

# AVIATION WEEK

A MCGRAW-HILL PUBLICATION

DEC. 17, 1951

50 CENTS

## Where a speck of dust is a mighty serious thing

A gyro is by nature a delicate instrument.

If, during production, any dust or lint gets into the assembly, chances are good that later the high speed, precision mechanism will refuse to give top performance. This can have serious consequences for a pilot, or can make a guided missile ineffective—if failure occurs at a crucial moment.

And this is why, at Honeywell, gyros are produced under the *carefully controlled* conditions you see pictured here. Workers wear nylon smocks and surgical caps to guard against lint and dust. A double door air lock prevents outside dust from entering. Humidity and temperature are held at just the right levels.

Further guarantees of top performance by Honeywell gyros—like the extremely sensitive rate gyro for radar tracking and missile guidance systems, shown in final assembly here—result from engineering and testing procedures in which no detail is overlooked.

Today, Honeywell, one of the nation's leading gyro manufacturers, specializes in this important field.

And Honeywell engineers will continue to experiment, improve and find new applications for gyroscopic controls. We plan to broaden our research in this and other fields of control—because *automatic control* is such an important part of aviation progress. And *automatic control* is Honeywell's business.

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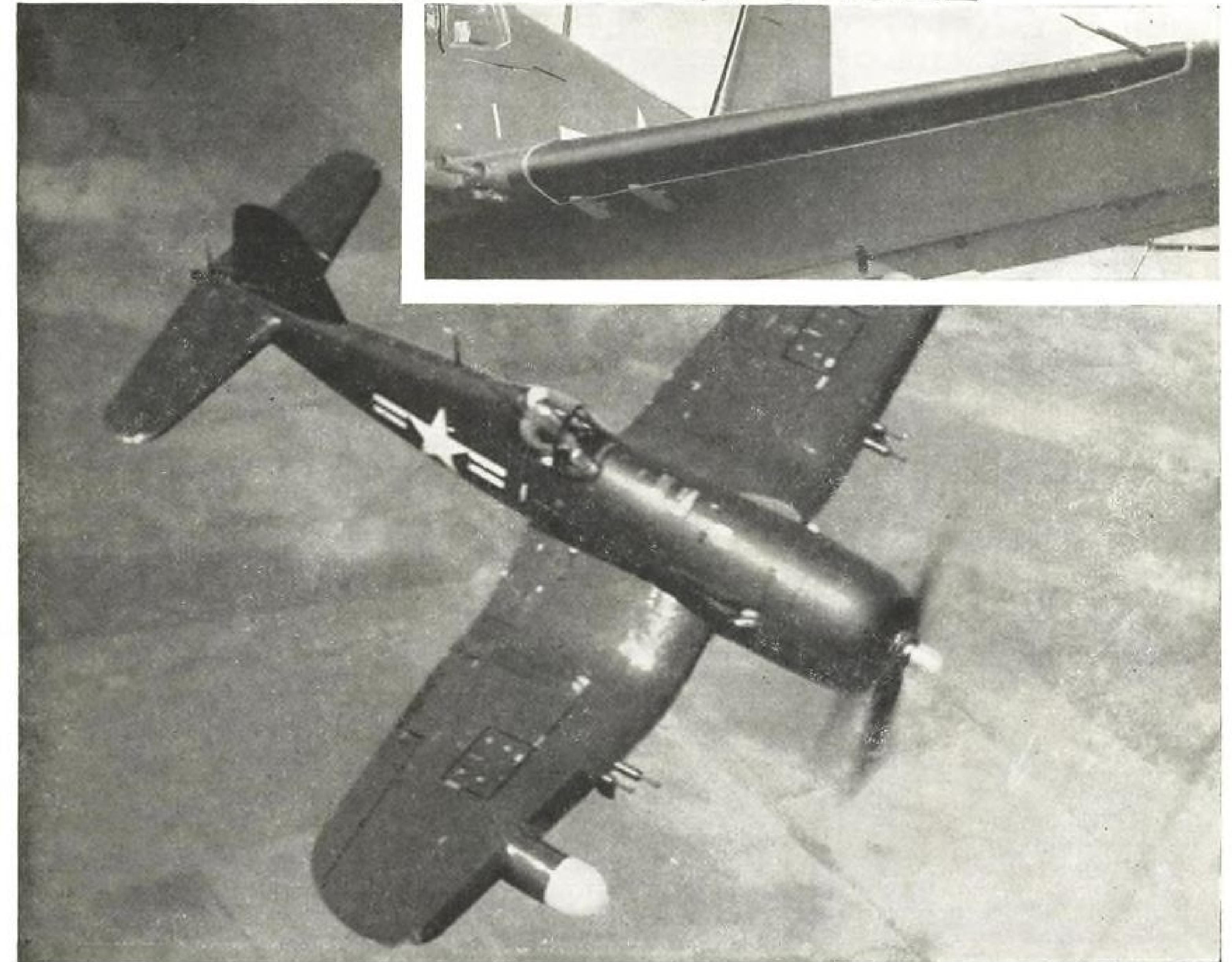
*Aeronautical Controls*







# B.F. Goodrich



## Another fast plane fights better with new De-Icer

IT TOOK only 21 days to design, install and test a new-type De-Icer for Chance Vought's Corsair. Fast work like that is proof that these tough little fighters needed ice protection in a hurry.

Two big questions were involved. Would the high performance of the Corsair tend to tear off the De-Icers in flight? Would De-Icers upset the plane's flight characteristics? The Navy and Chance Vought found out that B. F. Goodrich had been working on new De-Icer developments and had the answer.

BFG engineers in cooperation with Chance Vought engineers designed, installed, and flight-tested this new-type De-Icer on a Corsair. The new De-Icer

had its entire inner surface—not just the edge—cemented to the wing. Further reinforcement was provided by a screwed-on fairing strip. The new De-Icers came through the high-speed tests without a sign of damage. Original flight characteristics were maintained.

The designing, installing, and test-flying was followed by fast production, and within a short time, De-Icers were in use on Corsairs over Korea. The new De-Icers have extra efficiency in removing ice because they have smaller air tubes with higher air pressure and faster inflation and deflation cycles. They are light in weight, yet tough and long-lasting. Their plumbing takes up

little space. With De-Icers on the outside, readily accessible, maintenance is easy. The new De-Icers are now proved practical for high-speed single engine planes as well as twin engine or larger.

Safest ice-removal device for airplane leading edges yet developed, De-Icers are another product of B. F. Goodrich aeronautical research and engineering. Let us help you design De-Icers into your single engine planes. Write The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.

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Get in touch with our Engineering Department for data and suggestions on complete Lock-Clad Control Cable Assemblies. John A. Roebling's Sons Company, Trenton 2, New Jersey



# ROEBLING

# Aviation Week



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Volume 55

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Domestic News Bureaus: Atlanta 3, Rhodes-Haverty Bldg.; Chicago 11, 520 N. Michigan Ave.; Cleveland 15, Hanna Bldg.; Detroit 26, Penobscot Bldg.; Los Angeles 17, 1111 Wilshire Blvd.; San Francisco 4, 68 Post St.; Houston, 514 South St. Correspondents in more than 60 major cities.

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Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

Robert F. Boger  
PUBLISHER

R. W. Martin, Jr., Sales Manager; J. C. Johnson, Business Manager; Anita Scaffo, Research and Marketing; Sales Representatives: J. C. Anthony, New York; M. J. Storz, Philadelphia; H. P. Johnson, Cleveland; L. J. Biel, Chicago; W. E. Donnell, St. Louis; E. P. Blanchard, Jr., Boston; James Cash, Dallas; R. C. Maultsby, Atlanta; R. F. Dorland, Jr., San Francisco; C. F. McReynolds, Los Angeles. Other sales offices in Pittsburgh, Detroit, London.

December 17, 1951

AVIATION WEEK  
Member ABC and ABP

Vol. 55—No. 25

Published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. Publication Office: 99-129 North Broadway, Albany 1, N. Y.  
Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y.  
Curtis W. McGraw, President; Willard Chandler, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.  
Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 36, N. Y. Allow ten days for change of address.  
Please indicate position and company connection on all subscription orders.  
Single copies 50¢. Subscription rates—United States and possessions, \$6 a year; \$9 for two years; \$12 for three years. Canada, \$8 a year; \$12 for two years; \$18 for three years, payable in Canadian currency at par. Pan American countries, \$10 a year; \$16 for two years; \$20 for three years. All other countries, \$20 a year; \$30 for two years; \$40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A. Copyright 1951 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Cable address "McGraw-Hill" New York. Publications combined with AVIATION WEEK are AVIATION, AVIATION NEWS, AIR TRANSPORT, AERONAUTICAL ENGINEERING and AIRCRAFT JOURNAL. All rights to these names are reserved by McGraw-Hill Publishing Co.

TEXACO  
HAILS—

# NORTHWEST AIRLINES' 25<sup>TH</sup> ANNIVERSARY



**NORTHWEST AIRLINES** this year spans its first quarter-century . . . has grown from wood-and-wire, open-cockpit biplanes to a luxury skyfleet of Boeing Stratocruisers, and Douglas DC-4s all lubricated with *Texaco Aircraft Engine Oil*. Northwest inaugurated passenger service in July, 1927, and pioneered night air mail flights in 1928. Scheduled service to the Orient began in 1947. The Northwest Airlines system includes an additional 3,043 miles certified but not yet flown.



IN its first 25 years of growth and achievement, Northwest Airlines has written one of aviation's most notable "success stories." The first Northwest flight in the fall of 1926 carried air mail from the Twin Cities to Chicago. Today, Northwest Airlines routes span the entire continent and reach out to Hawaii, Alaska, the Philippines, Japan, Korea, Formosa and other points in the Far East . . . a total of 17,465 route miles.

