clubs of Salt Lake City. The next day, at a Kick-off Luncheon, Gov. George D. Clyde welcomed the delegates and proclaimed the week beginning January 28 Utah Airpower Week. The luncheon speaker was Ray O. Mertes, Director of School and College Services for United Air Lines, who discussed the peaceful uses of airpower.

The first of three half-day Symposiums was devoted to community relations. Speakers included Col. Harry W. Shoup, Director, Combat Operations Center, ConAD; Percy A. Wood from San Francisco, manager of United Air Lines Engineering Planning; and Col. John C. Meyer, faculty member of the Air University.

That evening an "Air Fraternity Rally" was held at nearby Fort Douglas. Maj. Gen. Robert B. Landry, Fourth AF Commander, discussed the AF Reserve; Maj. Gen. Winston P. Wilson, chief of the AF Division, National Guard Bureau, spoke on the ANG program; Brig. Gen. James E. Roberts, ATC Inspector General, discussed air training; Brig. Gen. J. G. Hopkins, Deputy Commander of MATS's Atlantic Division, spoke on transport problems; and Colonel Meyer outlined the curriculum of the Air University.

Saturday morning, educational problems were examined by a panel including Dr. Roland H. Spaulding, from New York University; General Wilson; Mr. Mertes; and Donald M. Tasker, general manager of the Marquardt Aircraft Company's Ogden plant. Reece Robinson, Salt Lake Squadron Commander, presided at the Awards Luncheon that noon, at which the principal speaker was Dr. Dean E. Wooldridge, president of the Ramo-Wooldridge Corp. John R. Alison, a past AFA President and Board Chairman, was toastmaster.

That afternoon the implications of AFA's 1956-57 Statement of Policy, which calls for a single service, were debated. Mr. Alison served as moderator, while AFA's viewpoint was presented by Peter J. Schenk, a National Director who is manager of General Electric's Technical Military Planning Operation (TEMPO), Santa Barbara, Calif. The Army was represented by a Salt Lake attorney, F. Robert Bayle, a Reserve lieutenant colonel; while Barry Brannen, a Los Angeles attorney and Naval Reserve captain, represented the Navy League. Eight high school seniors, who had been selected by Wing members, acted as a guest panel and showed a remarkable familiarity with the subject.

At the Airpower Banquet that evening, Dr. Ferenc Nagy, deposed premier of Hungary, told the audience of the experiences of the Hungarian Freedom Fighters. At the Golden Anniversary Ball, attended by 8,000 people, which followed the banquet, Miss Carol Martin, a junior at Utah State Agricultural College, was crowned Miss Airpower. Her escort for the evening was Cadet Lt. Col. Mel Shriner from Denver University, who was representing the Arnold Air Society. Miss Martin was crowned by Miss Helen Daines, last year's winner.

Space does not permit full credit to all who helped make the Symposium so successful, but a few names may be singled out: James Bonnar was program committee chairman; Joe Wixson handled arrangements; Lester Thomas headed the invitations committee; Wayne Baker was publicity chairman; David Whitesides, ways and means; and Bill Farmer, the finance committee. Joseph Jacobs, Wing Commander, was general chairman.

When the final figures were in, the Symposium proved to be a financial success, too, even after expenses were paid to send the couple who won a Wing-sponsored raffle off on their free two-week vacation, via United Air Lines, to Hawaii. This prize went to Mr. and Mrs. Dave Viator of Salt Lake City.

Any way you look at it, Utah's 1957 Airpower Symposium was as fine a program as has ever been sponsored by an AFA unit—if not the finest. —END

AFA NEWS

SQUADRON OF THE MONTH

The Utah Squadrons, Cited for

the outstandingly successful 1957 Airpower Symposium, emphasizing the need for air age education in Utah's schools; and for their contributions to AFA in the Rocky Mountain Region.

In Long Island program, seventeen-man forum answers military career questions.

At Arnold Squadron's Career Night program, from left: Sqdn. Cmdr. Lou Davis; General Duff; General Nelson; Milton Caniff; Capt. Roy Simpler; Carlyle Jones.

Seldom has any AFA Squadron had such success with two outstanding programs one right after the other. But the **H. H. Arnold Squadron** of Long Island has done it again this month (*see* "AFA News," March '56), with the **second of its planned four programs** designed to further the **airpower education** of the leaders of the entire community.

On **February** 15 some 300 educators and youth leaders from Nassau and Suffolk Counties attended a squadron-sponsored seminar on **military career opportunities** held at Mitchel AFB. Guidance counselors and principals from **110 high schools** in addition to **Boy Scout and Civil Air Patrol leaders,** and representatives from several **church organizations** were in the audience.

The panel—composed of **Maj. Gen. Roger J. Browne,** Commander, First Air Force; **Brig. Gen. Raymond C. Bell,** Chief, Military District of New York (Army); and **Capt. Leroy C. Simpler,** Chief of Staff, US Naval Reserve—kicked off the program with a special briefing on the educational requirements and opportunities in their branches. Then "teams" of military educators answered the audience's questions. Some measure of the program's success was the fact that the hour and forty-five-minute period allotted for questions had to be extended.

Squadron Commander Lou Davis appointed **Carlyle H. Jones,** Advertising and Public Information Manager for Sperry Gyroscope Company, as chairman of this program. **Milton Caniff,** who received AFA's Arts and Letters Trophy in 1955, was Toastmaster for the banquet that evening.

The third in the Squadron's program series, planned for this month, will be **"Classroom In The Sky."**

Miss Sandra Lee has been selected as the Illinois Wing's "Miss Airpower" and will reign at the **Wing Convention** in the Sherman Hotel, Chicago, on **April 27, Vern Arnt, Convention Chairman, has announced.** As a result, Miss Lee was inspired to take flying lessons. Her "teacher" is **George Edgecumbe,** Manager of Elgin Airport, and owner of Tufts Edgecumbe, Inc. He was a recipient of **AFA's Medal of Merit** at New Orleans last year, for his work in the annual "Kid's Day" program of the DuPage Squadron.

Miss Lee *(see cut)* also took part in the Chicago premiere of the new Universal-International film **"Battle Hymn"** on February 21. **George Anderl,** AFA National Director, was program chairman. The movie tells the story of **AF Col. Dean E. Hess,** through whose efforts a foundation known as HOPE, Inc., has raised money for an orphanage for Korean youngsters.

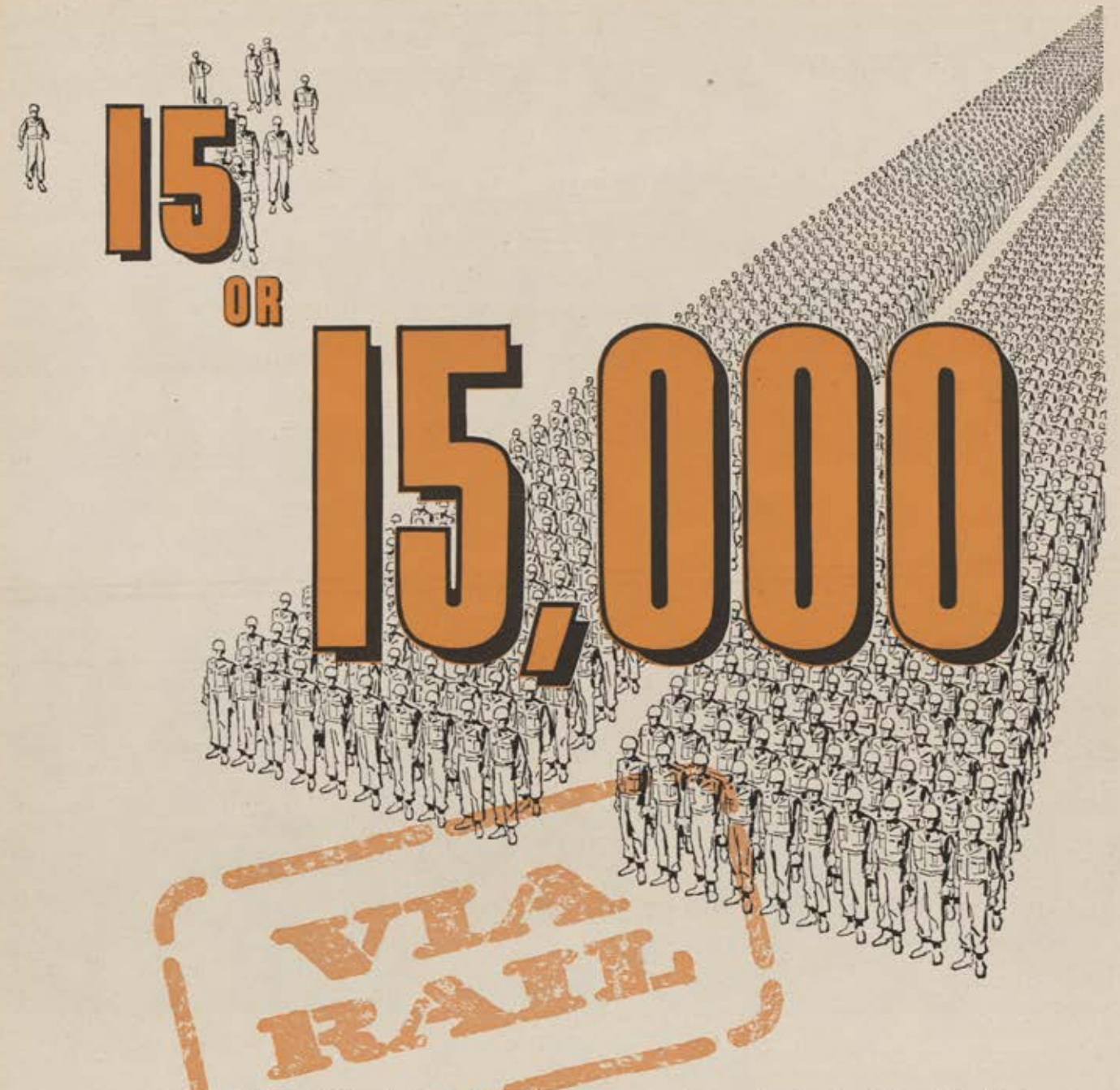
Before the premiere, a testimonial dinner was held for **Colonel Hess** and **Rock Hudson,** who portrays the colonel in the picture. Proceeds from the dinner, which was attended by almost 300 people, went to the foundation.