Northwest Airlines is justifiably proud of the dependable performance of its mighty skyfleet . . . and Texaco shares that pride. For the engines of all Northwest planes are lubricated with *Texaco Aircraft Engine Oil* exclusively.

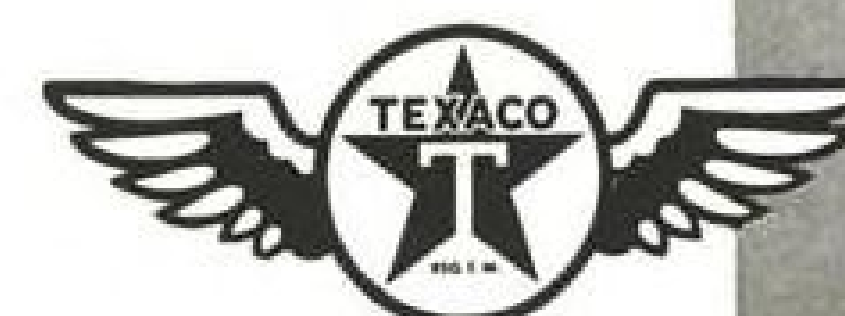
*Texaco Aircraft Engine Oil* was chosen for this exacting aircraft lubrication job because of its proved dependability

and superior performance. And these are among the reasons why —

*For over 15 years, more revenue airline miles in the U. S. have been flown with Texaco Aircraft Engine Oil than with any other brand.*

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## IN THE NEWS

# G-E FLIGHT TEST CENTER FINDS ANSWERS IN THE SKY

A sure way to test airborne equipment is in the air. So General Electric has established an invisible laboratory that stretches eight miles up into the sky.

At the bottom of this lab is the G-E Flight Test Center at the Schenectady, N. Y. County Airport. Here, a "private air force" is put through its paces with new and improved aircraft equipment. A division of the Company's General Engineering Laboratory, the Flight Test Center is devoted entirely to testing General Electric aviation equipment *in the air*.

G-E's program of designing, testing, redesigning, retesting means better, more reliable equipment for you.

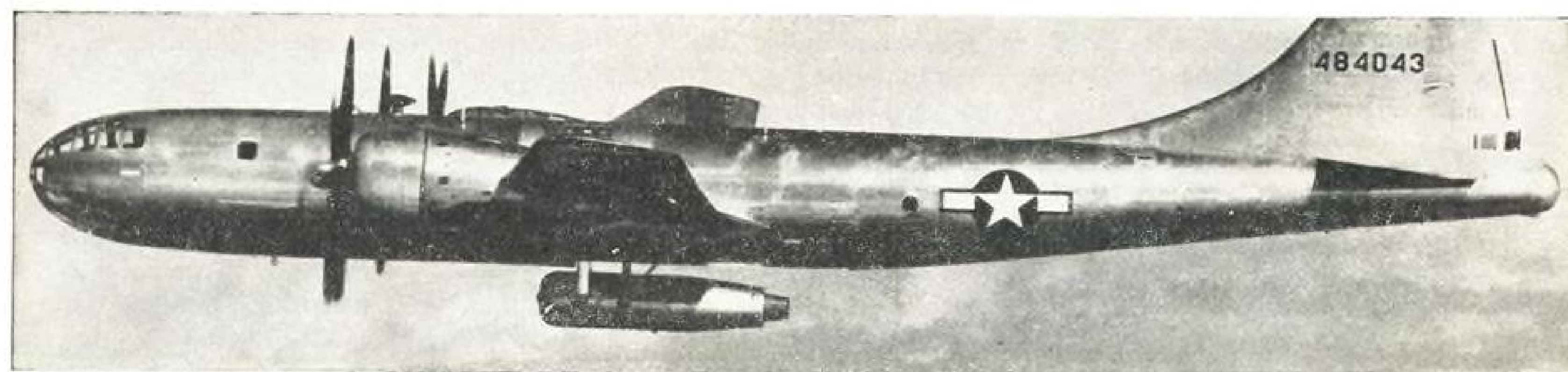
One of the biggest current programs, is an accelerated service test of G-E J47 engines in a North American B-45C, for the Air Force. This B-45 is one of the newest planes to join the Flight Test fleet.



Ed Haven, left, now manager of G-E's Aviation Divisions, beside G-E's first airplane, back in 1930. Prior to this purchase, equipment was tested in a monoplane rented for a dollar a minute. Foresight of men like Haven made possible the extensive facilities now in use.



New engines and components are tested thoroughly while slung from the bomb bay of a B-29. Here a J47-GE-23, powerful new jet recently placed in production, is made ready in the Flying Test Bed. New engine control, anti-icing, and ignition systems were first proved and improved in this plane.



A B-29 is pushed along by a standard J47, specially instrumented for test work. Many engine features and pilot techniques first checked out here, are now being combat-

proved in Korea. American Airlines crews, under contract to G-E, perform all flight operations.



Long distance wires and radio-telephones keep engineers in G-E's Aircraft Gas Turbine Divisions in Lynn, Mass., in contact with the crew in the test plane. Weldon Orme, at the Test Center, talks to Lynn (200 miles east) with the phone in his left hand, and the B-29 (eight miles up) with the phone in his right hand.



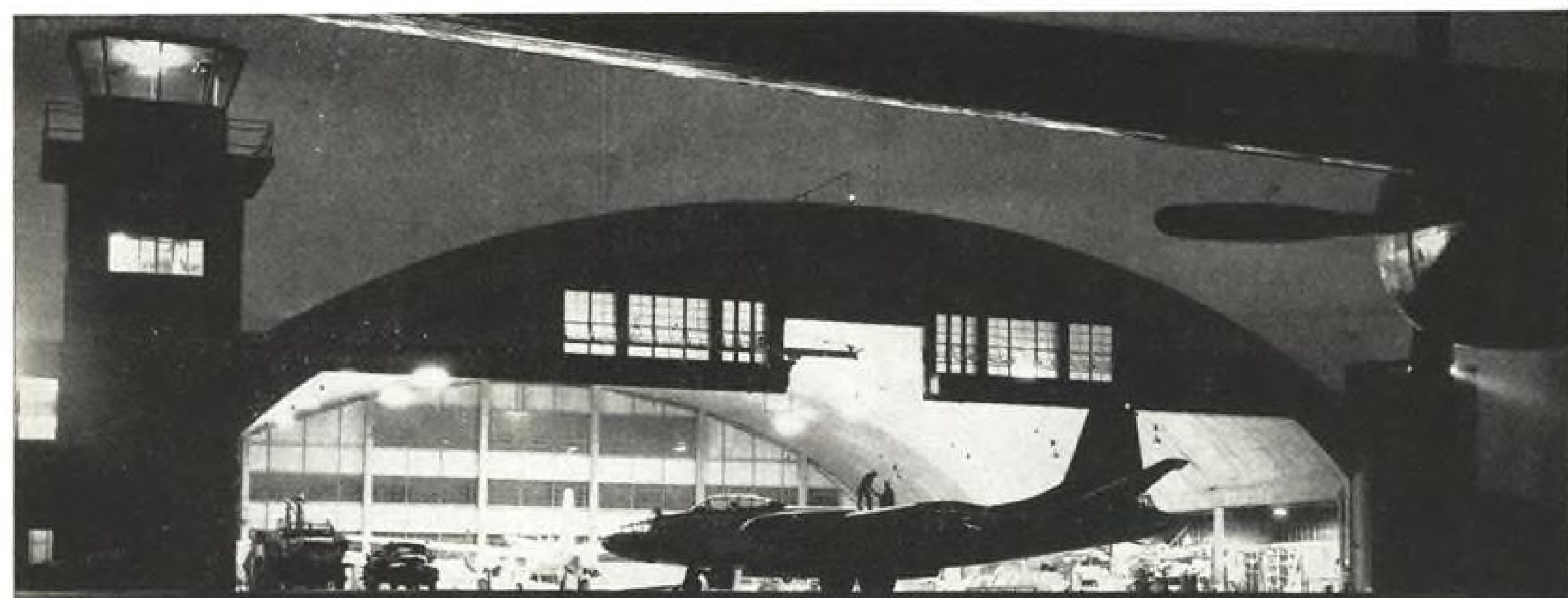
Special instrument panels in test aircraft are photographed four times per second. Cameras and instrument panels were specially designed for this purpose. After each flight the films are studied minutely to gain all possible information on operation of the engines.



Many types of aircraft are used. This B-23 tested high-altitude turbosuperchargers during the war. Cabin pressurizing from turbos, developed on this plane, is now in use on many military craft as well as on some commercial transports.



One of many projects at the Center has been a jet powerplant for a developmental helicopter. A 150-foot bowl served as a test pit for "Operation Skyhook." Ramjet, pulsejet, and turbojet engines are tested here.



The G-E stable of planes includes many loaned by the government as well as Company-owned craft. Closely guarded, the Flight Test Center tests armament, instru-

ments, autopilots, radar, electronics and communications equipment, electrical systems, and other aircraft equipment, in addition to aircraft powerplants.

# GENERAL ELECTRIC

210-24



## FOR THE TOUGHEST JOBS PICK THE HUSKIEST



Model R-220 photographed with a fountain pen to show compact size and design.

The huskier model TrimTrols—R-220 and R-174—are being used in increasing quantities where great strength and endurance are required. Rightly so. Although these models weigh only 3½ pounds, they have an ultimate static load capacity of 2,400 pound-inches and operate loads over 300 pound-inches through 160° rotation. Zero backlash, magnetic brake, adjustable limit switches, positive

overtravel stops, adjustable position-indicating potentiometer, and built-in radio noise filter are features of these TrimTrols.