Among the honored guests were **AFA President John P. Henebry,** National Director **Morry Worshill,** and Illinois Wing Commander **Bob Vaughan.**

In Chicago, Rock Hudson crowns Sandra Lee "Miss Airpower," while George Anderl (left) and Bob Vaughan look on.

The Arnold Aid Society's **Frank P. Lahm Squadron,** University of Maryland, was host on February 22-23 to the 127 cadets attending the **Eighth Annual Conclave** of Area C, of the Society. The area takes in **twenty-three schools** in Pennsylvania, North Carolina, Virginia, Maryland, and the

(Continued on page 159)



Regardless of size (and equipment) military units move best by rail. Train travel is comfortable, convenient and efficient. Troops, their baggage and impedimenta move together and arrive together at destination. Only the railroads are capable of providing complete transportation for any movement...anytime...any size...in any weather.

the RAILROADS OF THE UNITED STATES

Reduced fares when on leave
...special discounts on Transportation Requests
Ask about Family Fares

The Best Buy—BUY TRAIN!

Enjoy the luxury of "Red Carpet" Service ...only United Air Lines has it!

Before you've walked the full length of the long red welcome mat rolled out to greet you, you'll begin to feel that here is a special sort of travel. And it is. It's your most luxurious way to go places—in the nation's fastest airliners, DC-7s—swiftly, easily, relaxed. A choice of cocktails, full-course meals created by a master chef, tempting fruit tray—many other "extras"—add to your sense of satisfaction. You will want to travel in this comfort again—often.

NONSTOP Red Carpet* DC-7 service from New York, Philadelphia, Detroit, Washington, D. C., Chicago, Denver, Los Angeles, San Francisco, Seattle and Honolulu. Call United, or your travel agent, for reservations or information.

*Red Carpet is a service mark owned and used by United Air Lines, Inc.

District of Columbia. Headquarters of Area C is at Penn State University.

Cadet Maj. George A. Burch, Commander of the Lahm Squadron, was Conclave Chairman, and delivered the welcoming address. **Lt. Col. Louis F. Ciccoli** (USAF, Ret.), Executive Secretary of AAS, reported on the activities of his office and the general condition of the Society, saying that the Society now has more than **7,000 members** in some 170 Squadrons.

A banquet, at the Hamilton Hotel in Washington, wound up the two-day program. **James H. Straubel,** AFA Executive Director, was guest speaker, and outlined the relationship between the AAS and the Association. Arnold Air Society awards were given to **Mr. Straubel, Ralph V. Whitener, and John O. Gray,** in token of AAS appreciation of AFA cooperation.

The January luncheon meeting of the **San Francisco Squadron** featured an address by **Capt. Iven Kincheloe,** Edwards AFB test pilot who last year flew higher than any man has ever gone before—126,000 feet, in the **Bell X-2 rocket plane.** He described his record flight for the capacity audience and talked about the accomplishments of the pilots at Edwards.

This was the seventeenth in the Squadron's "**Airpower in Action**" series of luncheon meetings. At the February meeting, a surprise guest was **Arthur C. Storz** *(see cut),* a National Director, from Omaha, Nebr.

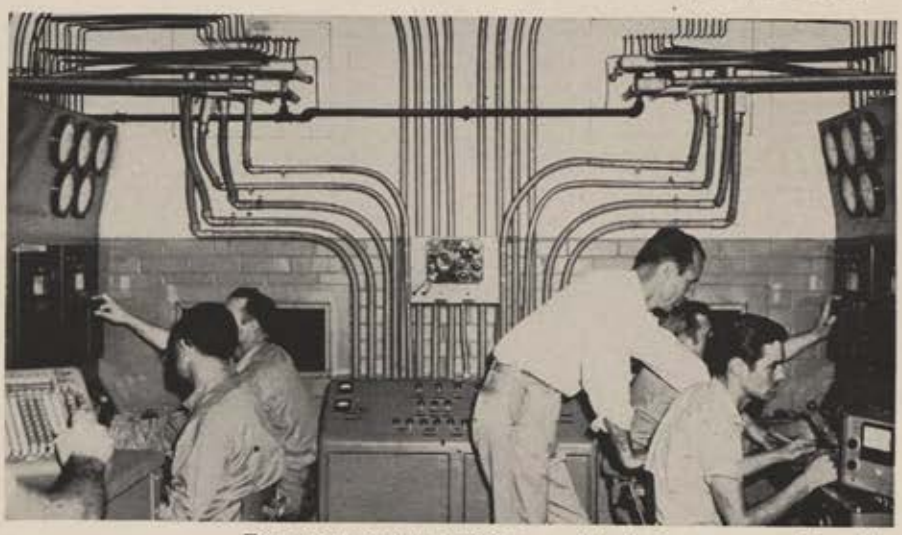
Bud West, Vice Commander of the **Syracuse, N. Y., Squadron,** reports that the Squadron sponsored an **Air Transport Conference** for the faculties of Syracuse schools in January. **American, Mohawk, and Eastern Airlines** each presented panel studies of the future plans for service to the area. The program was held in the Onendaga Hotel.

Leonard A. Work, State College, Penna., Regional Vice President, served as Moderator for the forum. Prior to the program, **Syracuse's Mayor, Donald H. Mead,** was made an honorary Squadron member. **Brig. Gen. Robert C. Israel,** Commander, 32d Air Division, ADC, Hancock AFB, made the presentation.

A dinner meeting at the Cloud Room of **Des Moines's** Municipal Airport on February 5 was the scene of the **re-activation of the Des Moines Squadron.** Thirty-five members signed the application for renewal of the Squadron which was originally char-

(Continued on following page)

AFTER OVERHAUL, Air Force and Navy jet engines are precision-checked in Southwest Airmotive's scientifically equipped and muffled testing installation. It is presently designed for turbine types from the J-33 and J-35 through the J-47 with afterburner. With relatively minor modification, it also can accommodate the J-57, J-75, and J-79.



FINE EQUIPMENT, training, and techniques are combined in the dual control room of Southwest Airmotive's two-cell jet test operation.

A surprise visitor to the San Francisco Squadron meeting at which new officers were installed was National Director Arthur C. Storz, fourth from left. Other are, from left, National Director Michael Kavanaugh; Walter Richards, First Vice Commander; Thomas Barbour, the new Squadron Commander; Mr. Storz; Clay Bernard, Second Vice Commander; and Clifford Griffin, the outgoing Commander.

At Fresno, Calif., Squadron luncheon meeting, from left: Col. George Edmonds, Lt. Ronald Lyons, Squadron Commander "Jack" Brummer, Jim McDivitt, and Ramsey Elliott, the toastmaster.

Roland Bohde, San Diego Squadron Commander, and Frank Brazda pose with Cub Scout winners in Squadron-sponsored model-building contest.

AFA NEWS — CONTINUED

tered in 1946, but has been inactive for some time. **Joel R. Johnson,** of nearby Alleman, Iowa, was selected as Commander. **Allen R. Packer,** a member of the Association's Air Guard Council, was elected Vice Commander. **Mrs. Anita M. Pence** is **Secretary,** and **Donald J. Boo** is Treasurer.

The Council includes **Allen E. Towne, James F. Quigley, Floyd E. Coultas, and Robert S. Miller.** Credit for an assist in this reorganization goes to **Lt. Col. Merlyn McLaughlin,** Commander of the Des Moines AF Reserve Center.

Johnson announced hopes to form **several more Squadrons** and then a Wing organization, and to come to the Washington Convention as a unit.

Maj. Gen. Clements McMullen (USAF, Ret.), AFA's Southwest Regional Vice President (Oklahoma, Texas, New Mexico) has announced the appointment of a new Texas Wing Commander—**Maj. Gen. Charles F. Born** (USAF, Ret.). The appointment, effective February 14, was confirmed by President Henebry on that date.

General Born who lives in Dallas, is associated with **Temco Aircraft Corp.** He is a member of the Dallas Squadron and the Airpower Council there. The final assignment in his long AF career was as Commander, Crew Training Air Force, ATC, Randolph AFB, Tex.

—Gus Duda

use COOPER *shelf service*

for faster service on precision fasteners AN, NAS, MS*

ARE YOU ENJOYING the tremendous convenience of obtaining your precision fasteners when you need them *as you need them* through Cooper Shelf Service? Let the "Industry's Inventory" save you uncertainties, delays and production tie-ups.