Models R-220 and R-174 are identical in performance, but differ in mounting arrangements.

The newer, lighter TrimTrols—R-420 and R-422—weigh 2¼ pounds, have an ultimate capacity of 1,500 pound-inches.

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## AVIATION CALENDAR

- Dec. 17—Wright Day Dinner of Aero Club of Washington, Hotel Statler, Washington, D. C.
- Dec. 17—Wright Brothers Lecture, sponsored by the Institute of the Aeronautical Sciences, U. S. Chamber of Commerce Auditorium, Washington, D. C. 3 pm.
- Dec. 17—Wright Memorial Luncheon, principal speaker, Major Alexander P. de Seversky, Hotel Carolinian, Nags Head, N. C.
- Dec. 19—Wright Brothers Lecture (repeat), NACA Auditorium, Lewis Flight Propulsion Lab, Cleveland.
- Dec. 21—Wright Brothers Lecture (repeat), IAS Western Hq. Bldg., Los Angeles.
- Jan. 5-6, 1952—Annual Miami Air Show, sponsored by the Florida Air Pilots Assn., Opa Locka Airport, Fla.
- Jan. 6-8—Annual Cessna Distributors Meeting, Allis Hotel, Wichita, Kan.
- Jan. 28-Feb. 1—20th Annual Meeting, the Institute of the Aeronautical Sciences, Astor Hotel, New York.
- Jan. 29-31—114th National Meeting of the American Meteorological Society, Roosevelt Hotel, New York.
- Feb. 7—Meeting of Society of Automotive Engineers, Igor I. Sikorsky will speak on helicopter progress. Brass Rail Restaurant, 5 Ave. near 43 St., New York.
- Feb. 7-8—Regional Meeting of Instrument Society of America, Power Plant Symposium, Hotel Statler, New York.
- March 3-6—Institute of Radio Engineers, Waldorf-Astoria Hotel & Grand Central Palace, New York.
- March 14—Seventh annual Flight Propulsion Meeting, Institute of Aeronautical Sciences, Cleveland.
- March 17-19—Second Midwestern Conference on Fluid Mechanics, Ohio State University.
- March 17-22—American Society of Tool Engineers, International Amphitheater, Chicago.
- April 21-24—National Aeronautic Meeting and Aircraft Engineering Display, Society of Automotive Engineers, Hotel Statler, New York.
- May 15-16—Eighth annual forum, American Helicopter Society, Washington Hotel, Washington, D. C.
- June 23-27—American Society for Testing Materials' 50th Anniversary Meeting, Statler and New Yorker Hotels, New York.
- July 16-18—Annual summer meeting, Institute of Aeronautical Sciences, Los Angeles.

## PICTURE CREDITS

12—McGraw-Hill World News; 15—(top) Enell, Inc.; (middle) BOAC; (bottom) PAA; 22-23—Douglas Aircraft Co.; 53—(top, left) USAF; (top, right, center, bottom) Levy-Shipp; 68—Hawaiian Airline; 84—UAL.

## WHO'S WHERE

### In the Front Office

Charles Glen Williamson has been made president of Kellett Aircraft Corp. and elected to the company's board. Williamson leaves his management engineering firm in California to take the new post. Previously, he had been vice president of Hodges Research & Development Co., and earlier was with Hughes Aircraft Co.

### Changes

W. R. (Pappy) Clay, former F-89 Scorpion project engineer, has been named director of missile development for Northrop Aircraft.

R. H. Widmer, has been promoted to assistant chief engineer at Convair's Ft. Worth division. He formerly was chief design engineer and supervised B-36 development.

E. R. Ordway has been designated general manager of Kaiser-Frazer Corp. aircraft production on the West Coast and will be in charge of operations at the Oakland Aircraft and the Richmond Machining divisions.

Laurence P. Saunders, formerly chief engineer of General Motors' Harrison division, has joined Bell Aircraft Corp. as chief administrative engineer of the firm's new Helicopter division.

George P. Martin, formerly with Parson's Corp., Traverse City, Mich., and Universal Helicopter Co., Buffalo, N. Y., has joined Prewitt Aircraft Co., Clifton Heights, Pa., as manager of its research and development.

Harold A. Clough has been made assistant sales manager of Parker Aircraft Co., Los Angeles, and will handle sales policy administration, customer relations and service in connection with aircraft tube fitting and valve production at the firm's two plants.

Duff Dean has been named head of the Johns-Manville aviation department in the Southern California area. He previously was with Lord Mfg. Co. and Pacific Air-motive Corp.

Francis A. Heines has been appointed international cargo sales manager for Chicago & Southern Air Lines.

Capt. A. P. W. Cane has been designated operations superintendent for British Overseas Airways Corp.'s DH Comet Unit.

### Honors and Elections

William C. Jordan, formerly president of Curtiss-Wright Corp., and Clarence M. Belinn, head of Los Angeles Airways, have been named to serve on the board of American Helicopter Co., Manhattan Beach, Calif., during fiscal 1952.

W. A. Patterson, president of United Air Lines, has been awarded the Legion of Honor "in recognition of (his) keen interest in the growth and development of civil aviation in France."

C. J. (Jack) Reese, president of Continental Motors Corp., has been re-elected president of the Aero Club of Michigan.

## INDUSTRY OBSERVER

► Allison is completing installation of its J-71 engine in a retractable nacelle in the bomb bay of a North American B-45 four-jet light bomber, on loan from USAF. It is believed the new Allison flying test bed is the first, in this country at least, in which a multi-jet plane is being used to carry a new experimental jet in a bomb bay arrangement for flight testing. The powerful new Allison engine originally was slated as power-plant for the production four-jet B-47C. It will go into the prototype B-47C after preliminary tests, but its future after that is not yet disclosed.

► When Pratt & Whitney's T-34 engines are installed in Navy's projected turboprop Lockheed Super Constellation cargo transport, designated R70, the switch from present engines is not expected to create any great problems. The R70-1s now under construction are powered with Wright R-3350 compound engines of 3,250 takeoff hp. as compared with the 5,500 to 6,000 hp. credited to the T-34s. But the Super Connie was designed to take turboprops with relatively simple modification of engine-mount attachment points.

► Beech Aircraft Corp. learned a lot about production problems for its new T-36 twin-engine transport, in putting together an all-metal, full-scale mockup—a far cry from oldtime wooden mockups. The trend toward more elaborate all-metal mockups appears solid among larger U.S. airplane manufacturers. They can get early information about forming curves in metal skins and more precise fits. At the same time, the completed mockup is an important selling adjunct, because it gives a military board a much better idea of how the finished article will look. The T-36 mockup looks almost ready for flyaway.

► Giant jet-powered helicopters, capable of lifting 50-ton payloads, or carrying as many as 450 troops, are now technically feasible, in the opinion of Westland Aircraft's O. L. L. Fitzwilliams. A recent paper by the British engineer discussed details of proposed copters. One would have a 100-ft. diameter rotor, turned by six small Armstrong Siddeley Adder turbojets, with combined 5,360-lb. thrust in the rotor tips. A 200-ft. diameter rotor craft, with three Armstrong Siddeley Sapphires in the rotor tips, was another proposed design. One major advantage would be increased ground effect with the big rotors. Ground cushion would be useful up to 100 ft.

► Efforts of some Air Force procurement personnel to read "manufacturing engineering costs" out of the sphere of legitimate costs of aircraft and engine production are meeting indignant criticism from manufacturers. The proposed new cost policy, it is pointed out, is at sharp variance with AF planning studies conducted on "producibility."

► U.S. aircraft industry engineers are expected to submit an official recommendation soon through AIA to the armed services and NACA on the research projects still needed to fill in the gaps of current knowledge about sweptwing performance in the transonic speed range.

► The proposed huge 75,000-ton forge press, part of the long-range USAF program for fabrication of large airframe components, now appears definitely shelved in favor of smaller forge presses that can be completed and put into service more quickly.

► U.S. officials are disappointed at Bristol Aeroplane's record in rehabilitating Superfortress engines. Company has managed to service less than half a dozen since last March. A Bristol team is now in U. S. working in Curtiss-Wright shops to see how it's done.

► Watch for Cessna to announce at least one of its two new models around the first of the year. Its new Model 180, powered with a Continental E-225C engine, could well be the next development of the four-place Model 170. A more powerful 225-hp. engine would be used, based on the military development of the Cessna L-19, which uses essentially the same engine. Other new Cessna model is the 310, using same engine.



## The Right Move for ECONOMY



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## NEWS DIGEST

### DOMESTIC

USAF armament test facilities have been transferred to the jurisdiction of Air Research and Development Command from the Air Proving Command. Transfer is part of Air Force's program to organize all development activities under one command. ARDC headquarters is in Baltimore.

Doman Helicopters, Inc. will build a new 4-6-seat copter, designated LZ-5, for the Army Field Forces. Craft will be powered by a 400-hp. geared Lycoming engine, will have a normal gross weight of 4,419 lb., climb 1,300 fpm., cruise at 82 knots on 65% power for 260 miles.

Delta Air Lines has ordered four DC-6Bs at approximately \$1.1 million each for delivery beginning September, 1953. Delta's DC-6Bs tentatively are planned to seat 64. The carrier now has seven DC-6s.

Chester S. Ricker, 63, one-time Detroit editor for Aviation magazine, died Dec. 5. Credited with devising a method for timing auto races, he scored and timed the 500-mile Indianapolis Automobile Race classics since the inaugural event 40 years ago.