*Cooper Service is faster on Specials, too. May we quote?

now thirty million

~~3~~ 20,000,000

standards in stock

Typical Inquiry

What you can expect from Cooper Shelf Service is illustrated by this typical customer inquiry which found all items available for immediate shipment—additional quantities available within two weeks.

Customer Requirement	*In Stock*
AN 3-5A	97000
AN 16-20A	265
AN 3C-4A	84000
AN 12C-43	325
AN 3DD-4A	34000
AN 8DD-35A	1300
AN 23-8A	45000
AN 30-50	450
AN 73-2	11500
AN 80-15	385
AN 73-A2	9700
AN 81-A47	210
AN 173-3A	6300
AN 182-41	570
AN 173C-5A	5200
AN 178C-47	420
AN 174DD-4A	1350
AN 177DDH-21	490
NAS 333-PA-3-45	64000
NAS 340-A25	275
NAS 428-3-6	14000
NAS 428-6-16	940
NAS 464-3A-5	15500
NAS 464-16-45	340
NAS 501-3-3A	39000
NAS 501-8-20A	975
NAS 517-3-0	38000

symbol of

security in fasteners

COOPER PRECISION PRODUCTS

5625 West Century Boulevard, Los Angeles 45, California • ORegon 8-3973

THIS IS AFA

The Air Force Association is an independent, non-profit, airpower organization with no personal, political or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

OBJECTIVES

• To assist in obtaining and maintaining adequate airpower for national security and world peace. • To keep AFA members and the public abreast of developments in the field of aviation. • To preserve and foster the spirit of fellowship among former and present personnel of the United States Air Force.

MEMBERSHIP

Active Members: Individuals honorably discharged or retired from military service who have been members of, or either assigned or attached to the USAF or its predecessor services, or who are currently enrolled in the Air Force Reserve or the Air National Guard. $5.00 per year.

Service Members (non-voting, non-office-holding): Military personnel now assigned or attached to the USAF. $5.00 per year.

Cadet Members (non-voting, non-office-holding): Individuals enrolled as Air Force ROTC Cadets, Civil Air Patrol Cadets, or Cadets of the US Air Force Academy. $3.00 per year.

Associate Members: (non-voting, non-office-holding): Individuals not otherwise eligible for membership who have demonstrated their interest in furthering the aims and purposes of the Air Force Association. $5.00 per year.

Industrial Associates: Companies affiliating with the Air Force Association on a non-membership status that receive subscriptions to AIR FORCE Magazine and special magazine supplements known as Industrial Service Reports.

OFFICERS AND DIRECTORS

JOHN P. HENEBRY, President
Box 448
Park Ridge, Ill.

JULIAN B. ROSENTHAL, Secretary
630 Fifth Ave.
New York 20, N. Y.

GILL ROBB WILSON, Chairman of the Board
366 Madison Ave.
New York 17, N. Y.

SAMUEL M. HECHT, Treasurer
The Hecht Co.
Baltimore 1, Md.

Regional Vice Presidents: Thomas C. Stebbins, 66 Uxbridge St., Worcester, Mass. **(New England);** Leonard A. Work, 511 Clarence Ave., State College, Penna. **(Northeast);** William W. Spruance, RFD 1, Wilmington, Del. **(Central East);** Alex G. Morphonios, 3131 NW 16th St., Miami, Fla. **(Southeast);** Jerome Green, 23090 Parklawn, Oak Park 37, Mich. **(Great Lakes);** Edwin A. Kube, 4516 42nd Ave., South, Minneapolis, Minn. **(North Central);** Fred O. Rudesill, 516 Sadie Ave., Metairie, La. **(South Central);** J. Chesley Stewart, 1423 Locus St., St. Louis 3, Mo. **(Midwest);** Clements McMullen, 515 Lamont Ave., San Antonio 9, Tex. **(Southwest);** Gwynn H. Robinson, P. O. Box 106, Colorado Springs, Colo. **(Rocky Mountain);** Winfield G. Young, 2039 E. 103 St., Seattle 55, Wash. **(Northwest);** Charles O. Morgan, Jr., 1310 Mills Tower, San Francisco, Calif. **(Far West);** Roy J. Leffingwell, P. O. Box 2450, Honolulu, T. H. **(Pacific Ocean Area).**