Senate Small Business Committee will hold public hearings on construction of an \$8-million aircraft landing gear strut plant scheduled by General Motors in Dayton vicinity. A committee spokesman says that investigation shows that there is already adequate idle plant capacity for the proposed production. NPA has allocated steel.

Howard Hughes has received another extension from RFC—this time to June 1—on flying his eight-engine flying boat. Hughes' officials state that powerplant problems are involved, including high vibration stresses encountered using the present propeller-powerplant combination. The company is negotiating with P&WA for newer model Wasp Major engines.

Paul Butler has been named administrator of the Defense Air Transportation Administration by Secretary of Commerce Charles Sawyer. Butler is president of Butler Aviation Co. and Butler Aviation, Chicago.

Two fellowships have been established by Seaboard & Western Airlines at Columbia University for study and research on international air freight on

the North Atlantic route. The fellowships will begin with the 1952-1953 academic year, provide \$2,000 yearly for each student selected. Program tentatively covers a three-year period.

George McKinley Paulson, 59, former BG Corp. chief engineer and an authority on aircraft ignition, died Nov. 30 in Englewood, N. J., Hospital of a coronary occlusion. Among his achievements was development work on the shielded spark plug and the laminated mica plug.

Fifth Fairchild guided missile in five months has been fired by Army Field Forces First Guided Missiles Group, Ft. Bliss, Tex. Target was a small radio-controlled drone aircraft.

### FINANCIAL

Northrop Aircraft, Inc. is now listed on the N. Y. Stock Exchange under the abbreviation NOC. Company's stock was previously listed on the N. Y. Curb Exchange, will continue on the Los Angeles and San Francisco Stock Exchanges.

Temco has declared a regular quarterly dividend of five cents a share on common stock payable Dec. 22 to holders of record on Dec. 14.

Philippine Air Lines reveals a net profit of \$1,211,030.50 for the first nine months of 1951, a 375% gain over the same period last year.

Braniff International Airways has declared a 25-cent dividend to common stockholders of record Dec. 10.

### INTERNATIONAL

Denmark has ordered 20 two-seat Meteor fighters from Great Britain.

Fiat G.80, Italian jet, has been successfully flight tested. The two-seat trainer-fighter is powered by a DH Goblin 35.

Vickers Viscount 700 prototype has returned to Britain after completing eight weeks of tropical and high-altitude trials in Africa. BEA expects to have the turboprop Viscount in operation early in 1953. Air France has ordered 12, and Aer Lingus four.

Chargeurs Reunis has signed a contract with de Havilland increasing its Comet I order to three planes, with delivery to begin late next year. The French carrier also has an option on Series II Comets (Avon-powered).

# AVIATION WEEK

VOL. 55, NO. 25

DECEMBER 17, 1951

## Red Pilots Sharpen Skill in Korea

Many knowledgeable observers are convinced that the reason for the presence of the Russian-built MiG-15 in Korean skies is the Soviet's desire to gain experience with planes and pilots in case the East-West clash turns into a world-wide combat. The following story by Aviation Week's on-the-spot reporter sheds significant light on this widely held belief.

By A. W. Jessup  
McGraw-Hill World News

Fifth Air Force, Korea—Korea is the jet fighter laboratory and university for world communism's air forces. Besides battle-testing several series of MiG-15 jet fighters, the Reds are battle-training hundreds of pilots and battle-proving bomber interception tactics, according to Fifth Air Force analyses.

Who flies the MiG is still unprovable. "For all we know," one F-86 Sabre jet pilot of the Fourth Fighter Interceptor Group says, "there may be some ex-American World War II fighter jockeys up there."

It looks, however, as if every nation in the Soviet orbit runs its flyers through the "school," on a volunteer basis, of course. The student body, therefore, would include Chinese, North Koreans, Poles, Germans, Mongols, Russians and perhaps others.

### I. The Training School

The MiG training program has its beginning with transition flying in Manchuria, probably from airfields in the vicinity of Mukden and Changchun. Pilots move on from there to indoctrination flying from the Antung and Ta Tung Tou airbases, both south of Antung city and close to the Yalu River. They finish off with the graduate course in MiG Alley against the F-86 Sabre jets.

This training program shows up in the definite cyclic pattern of MiG operations in the Alley. A new course is marked by the appearance of unaggressive formations, flying back and forth at high altitude.

They stay high for a few days and make no effort to tangle with the Sabres. Then they start making passes with tactics that are not too sharp. Gradually, the formations tighten up, and the class puts on a professional tactical performance. Then a new group comes along, repeating the process.

But Fourth Fighter Group pilots note a steady overall improvement, as well, in the MiG proficiency. Each new group is a little sharper than the last.

Even so, they think it still is superior American pilotage and gunnery which enables the Sabres to consistently shoot down 11 to 12 MiGs for every Sabre lost. They are amazed at the continuing failure of the MiG flyers to make better use of what they consider one of the great jet fighters.

►Losses Should be Less—Not that American losses would increase until the MiG is equipped with an electronic computing sight, but MiG losses should be a lot less, perhaps

no more than ours. Some more experienced American pilots believe, for example, that they would do better flying the MiG against the MiG than they are doing now in the Fox-86, provided they have equivalent sighting devices.

Incidentally, enough Sabres have gone down in enemy territory to assume that it has been compromised, and a Russian version of the Sabre gunsight is expected to come along in the next few months.

New series of MiGs are showing up. All are not sorted out as yet, because jet versus jet encounters are so fast and furious that pilot observations are sketchy.

### II. The Planes

►Battle Comparisons—Here are some of the facts showing up:

- All MiGs are faster than the Fox-86 flat out above 32,000 ft.
- Some MiGs are faster flat out between 20,000 and 32,000 ft.
- MiGs can dive as fast as the Sabre. There is increasing proof that some will go through Mach-1 in a dive.
- From level flight, some MiGs can loop well inside the Sabre. Pilots report seeing MiGs go into a vertical climb from flat out at almost a perfect 90 degree angle and from this climb flip back to horizontal albeit upside down in a similar maneuver.

Although some belief exists that the MiG buildup in Manchuria was made at the expense of MiG concentrations in Europe, the MiG is a production airplane. It's certain that the Communists assemble MiGs at ex-Japanese plants in Manchuria. Some manufacturing may be done there.

Air Force engineering officers believe the Russians use steel for many MiG parts for which we would use aluminum and non-ferrous alloys. For many parts the difference in the weight-strength ratio would be negligible. The steel casting blanks could come from Russian factories and be machined in Manchuria.

►How Do They Get Fuel?—Everyone would like to know where the Communists obtain fuel for the MiGs. Ocean tanker shipments to Vladivostok and Dairen are discounted as being too complicated and potentially too vulnerable, should the air war expand.

Fuel of JP type probably comes in over the trans-Siberian railroad from Central Asiatic Russia or the Caucasus. Consumer goods shipments on the trans-Siberian railroad dwindled to practically nothing in recent months.

There is some relief felt here because the MiG operation alone puts such a load on Russia's transportation bottleneck to the Far East. It indicates serious limitations on the ability of the Russians to mount aggressive air attacks in



this part of the world. So far the Communist MiG program has taken a largely defensive aspect.

### III. The Fields

Their excellently and rapidly built bases are strictly combat operational fighter bases, presently incapable of handling anything bigger than light bombers, and none of these has been sighted in the battle area. The runway at Antung is 6,300 ft. by 200 ft., with a concrete surface.

There are no hangar or shop buildings and no visible fuel storage, but the Russians normally put their fuel underground. Only minor repairs and maintenance is completed at Antung or any forward base. Medium and heavy maintenance is taken care of in the rear, probably in the complex of airfields that ring Mukden.

► **Reds Build Bases Fast**—Other airbases, such as Ta Tung Tou in Manchuria and the new ones at Uiju, Saamchan, Namsi and Taechon in MiG Alley, North Korea, are roughly comparable to Antung. The Korean fields were not as finely finished before night-raiding Baker-29s cratered the runways.

But at Saamchan, for example, the Commies put in a 6,000 ft. by 200 ft. concrete surface, a semi-oval taxiway around one side and a large number of revetments, all in about one month. They used no heavy machinery but plenty of hand labor—about 2,500 laborers were counted on one aerial photograph taken during the construction.

Air Force operations officers would like to get the Commie engineers to show our engineers how to put in proper fighter runways.

Even granting the difficult problems of building bases for an army which depends so heavily on air transportation, in comparison with the Chinese and North Koreans who have none, the American engineering construction is far from satisfactory. It certainly is shown up by the Communist work of three months in North Korea.

### Reds Bag 583 U.N. Planes

Losses reported by United Nations air forces since start of Korean hostilities have exceeded Communist Chinese losses by 275 planes, combat statistics released by Defense Department last week have disclosed.

Total combat losses of the Far East Air Forces, which included all U. N. aircraft and U. S. shore-based Marine planes, have reached 368. Naval aircraft losses during the same period have totaled 215. Grand total enemy bag of U. N. forces is 583.

Of the United Nations aircraft losses, 85% are the result of enemy ground fire, the Defense Department said. This, they explained, resulted from heavy emphasis on tactical support of U. N. ground troops conducted at very low altitudes.

Chinese Communist losses resulting from air-ground support operations of their troops are negligible since those forces do not employ air-ground tactical support, Defense Department said.

Of the total number of Chinese Communist losses, 170 were Russian MiG-15 aircraft. Of our losses, only 10 were F-86 Sabre jets lost to enemy air action. Figures are exclusive of planes wrecked in non-combat accidents.

Air Force statistics are compiled as of Dec. 8 while Navy statistics are dated from Oct. 23. Navy is credited with destruction of three MiG-15 fighters—two by F9F-2 aircraft and another by a Navy pilot in an F-86.