Directors: John R. Alison, c/o Northrop Aircraft, Inc., Hawthorne, Calif.; **George A. Anderl,** 412 N. Humphrey Ave., Oak Park, Ill.; **Walter T. Bonney,** 9414 St. Andrews Way, Silver Spring, Md.; **Benjamin W. Chidlaw,** 23555 Euclid Ave., Cleveland, Ohio; **John J. Currie,** 175 E. Railway Ave., Paterson, N. J.; **Edward P. Curtis,** 343 State St., Rochester 4, N. Y.; **James H. Doolittle,** 100 Bush St., San Francisco 6, Calif.; **Joseph J. Foss,** Governor's Office, Pierre, S. Dak.; **Jack B. Gross,** 2933 N. Front St., Harrisburg, Penna.; **George D. Hardy,** 3403 Nicholson St., Hyattsville, Md.; **Robert S. Johnson,** Brae & Shadow Lane, Woodbury, N. Y.; **Michael Kavanaugh,** 925 Golden Gate, San Francisco, Calif.; **Arthur F. Kelly,** 6060 Avion Drive, Los Angeles 45, Calif.; **George C. Kenney,** 23 W. 45th St., New York 36, N. Y.; **Thomas G. Lanphier, Jr.,** 3165 Pacific Highway, San Diego 12, Calif.; **Stephen F. Leo,** Sverdrup & Parcel, Cafritz Bldg., Washington, D. C.; **Carl J. Long,** 1050 Century Bldg., Pittsburgh 22, Penna.; **Hardin W. Masters,** 621 N. Robinson, Oklahoma City, Okla.; **Peter J. Schenk,** 1617 Las Canoas Rd., Santa Barbara, Calif.; **C. R. Smith,** Apt. 4-A, 510 Park Ave., New York 22, N. Y.; **Carl A. Spaatz,** 9405 Oak Lane, Chevy Chase, Md.; **Arthur C. Storz,** 1807 N. 16th St., Omaha, Nebr.; **Harold C. Stuart,** Suite 1510, Nat'l Bank of Tulsa Bldg., Tulsa, Okla.; **James M. Trail,** Box 1098, Boise, Idaho; **S. Ernest Vandiver,** Lavonia, Ga.; **T. F. Walkowicz,** Suite 5600, 30 Rockefeller Plaza, New York 20, N. Y.; **Frank W. Ward,** 257 Lake Shore Dr., Battle Creek, Mich.; **Morry Worshill,** 2223 Highland Ave., Chicago 45, Ill.; **Msgr. William F. Mullally,** National Chaplain, 4924 Bancroft Ave., St. Louis 9, Mo., **ex-officio member; William Sparks,** National Commander, Arnold Air Society, University of Denver, Denver, Colo., **ex-officio member.**

WING COMMANDERS

Thomas E. Bazzarre, Jr., Beckley, W. Va.; Girard A. Bergeron, Warwick, R. I.; Wallace Brauks, St. Louis, Mo.; Paul Canonica, Pueblo, Colo.; Curtis Christensen, Van Nuys, Calif.; Philippe Coury, Readville, Mass.; Robert Cox, Harrisburg, Penna.; Alan Cross, Miami, Fla.; Irvin F. Duddleson, South Bend, Ind.; C. J. Fern, Honolulu, T. H.; Paul Fonda, Hagerstown, Md.; Wayne Fredericks, Battle Creek, Mich.; William H. Hadley, Little Rock, Ark.; Clyde Hailes, New Orleans, La.; Ken Hamler, Millington, N. J.; Harold R. Hansen, Seattle, Wash.; Thomas Hogan, Mississippi City, Miss.; Joseph Jacobs, Ogden, Utah; Arland L. James, Albuquerque, N. M.; Hardin W. Masters, Oklahoma City, Okla.; Robert N. Maupin, Cheyenne, Wyo.; Herbert McCormack, Milwaukee, Wis.; Robert H. Mitchell, Portland, Ore.; William O. Ross, Mobile, Ala.; Walter L. Savage, Washington, D. C.; William Stein, New York, N. Y.; Ernest Vandiver, Atlanta, Ga.; Robert Vaughan, Mt. Prospect, Ill.; Frank W. Wiley, Helena, Mont.; Don Wohlford, Akron, Ohio; Glenn Yaussi, Lincoln, Nebr.

COMMUNITY LEADERS

Akron, Ohio, James D. Wohlford, 247 Pierce Ave., Cuyahoga Falls; **Albany, N. Y.,** LeRoy Middleworth, 387 Myrtle Ave.; **Aliquippa, Penna.,** William Rohm, 1306 McMinn St.; **Atlanta, Ga.,** Joel B. Paris, 2452 Ridgewood Rd., NW.; **Arlington, Mass.,** Richard Carter, 147 Jason St.; **Baltimore, Md.,** Meir Wilensky, P.O. Box 3725; **Bangor Me.,** Martin Cantor, 312 French St.; **Baton Rouge, La.,** William A. Cox, Elm St., Denham Springs; **Battle Creek, Mich.,** Stewart Mast, 190 W. Territorial Rd.; **Berwyn, Ill.,** Walter R. Mahler, 6415 Roosevelt Rd.; **Bland, Mo.,** Bruce Zulauf, RFD 2; **Boise, Idaho,** C. B. Reese, P.O. Box 1098; **Boston, Mass.,** James Winston, 105 Sagamore Ave., Winthrop; **Brooklyn, N. Y.,** R. H. Kestler, 436 Lincoln Ave.; **Chicago, Ill.,** Robert Vaughan, 713 N. Pine, Mt. Prospect; **Chicopee, Mass.,** Raymond J. Tomchik, 104 Granville Ave.; **Cleveland, Ohio,** O. M. Fike, 22370 Coulter; **Clifton, N. J.,** Betty Kalincsak, 156 Union Ave.; **Colorado Springs, Colo.,** James Reilly, 2818 Templeton Gap Rd.; **Dallas, Tex.,** Paul Cain, 3906 Lemmon Ave.; **Dayton, Ohio,** Jack Jenefsky, 1428 Benson Dr.; **Daytona Beach, Fla.;** William Wright, P.O. Box 1730; **Denver, Colo.,** J. P. Swagel, 4770 Columbine St.; **Detroit, Mich.,** Russell Lloyd, Renssalear Blvd., Oak Park; **Elgin, Ill.,** Bruce Rice, 573 N. Grove Ave.; **Enid, Okla.,** Clyde Dains, 430 S. Van Buren; **Fairfield, Calif.,** Alan Engell, Box 521, Suisun; **Flint, Mich.,** James Mitchell, 901 Buckingham; **Fresno, Calif.;** M. J. Brummer, 2017 Mariposa; **Gulfport, Miss.,** Louis Riefler, 2001 Curcor Dr., Miss. City; **Hagerstown, Md.,** Jake Beard, 831 Mulberry Ave.; **Harrisburg, Penna.,** William Lunsford, 3720 Brisban St.; **Hollywood, Fla.,** Vincent Wise, 41 Edmund Rd.; **Honolulu, T. H.,** V. T. Rice, 302 Castle & Cook Bldg.; **Houston, Tex.,** Earl Shouse, 1009 San Jacinto Bldg.; **Kansas City, Mo.,** Wofford E. Lewis, 6031 Summit; **Knoxville, Tenn.,** Laurence Frierson, c/o Hamilton Nat'l Bank; **Lake Charles, La.,** L. R. Savoie, Gordon Bldg.; **La Mar, Colo.,** Arthur Kroell, Box 212; **Lansing, Mich.,** Richard Pifer, 4415 De Camp St., Holt, Mich.; **Las Vegas, Nev.,** Ray Culley, 2421 So. 5th St.; **Lewistown, Pa.,** Peter Marinos, 17 W. Charles St.; **Lexington, Mass.,** Harold E. Lawson, RFD; **Lincoln, Nebr.,** Walter Black, 726 Stuart Bldg.; **Long Beach, Calif.,** Richard Trevor, 5363 The Toledo; **Los Angeles, Calif.,** James Czach, 1729 W. 4th St., San Pedro, Calif.; **Marietta, Ga.,** Joseph A. Sellars, 401 S. Woodland Dr.; **Meridian, Miss.,** James E. Baxter, Box 729; **Miami, Fla.,** Robert Myer, Jr., Box 151, IAB; **Miami Beach, Fla.,** John Peterson, 4881 Lake Dr. Lane, So. Miami; **Millington, N. J.,** Ken Hamler, Overlook Rd.; **Milwaukee, Wis.,** Elmer M. Petrie, 234 S. 74th St.; **Minneapolis, Minn.,** Robert P. Knight, 806 Morehead, White Bear Lake; **Mobile, Ala.,** William Ross, 352 Durande Dr.; **Nashville, Tenn.,** James Rich, 3022 23rd Ave. S.; **New Orleans, La.,** Clyde Hailes, 5218 St. Roch; **New York, N. Y.,** William Stein, 236 W. 27th St.; **Norman, Okla.,** Newton Moscoe, 1303 Ann Arbor Dr.; **Ogden, Utah,** John Dayhuff, P. O. Box 1063; **Oklahoma City, Okla.,** Ted Findeiss, 1405 Sherwood Lane; **Omaha, Nebr.,** Danforth Loring, 209 S. 19th St.; **Park Forest, Ill.,** Albert Stein, 14 Bertoldo Rd.; **Philadelphia, Pa.,** Joseph Dougherty, 1200 Agnew Dr., Drexel Hill; **Phoenix, Ariz.,** James Shore, 3312 E. Coulter; **Pittsburgh, Penna,** C. A. Richardson, 304 Hillcrest Ave.; **Portland, Ore.,** Thomas Moore, 517 Corbett Bldg.; **Sacramento, Calif.,** Frank Grow, 3841 El Ricon Way; **St. Joseph, Mich.,** Ralph A. Palmer, 2522 Thayer Dr.; **St. Louis, Mo.,** Ken Wander, 8804 Swifton Ave.; **San Diego, Calif.,** Rolan Bohde, 3035 Juniper St.; **San Francisco, Calif.,** Clifford Griffin, 610 California St.; **San Juan, P. R.,** Jose Rivera, 207 Jose de Diego St., Rio Piedras; **Savannah, Ga.,** Andrew Swain, 1931 Grove St.; **Seattle, Wash.,** Harold Hansen, Exchange Bldg.; **Shreveport, La.,** Frank Keith, 3805 Baltimore; **Sioux Falls, S. D.,** Duane Corning, 2713 S. Duluth Ave.; **Spokane, Wash.,** Roy Hanney, Realty Bldg.; **State College, Penna.,** D. H. McKinley, 642 Fairway Rd.; **Stockton, Calif.,** Norman Foote, 7616 St. Carlo St.; **Syracuse, N. Y.,** J. William Lowenstein, 1026 Westcott St.; **Tampa, Fla.,** George Lyons, Jr., 707 W. River Dr.; **Taunton, Mass.,** Stephen Tetlow, P. O. Box 423; **Toledo, Ohio,** Herman Thomsen, 4104 Fairview; **Tonawanda, N. Y.,** James Lynett, 725 Brighton Rd.; **Trenton, N. J.,** Anthony Bliznawicz, 315 Hollywood Dr.; **Washington, D. C.,** Walter Savage, 1500 Massachusetts Ave., N.W.; **Worcester, Mass.,** Charles Cashen, 4 Othello St.; **Yakima, Wash.,** Henry Walker, 6403 Summitview Ave.