ALPHEUS W. ("BILL") JESSUP is McGraw-Hill World News and Aviation Week correspondent in Japan and Korea and is one of the few major publication representatives who has been continuously in those countries since before the outbreak of Korean hostilities in June, 1950 . . . Has been in the front lines with the Infantry . . . Aboard carriers during Navy strikes . . . Flown on Air Force missions (in photo above he is inspecting AA hole in wing of T-33 in which he rode on strafing mission).

► **Build-up for Cease-Fire**—Communist building of Korean bases aims at two things: Extending the defensive range of the MiGs in an effort to counteract the extensive Fifth Air Force interdiction program, and providing parking spaces for a North Korean air force in-being in the event of a cease-fire.

With bases in North Korea, the Communists could move in a large number of MiGs a couple of hours before the cease-fire is signed, receive credit for these in any arms count required if the agreement restricts reinforcement. For example, if the Reds get 150 fighters into Korea in this way, they would have every right to maintain 150 aircraft there without violating any clause.

### IV. The Tactics

Whatever the MiG and MiG pilot shortcomings are in air-to-air combat with the Sabres, they certainly can handle conventional bombers. The Communist defense is based on excellent GCI radar.

It appears certain that their early warning techniques are the equal of anything possessed by the UN command in this theater.

Air Force analysis leads to the conclusion that the Reds know very shortly after UN planes take off or approach the Korean coast just how many planes there are and the approximate type.

► **Swoop Down on Prey**—The MiGs take off from Antung or Ta Tung Tou, climb into the sun to high altitudes. There they are picked up by other radar tracking equipment and vectored into attacking position. They then press the attack home against our B-29 medium bombers in a high-speed, downhill pass that is virtually impossible to stop.

In the old days, conventional escort fighters could see enemy interceptors minutes away and could maneuver to meet the attack. It's different now. MiGs coming downhill

can't be headed off even if the Sabre pilots see them at maximum visibility. By the time the Sabres turn 90 deg. to meet the attack the MiGs pass and are on the bombers. That is just what happened a few weeks ago when the MiGs got three and damaged six other B-29s trying to raid Namsi.

Besides good warning radar and vectoring technique Communist radar searchlight and anti-aircraft artillery control is winning the respect of the UN Air Force.

As yet, no airborne radar has been detected.

Effectiveness of the 37 mm. cannon, with which the MiG is equipped, raises new discussions over the advisability of cannon rather than the 50 caliber machinegun. A 37 mm. hit does a lot of damage and it is death on bombers, such as the B-29. Hits now are believed to be more a function of the sighting equipment than of the weapon. It's doubtful whether the MiGs equipped with 50s would have

downed as many U.N. aircraft.

Earlier speculation that the Communists use jet night fighters is discounted. Observations by Baker-26 crews indicate that they are using a Yak type plane.

Recently, the Reds began experimenting with wing tanks to extend the MiG range. It's a simple production job, adequate but far less expensive than the Fox-86 external tank. People who have seen it think we could manufacture it for about \$15 per. The Communists are trying the MiG out for close support. It has not appeared in the battle zone.

MiG training and experimentation has been costly in a way. Losses have been high, but probably not nearly as high as the present production rate which is guessed at 100 per month.

But the training alone of several hundred Red pilots outweighs their losses, to say nothing of the profit from MiG and tactics tests.

## Navy Readies Highspeed Jet Fleet

A whole generation of fighters which will outperform the 1951 MiG should be in operation by end of 1952.

By Ben S. Lee

A new generation of Navy carrier jet fighter craft, most of which are interceptor types and all of which will out-perform the Russian MiG-15, Navy sources say, are in accelerated flight test, and some are scheduled to be in operational use before year-end 1952.

Two of the new fighters are, or will be, powered by the Westinghouse J-40 turbojet engine which develops approximately 8,000 lb. thrust and 9,500 lb. with afterburner.

► **The New Crop**—These are the McDonnell F3H Demon, and Douglas F4D Skyray.

Another new fighter type entering production shortly after the first of the year is the Grumman sweptwing fighter F9F-6 which is powered with the Pratt & Whitney J-48 turbojet developing approximately 8,000 lb. thrust with afterburner.

Still getting flight experience is the highspeed but somewhat erratic Chance Vought F7U-3 Cutlass, which in its fleet version will be powered by two Westinghouse J-46 engines rated at 6,000 lb. thrust each. Final fighter entry in Navy's 1952 production stable is the Douglas F3D Skyknight all-weather fighter powered by twin Westinghouse J-34 turbojets developing 3,600 lb. thrust each.

While exact performance of these new fighters must remain cloaked in security for the time being, all may be described as in the "more than 600-mph. class," a Naval spokesman said.

► **The Lineup**—The MiG-15 has been rated unofficially at about 600 mph. The F3D, considered to be underpowered, is the slowest of the five planes. Next in ascending order of speed are the F3H, F7U-3, F9F-6, and the supersonic Douglas F4D.

Navy's North American F2J version of USAF's F-86E will fall somewhere between the F3H and F7U performance-wise when it reaches production. Primary differences between the F2J and its Air Force counterpart, are that the F2J is stressed for arrested landings aboard carrier as well as for catapult takeoff.

Another radically new fighter type which will make debut in flight test before the end of the next calendar year is the Grumman XF10F.

Also scheduled for flight test, probably late in 1952, is Douglas' A3D. Powered by two Westinghouse J-40 turbojet engines and weighing somewhere in the neighborhood of 70,000 lb., it will be the heaviest carrier-borne bomber. Performance of the A3D is still largely conjectural but some quarters would place it on a par with the Air Force B-47 six-jet bomber, despite the fact that it grosses less than half the B-47 in weight and has just two engines.

Present carrier fighters on combat duty in Korean theater waters—the Grumman F9F-2 and McDonnell F2H—are considered outclassed by the Russian-built MiG-15.

On July 11, 1951, Rear Adm. Herbert S. Duckworth, Director Aviation Plans and Programs, Office Deputy Chief of Naval Operations, told the Senate subcommittee of the Committee on Appropriations: "The F9F-2 and-3 and the F2H . . . go second-line in fiscal 1952. From the diagram . . . you can see why we make it second-line. Actually these two planes should have gone second-line the day the MiG appeared over Korea. . . . It has been out-performed by the Russian fighter on the front line. That is actually the final test on whether or not an airplane is first-line."

These facts were reported shortly after official release of 1952 budget testimony by AVIATION WEEK Oct. 1, p. 11.

Facts are that both F9F-2 and F2H, according to Naval sources, are out-matched 50 to 70 knots in speed by the Russian MiG.

► **Superior Replacements**—With present limitations recognized by both Air Force and Navy, carrier units of F9F-2 and F2H planes are being withheld from MiG Alley until faster replacements can reach the fleet. This policy will continue, official Naval sources said, unless overall strategy or an emergency necessitates a change.

It was pointed out that present carrier jet fighters are designed for considerable range and endurance to meet Naval requirements. In combat at sea these fighters could stand with the best the enemy has to offer.

For example, the MiG-15 has a combat radius of only some 250 mi., whereas the F9F-2 and F2H are designed for an approximate 600-mi. combat radius. The North American F-86, which compares most favorably with the MiG, has a combat radius which falls somewhere between that of the MiG and those of the F2H and F9F.

In present military terminology, then, it was explained, the F9F-2 and F2H are "escort" fighters; the F-86A "tactical" weapon and the MiG a short-ranged "interceptor."

## Misrair Adds Three Languedocs to Fleet

(McGraw-Hill World News)

Cairo—Misrair, the state-subsidized Egyptian airline serving the Middle East and South Europe, has put three 4-motored Languedoc 161s on its routes to Geneva, Tehran and Khartoum (Sudan).

The carrier expects shortly to extend its overseas services to Vienna, Paris, London and Karachi, and plans gradually to replace all its twin-engine Vikings with 4-motor craft.



## Who Will Fly What How Often

Airline	Starting Date	Planes	How Many	No. of Seats	Roundtrips Per Week
Air France...	May 1	L-749A	3	59-60	3
BOAC .....	May 1	L-049	5	68	400 seats
El Al					
Israel .....	May 1	L-049	NA	60	1-2
KLM .....	May 1	L-749A	NA	59	2
PAA .....	May 1	DC-6B	8	82	7
Sabena .....	May 1	DC-6	NA	64	3-4
Swissair .....	May 1	DC-6B**	NA	NA	1-2
SAS .....	May 1	DC-6B*	2	78	2
TCA .....	May 1	DC-4M	***	40	7
TWA .....	May 1	L-749A	NA	59	7

NA—Not available at time story went to press. No information available for LAI.  
 \* SAS has been promised delivery of 2 DC-6Bs in time for tourist service.  
 \*\* Swissair may use DC-4s, if 6s are not available.  
 \*\*\* TCA now has 6 DC-4Ms with 40 seats on trans-Atlantic run, can switch them to tourist service as needed.  
 SOURCE: Airline reports to AVIATION WEEK.

## Ocean Coach Plans Shaping Up

- Eleven trans-Atlantic lines had advance warning on tourist service, but some still lack detailed programs.
- And all are not sure of just what future will bring. Their revolution may swing farther than planned.

The airlines of the world, having erected history's lowest air fare structure across the North Atlantic, are like a man walking in the pre-dawn darkness in a new house: They know where they are, but they have to feel their way around.

Even the hardest exponents of the \$270 New York-London tourist fare which starts next May 1 are not sure of the exact dimensions of their new house—how much new traffic will result from the lowered ocean fares. Some of the eleven trans-Atlantic airlines meeting at Nice two weeks ago (AVIATION WEEK Dec. 10, p. 13) are still frankly skeptical that the lower fare is sound economics right now, and two reportedly abstained from the final vote.

► **CAB Hopeful**—Airlines not operating across the North Atlantic are scanning their own tariff structures. Already, a jubilant Pan American World Airways, claiming full credit for establishment of Atlantic tourist fares, is planning a revival of its dormant campaign for trans-Pacific coach service.

The Civil Aeronautics Board "expressed the hope that the new low fares will permit a considerable expansion of trans-Atlantic travel, affording an opportunity for low-cost travel to people who ordinarily would not be able to take advantage of travel by air to Europe."

That was a hope of all the airlines in-

volved. But their realistic appraisals more closely matched the statement of Sir William Hildred, director general of the International Air Transport Assn. "... The most daring step since Atlantic air service began. Grave decisions have been involved for all the airlines, in order to make certain that the agreed rates would stimulate enough new traffic to render the reduction feasible without becoming completely uneconomic."

Grave decisions not only had been involved; they still are involved—and still being made.

### I. The Plans

From the sketchy details offered by some of the 11 carriers on their impending ocean coach services, it was plain that despite the months of discussion and repeated conferences about trans-Atlantic coach, agreement at Nice was a sudden and perhaps unexpected eventuality.

An AVIATION WEEK poll last week uncovered these plans:

- **Air France.** Will begin service May 1, using three 60-passenger Constellation 749A, flying three roundtrips weekly using N. Y.-Gander-Shannon-Paris route. Predicts load factor of about 85%, will probably run lower. Passengers will be able to purchase box lunches.
- **BOAC.** Will start May 1, using five

68-seat "convertible" 049 Connies now being rebuilt by Lockheed Aircraft Service at Burbank. There will be 400 tourist-class seats available each week on N. Y.-Gander-Reykjavik-London runs. Predicts 72.3% load factor. Catering will be handled mostly at ground stops. Eastbound run is expected to take three hours more than regular service and the westbound run four hours more. These Connies will be of "flexible-density" type, convertible to regular or charter flights by taking out 14 center-row seats. Also, the first six rows can be folded back against the fuselage to provide cargo space. Completely new pressurization and air conditioning systems are being installed.

- **El Al Israel Airlines.** Will start May 1, using Constellations seating about 60, for at least one or two flights weekly to the U. S., at least twice weekly to London. El Al operates three 049 Connies.
- **KLM Royal Dutch Airlines.** Will begin service May 1, using 794A Connies seating 59 on twice weekly schedule, plans to increase to four or more weekly depending on traffic requirements.
- **Lai Italian Airlines.** No information available.

• **PAA.** Will start May 1, using eight DC-6Bs carrying 82 passengers. Is scheduling seven roundtrips a week to start, and will add others later as more DC-6Bs are delivered. Predicts a load factor of 75-80%.

• **Sabena Belgian Airlines.** Hopes to begin May 1, probably with DC-6s seating perhaps 64, flying three-four roundtrips weekly N. Y.-Gander-Brussels. Equipment shortage a major problem since the carrier's six DC-6s are now being pulled out for major overhaul which inactivates a plane for six weeks. Won't get new DC-6Bs until end of 1952.

• **Swissair.** Will start May 1, using DC-6Bs, flying one-two trips weekly.

• **SAS Scandinavian Airlines System.** Will start service May 1 with two 78-passenger DC-6B roundtrips weekly, then plans to have four flights weekly in June, and increase further as necessary. The carrier will cut back on its regular service if it has to in order to handle tourist business. SAS has eight DC-6Bs on order, will have two by May 1. Food will be served on board at minimum cost to passengers.

• **Trans-Canada Air Lines.** Will begin May 1, using DC-4M2s seating 40, on perhaps daily service Montreal-London. TCA now has six DC-4M2s (Rolls-Royce Merlins) on the trans-Atlantic run. Feels assured of about 100% load factors westbound because of present England-Canada immigration contracts under which immigrant pays \$160 fare and Canadian government pays TCA remainder. This service expected to run solidly through 1952.

• **TWA.** Will begin May 1 with 749A

Constellations seating 60 on daily roundtrip service. Although, as yet, TWA is not saying how many trans-Atlantic tourist Connies it is readying for service May 1, it has at least five ready now. The carrier may rig its entire 749A fleet as "Convertibles" by putting in flooring capable of taking tourist or regular service seating arrangements. The carrier estimates an 80-85% tourist load factor on a year-round basis. Plans at present call for passengers buying food prior to takeoff.

The key to all those plans is equipment. Pan American has been in the driver's seat on the entire ocean coach proposal all along because it had the planes, either already flying or on order so long that delivery is near.

### II. The Planes

Opposition by other carriers to Pan-Am's coach idea has been ascribed to everything from a monopoly mentality to competitive jealousy, when the real reason for opposition all along has been airplanes.

► **All Claim Idea**—For years, all carriers concerned have agreed that tourist service is good in principle. British Overseas Airways Corp. now is claiming that its predecessor, Imperial Airways, fathered the coach idea in the thirties. Air France has been operating coach service on the continent and to Africa for several years; so has Sabena, the Belgian airline. Sabena claims it supported PanAm's original plea for coach back in 1948.

The foreign carriers long ago agreed that tourist fare was bound to bring more passengers and more passengers were bound to bring more dollars to Europe. But they didn't know whether they could stand the cost of flying the additional passengers—costs have increased 20% during the past year alone. And one reason they worried about higher costs is the sizes of their transport fleets.

Competing for first-class passengers, they have to use low-density seating arrangements, even when the demand for space is on the upswing. To a foreign operator with comparatively few planes, coach passengers may mean a lower total revenue for a plane already saddled with high overhead.

In essence, no foreign operator—with the possible exception of BOAC—has enough planes to contemplate with an easy mind a double standard of service.

That's the main reason Pan American had a tough job in selling the other operators on trans-Atlantic coach service.

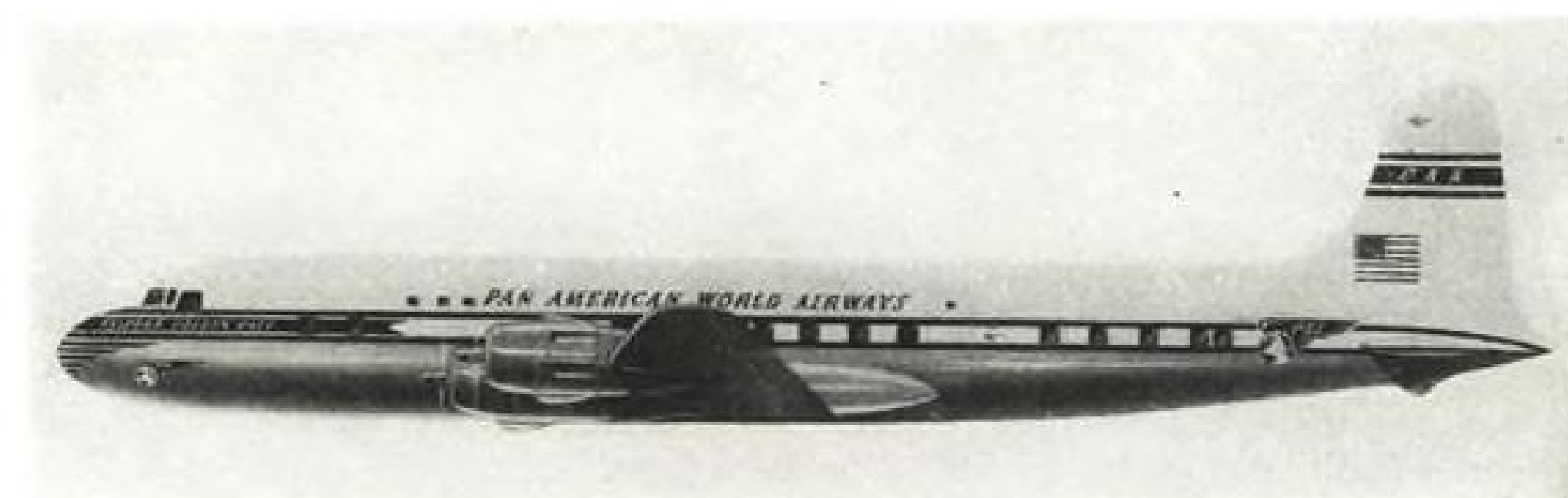
► **Played Long Shot**—Several years ago, PanAm gambled on such an increase in trans-Atlantic air travel that coach could be made profitable. It ordered a fleet of 18 DC-6Bs while foreign carriers



TWA pioneered Constellation coach service with this domestic version. Now ...



BOAC is adapting five old-model Connies for trans-Atlantic coach trade. But ...



PAA is in best position with all-new fleet of these DC-6Bs soon to be delivered.

were ordering planes in twos and threes as replacements. With the sure knowledge it had an entire fleet of airplanes coming (it will get the first DC-6B Feb. 1), PanAm could afford to push the air coach concept.

That is not as ruthless as it sounds. PanAm did not order the planes for coach service to put its competitors in a squeeze. It did so because its president, Juan T. Trippe, has always wanted his airline to be a mass transportation medium, which he believes it can be only with low fares.

A Pan American spokesman said, "If the other airlines believed in coach, why didn't they order the planes?" The dollar shortage abroad seems to be the best answer to that problem for most.

That some airlines may still be hedging their belief in tourist service is indicated by the minimum seating capacities approved at the Nice conference:

- **DC-4.** 55 seats.
- **DC-6.** 60 seats.
- **DC-4M2.** 40 seats.
- **DC-6B.** 77 seats.
- **Constellation.** 59 seats.

There are two bases of comparison.