NATIONAL HEADQUARTERS STAFF

Executive Director: James H. Straubel
Program Director: Ralph V. Whitener
Projects Director: John O. Gray

Director of Industrial Relations: Robert C. Strobell
Assistant for Reserve Affairs: Edmund F. Hogan

Organization Director: Gus Duda
Assistant for Special Events: Herbert B. Kalish

LEADERSHIP!

By definition, to lead is to move in advance of; have the first place among; take precedence over. To achieve such a position among weapons systems manufacturers, however, takes unusual teamwork.

Long regarded as a leader in the design and manufacturing of the most advanced armament control systems for aircraft of the United States, Hughes Aircraft Company utilizes the talents of major subcontractors such as Servomechanisms, Inc., to provide reliable sub-systems and components for the systems of today and the designs for tomorrow.

Typical of these sub-systems is Servomechanisms' Master Data Computer which senses temperatures, pressures, acceleration and other basic data; computes and integrates them to provide vital control imputs for air craft's navigation, fire control, flight control and other systems.

SERVOMECHANISMS SMI INC.

SUBSYSTEMS GROUP

PLANTS: WESTCHESTER, CALIFORNIA • HAWTHORNE, CALIFORNIA • WESTBURY, L. I., NEW YORK • GARDEN CITY, L. I., NEW YORK

GENERAL OFFICES: 12500 AVIATION BOULEVARD, HAWTHORNE, CALIFORNIA

GOING PLACES!

People on the go, go Convairliner... *the world over!*

Forty-one leading airlines on all six continents now offer you the unexcelled convenience, comfort and dependability of the Convairliner. Built-in steps, ample racks for carry-on luggage, and many other comforts that are only now being planned for airliners of the future, are yours to enjoy *today* on a Convair! No wonder more airlines have chosen the Convair than any other modern passenger plane. Ask your travel agent or favorite airline to make your next flight a Convair. Wherever you go, you'll find a Convair *going places* the world over!

AERO O/Y Finland
AEROLINEAS ARGENTINAS
AERONAVES DE MEXICO
ALITALIA Italy
AMERICAN
ANSETT Australia
AVENSA Venezuela
BRANIFF
CANADIAN PACIFIC
CONTINENTAL
CRUZEIRO DO SUL Brazil
DELTA
EAGLE England
EASTERN
ETHIOPIAN
GARUDA Indonesia
HAWAIIAN
IBERIA Spain
IRANIAN
JAT Jugoslavia
KARHUMAKI Finland
KLM Royal Dutch
LACSA Costa Rica
LUFTHANSA Germany
MOHAWK
NATIONAL
NIPPERI Japan
NORTHEAST
ORIENT AIRWAYS Pakistan
PAN-AMERICAN
PAL Philippine
REAL S/A Brazil
SABENA Belgium
SAS Denmark, Norway Sweden
SAUDI ARABIAN
SWISSAIR Switzerland
TRANS-AUSTRALIA
TRANSOCEAN
UNITED
VARIG Brazil
WESTERN

CONVAIR

A DIVISION OF GENERAL DYNAMICS CORPORATION