On the U. S. transcontinental coach runs, TWA carries 81 in its Constellations and American Airlines haul 70 in its DC-6s. Last spring in commenting on the trans-Atlantic coach proposals, CAB suggested seating 60 in a DC-4 and 65 in DC-6 and Connie.

► **How Many Seats?**—The lower seating minimums for the trans-Atlantic coach service could be due to necessity for more fuel and crews. But a safety-conscious CAB has difficulty in understanding why IATA's minimums are lower than its own. The Connie capacity, in particular, irks some Board experts. They think the plane can carry 66 comfortably.

Consequently, CAB (which has veto power over the Nice agreement) is going to watch keenly for any evidences of "up-grading" service on the tourist flights. The lower seating capacities can mean two things competitively: more fuel, fewer stops, faster service; better food service even though it must be paid for by the passenger.

Some of the planes to be used in tourist service will have galleys where hot meals can be prepared. One CAB offi-



cial comments: "If they put in a hot kitchen, every meal they serve will cost the airline about \$30 a meal in lost seat space and dead weight."

One reason some airlines will have hot galleys in their tourist planes is the familiar one: lack of a large fleet. BOAC, for instance, announces its coach planes will be convertible to first-class use—and for that the galleys must be permanently installed. Other carriers have the same problem.

The galleys cut down the maximum seating capacity. But many of the eleven carriers are not too worried about that. They still are disinclined to accept the estimates of PanAm and a few others on the tourist traffic potential.

### III. The Passengers

Pan American, only one of the eleven with experience in over-the-ocean coach (New York to Puerto Rico), estimates a load factor of 75%. So does Air France, and BOAC puts it almost as high.

If the trans-Atlantic tourist traffic trend follows that of U. S. transcontinental coach, those estimates are conservative. From July, 1950, through May, 1951, American Airlines' transcontinental coach load factor dropped below 80% in only one month. In five of the 11 months, it was above 90% (AVIATION WEEK, Nov. 19, p. 81).

► **Traffic Estimated**—PanAm claims to have 50,000 unsolicited requests for reservations for the trans-Atlantic coach service to begin next May 1. IATA's Hildred estimates that airline traffic over the Atlantic in 1952 will total more than 500,000 passengers.

In 1950, North Atlantic air passengers, both ways, numbered 317,164. For the first six months of 1951, both-way passengers numbered 147,848—an excellent showing with no Holy Year traffic to give a stimulus. So PanAm and Hildred may be underestimating ocean coach potential.

The extent of the revolution stirred up in eight days of closed-door meetings in Nice two weeks ago may be appreciated by the steamship companies even more than by the airlines.

For the first eleven months of this year, more people (773,105) moved in and out of New York to and from foreign points by air than by sea (752,269 arrivals and departures). That is also the trend at other great ports. But steamships still carry twice as many passengers over the North Atlantic as the airlines. (Airlines take the lead in total Port of New York movements because of the heavy air traffic southward.)

► **Sea vs. Air**—The North Atlantic is the world's last major trade route still dominated by passenger steamers.

How much longer that will be true in the era of low air fares is perhaps the

greatest significance of the North Atlantic tourist fare agreement. That agreement calls for an off-season (November through March) New York to London fare of \$417 roundtrip. There is no reduction even during the off-season in the basic \$270 one-way tourist fare.

In season (April through October), the roundtrip rate will be \$486, New York to London. Fares to other points will be calculated accordingly. First-class fares remain the same, based on New York to London, \$395 one way and \$711 roundtrip.

One-way first-class steamship fares in season, New York to England, range from \$325 (S. S. America) to \$375 (Cunard's Queens). Comparable off-season fares are \$295 and \$365. One-way tourist fares for the same ships are \$165 and \$170 in-season, and \$160 and \$165 off-season.

► **What Price Time?**—There is still a wide gap between tourist-class air and sea fares. But there are two other considerations: a two- or even three-week vacation in Europe is hardly worthwhile by ship; some passengers might rate tourist air service on a par with first-class steamship service. And on that basis, the steamships are priced out of the market.

The foreign carriers are sure of one thing about their new tourist air service: It will bring their countries' trades more eagerly sought dollars. And most of them, closely linked by economy and tradition with their nation's maritime services, must certainly be remembering a maritime axiom—"Freight follows passengers."

This belief of the men who sent traders to the seas of the world has always been the reason why blue-ribbon steamship services were tolerated though costing more than they earned. If freight should follow passengers in the air, the tourist service may bring a bonanza.—WK/EJB

### Wage Increase Set

Wage increase of about 24 cents an hour has been recommended by the Wage Stabilization Board panel in the Douglas Aircraft-CIO Auto Workers dispute. WSB has asked the company and union for comments on the panel's views before it makes its own recommendation.

A UAW-CIO official indicated the union would object to the panel's failure to recommend retroactive application of the increase to October, 1950, and failure to take a position on the union's demand for elimination of the merit system.

President Truman referred the dispute to WSB for recommendations on Oct. 12, ending a six-week strike at the Douglas Long Beach plant which had

affected the production of C-124 transports used for evacuating wounded out of Korea. The workers have not had a wage increase since 1949.

## Avionics Production Outlook Improves

Outlook for 1952 military electronics production, including avionics, is taking definite shape, and a Munitions Board official finds it promising.

Trends can now be charted with certainty, requirements are firm, and trouble spots have been localized so they can be attacked systematically, Col. Clifford A. Poutre, chief of the Board's Office of Electronics, recently told the Radio-Television Manufacturers Assn.

► **Production Lag**—The avionics program for airborne equipment is paced by the aircraft program which it supports. As a result, the production pattern for airborne avionics equipment differs from aircraft schedules only by lead time required.

The production peak for avionics equipment will be behind that of the electronics program as a whole. It is likely that this will not have a noticeable impact on the electronics industry since certain non-aviation programs by that time will have passed their peaks, leaving some productive capacity available.

Col. Poutre declared that the overall electronics industry will have been expanded by mid-1952 to the point where it can fully support the military program and still maintain a high level of civil production.

► **Emphasize Balance**—In scheduling electronic equipment, the Munitions Board spokesman predicted that the peak for the industry as a whole should be reached in the first quarter of 1952, after which the production curve will level off and remain more or less constant. Some officials, however, believe that this peak will not be reached before the industry starts second or third quarter of 1952.

Difficulties with individual items will crop up, Col. Poutre said, but an effort is being made to minimize these by placing emphasis on balanced production with scheduled quantities of each item to be allotted for a complete military force.

The materials picture has been bettered, according to the colonel, by the priority system of A, B, C and E ratings. By limiting the use of these ratings they have been given true priority status. The difficulties are falling into set patterns, and by fighting them as they come up, company by company, it is hoped that an industry wide solution will be reached.



THROUGH CHANNELS, Custer's wing gets its lift. It rose off the ground when tethered, but there are still unanswered questions.

## Vertical Lift Is Claimed for Channel Wing

By David A. Anderton

Pittsburgh—In tethered flight, purporting to demonstrate sustained vertical lift, the Custer Channel Wing aircraft was shown here to dramatize the announcement by Taylorcraft, Inc., of Conway, Pa., that license rights had been secured for the use of the unique principle.

Willard Custer, who has spent many years inventing, developing and refining the principle which bears his name, said that when the full usefulness of the Channel Wing is applied to aircraft, it could well be that such aircraft would supersede the airplane, the helicopter and the automobile.

► **Basic Scheme**—Custer's channel-wing principle uses a half-shroud of airfoil section in place of the normal lifting surface of an aircraft. The engine and prop—and, says Custer, jets as well—are placed on the centerline of this shroud, with the prop at the trailing edge of the airfoil section.

The propeller then acts as an ejector and draws air through the shroud. The velocity of the air over the upper surface of the shroud reduces the static pressure there and produces a pressure differential on the section.

This pressure differential makes itself felt as lift regardless of whether or not the aircraft has any forward motion.

This principle has been applied to a single test aircraft which was built from miscellaneous Taylorcraft and Piper parts, plus a large amount of special components. Engines are two Continental C-90 air-cooled, rated at 90 hp. each for takeoff. Props are 11-deg. pitch, approximately 6-ft. diameter wooden units.

The shroud has a chord length of 35 in.; diameter of the half-circle is 6 ft. With two of these shrouds, the total

"wing" area of the Custer craft is 35 sq. ft. Empty weight of the airplane is quoted as 970 lb.; it has been flown at gross weights in excess of 1,100 lb.

Movies were shown which demonstrated the flight performance of this craft. It flies well in the conventional straight-and-level sense. Its takeoff run was extremely short—45 ft. and airborne at a speed of 30 mph.—but there appeared to be some indication of lateral instability immediately following take-off.

► **Tethered Flight**—By itself, this pictured display made a convincing argument. But then an attempt was made to prove that the aircraft was capable of sustained vertical lift. And that ruined the picture.

The plane, without a pilot, was tethered to a stout pole in the ground. From the pole a cable ran to a tripod structure above the aircraft center of gravity. The cable sloped down from the pole to the plane.

When the throttles were opened, the plane lifted majestically—and unsteadily—off the ground to a ceiling of about one foot. At no time did the tethering cable show a positive angle upwards with respect to the horizon. And that does not prove the craft is capable of vertical lift.

If the cable had risen above the horizon, that would have been another story. But then they put a pilot in the craft, and moved the attachment point of the cable further up the pole. This stratagem gives a longer moment arm to the thrust which, by pulling hard on the cable, actually lifts the aircraft off the ground.

► **Background**—Some of Custer's earlier experiments were reported in AVIATION WEEK, Sept. 15, 1947, and in AVIATION NEWS, June 2, 1947. And the then Army Air Forces tested the basic prin-

ciple in a Wright Field tunnel and reported on those tests in the spring of 1946.

Custer originally financed his experiments by selling interests to fellow townspeople in Hagerstown, Md. And he organized the National Aircraft Corp. there to produce the craft.

Somewhere along the line, money began to flow into the organization from Pittsburgh (It is known that Allen Scaife and H. J. Heinz, III, both prominent businessmen, have a powerful interest in the current corporation). And the name of the firm was changed to the Custer Channel Wing Corp.

Custer says jet research shows that the principle is equally applicable to subsonic and supersonic jet-propelled aircraft.

As one example, he stated that the use of the Channel Wing would enable the Navy to fly North American F-86 Sabres off a battleship—there would be no need for a carrier. And further, there would also be no need for wings on the Sabres.

► **Opinion**—This writer does not agree with Custer's claims for supersonic flight performance. Nor does he believe the business about the Sabres off the battleship. And he is not convinced he saw vertical lift.

But movies show that the craft flies normally, and the principle survived the rigors of a patent case in the Washington Federal District Court.

It's difficult to assess the craft. But one would immediately forecast stability and control problems in roll. In lateral motion, the craft has high inertia and low damping.

But until we get a chance to slide a slipstick around with some numbers, we's rather not say further. What we find will appear in a future engineering article.



## Fiscal Boxscore

• **AF, Navy obligate total of \$17.2 billion for air.**

• **Semi-annual report lists new projects now in works.**

Air Force obligated \$13.3 billion of fiscal 1951 procurement funds by the close of the fiscal year (June 30) out of a total Defense Department obligation of \$35.9 billion, the semi-annual report of the Secretary of Defense to President Truman disclosed last week.

Navy obligated a total of \$8.6 billion, of which \$5.9 billion was for aircraft and related procurement. For Army liaison-type aircraft, the Air Force placed procurement orders totalling \$109.5 million.

Air Force reported its aircraft acceptances in fiscal 1951 were 11% behind schedule, primarily because of shortages of government-furnished property and difficulties with getting new models in production.

Following are some aviation highlights of the 280-page report, which was signed by former Defense Secretary George Marshall, with correlated reports from Air Force Secretary Finletter, former Navy Secretary Matthews and Army Secretary Frank Pace:

### AIR FORCE:

► **Aircraft**—Consideration is being given to installing larger engines (Allison T-38 Turboprops) in the second Piasecki XH-16 transport helicopter which may result in a substantial improvement of the helicopter.

Installation of a new boundary layer control device on a Chase C-123 transport by applying suction and pressure to portions of the wing, is designed to increase lift.

► **Engines**—Turboprop engine prototypes in the 10,000-lb. thrust class were almost ready for initial flight-testing at the end of the fiscal year, incorporating significant improvements in fuel consumption, weight and frontal area.

Air Force decided to produce the 7,200-lb. thrust British Sapphire engine in this country "because it is the best engine qualified to meet USAF interim needs."

► **Missiles**—Air Force continued six major missile developments and initiated a seventh. One missile will be available for use in fiscal 1952. Preliminary plans are made for operational use of missiles with tentative programs for personnel, units and weapons. Encouraging progress has been made in flight-testing of several missiles and development testing of components of other missiles.

### NAVY:

► **Carriers**—At the close of the fiscal year navy had 12 large carriers and 15 light and escort carriers in its active fleet.

► **Helicopters**—Use of helicopters in anti-submarine operations show great promise. New automatic pilot control has been successfully demonstrated throughout speed ranges and hovering, and in maneuvers with two types of copters.

► **Missiles**—Some types of missiles are now approaching the stage of plans for their use in the fleet. Large-scale production in a major industrial plant is scheduled for one missile. Nucleus missile operating units are being formed for specialized training.

► **Aircraft Launching**—Progress on new means of launching and arresting aircraft at sea, and for launching missiles, will speed up replacement of existing planes by new types with greatly improved performance. Longer arresting runs will be permitted. New automatic aircraft positioning equipment, jet blast deflectors, and devices for protecting the carrier deck from the intense jet heat, are being procured. Jet-assisted takeoff rocket units have been improved.

### ARMY:

► **Helicopters**—Army Transportation Corps initiated training of two helicopter companies, and is expanding use of helicopters in all phases of operations as more equipment becomes available. Units are being trained to operate large cargo helicopters in the same manner as general purpose trucks. Employment of small helicopters by the Army in Korea as aerial jeeps has greatly improved medical evacuation, resupply, communications and transportation.

## Wright Honors

• **Collier Trophy goes to copter industry, military.**

• **Hunsaker is named for Wright Brothers Trophy.**

By Alexander McSurely

Top Wright Day honors will go to the helicopter industry and the military services for development and use of rotor-wing aircraft, and to a long-time leader of modern aeronautical research in this country. Awards will be made in Washington, D. C. today, the 48th anniversary of powered flight in this country.

• **Dr. Igor Ivan Sikorsky**, engineering manager of the Sikorsky division, United Aircraft Corp., and inventor of the first

successful helicopter produced in the U. S. (VS-300), will accept the Robert J. Collier Trophy, on behalf of the U. S. helicopter industry and the military services. The award will be presented at the Aero Club of Washington annual dinner tonight at the Hotel Statler.

• **Dr. Jerome Clark Hunsaker**, longtime chairman of the National Advisory Committee for Aeronautics, and mentor of many of today's topgrade U. S. aviation engineers in his role as professor of aeronautical engineering at Massachusetts Institute of Technology, will receive the Wright Brothers Memorial Trophy. Presentation is scheduled to be made at the White House by President Truman at noon today.

A third award recipient, Dr. Harold E. Mehrens, who is the supervisor of CAA's aviation development education program, gets the 1951 Frank G. Brewer Trophy award, for contributing most to air youth education.

► **Hunsaker**—Dr. Hunsaker, in his NACA post, and as former head of the Massachusetts Institute of Technology's Department of Aeronautical Engineering is credited with many important contributions to U. S. aeronautical research and development over a number of years.

He is credited with the establishment of one of the first American courses of instruction for aeronautical engineers at MIT in 1914.

► **Sikorsky**—Sikorsky's aviation career began in Russia with the design of a helicopter in 1909.

Leaving Russia about the time of the 1917 revolution, Dr. Sikorsky came to France and soon after to the U. S. His all-metal 14-place twin-engine S-29 landplane was one of the first successful large commercial landplanes in this country, completed in 1924. He became a U. S. citizen in 1928. A series of amphibians and large flying boat developments followed.

His company, which became a division of United Aircraft Corp. in 1929 turned to helicopter development shortly before World War II, and has been a leader in military and civilian copter developments and quantity production since.

Other helicopter producers cited by the Collier Trophy committee as sharing in the honor with Sikorsky, Bell and Hiller—the three whose machines are now in combat areas—are McDonnell, Hughes, Kaman and Doman.

At the Washington Wright Brothers Day Dinner, Lt. Gen. James H. Doolittle will be toastmaster. Vice Adm. Emory S. Land, president of Air Transport Assn. will be principal speaker. The largest number of U. S. airline presidents ever to be gathered in a single room is expected to attend the dinner.

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Oxygen Walk-Around Assembly.

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bombers, cargo and personnel  
carriers. New units in pro-  
duction and available to  
airplane manufacturers.



### TECHNICAL DESCRIPTION

U. S. A. F. Type A-1 Cylinder  
and Regulator Assembly consists  
of: U. S. A. F. Type A-15 Low Pres-  
sure Diluter Demand Oxygen Regu-  
lator. (Designed and produced by Scott.  
Automatically mixes air and oxygen, sup-  
plying correct air-oxygen ratio for all altitudes  
up to 34,000 feet.)

AND . . . U. S. A. F. Type A-6 Low Pressure Portable  
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... SCOTT AVIATION is also equipped and approved by U.S.A.F. to  
process surplus A-15s.



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for Passenger Comfort  
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system including supplementary  
oxygen for crew and passengers,  
demand oxygen for smoke and  
fume protection for crew. Its  
regulator (shown above) is the  
lightest in existence and sup-  
plies required oxygen up to  
30,000 ft. for up to fifty outlets.

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tion in smoke or  
fumes. Supplies  
100% oxygen for  
a minimum of 15  
minutes.

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## FINANCIAL

### Equity vs. Market Value of Airline Stocks

COMPANY	BOOK VALUE OF SHARES OUT AS OF 8/30/51 (\$000 OMITTED)	COMMON SHARES OUT	NET EQUITY PER COMMON SHARES	MARKET PRICE PER COMMON SHARE*	MARKET VALUE OF SHARES OUTSTANDING (\$000 OMITTED)	RATIO OF MARKET PRICE TO EQUITY
American.....	\$34,587	6,452,835	\$5.36	\$15 1/2	\$100,019	2.89
United.....	46,130	2,069,547	22.29	30	62,086	1.35
TWA.....	30,066	2,424,672	12.40	21	50,918	1.69
Eastern.....	36,389	2,395,572	15.19	25	59,889	1.65
Northwest.....	11,738	820,808	14.30	13 1/2	11,081	.94
Capital.....	6,887**	835,749	8.24	14	11,700	1.70
Delta.....	8,680	500,000	17.32	24 1/2	12,250	1.42
Braniff.....	8,870	1,000,000	8.87	14	14,000	1.59
Western.....	5,267	525,164	10.03	14 1/2	7,615	1.45
National.....	8,840	1,000,000	8.84	15	15,000	1.70
C & S.....	6,861	509,236	12.49	12	6,112	.96
Northeast.....	3,053	641,321	4.76	4 1/2	2,886	.95
Mid-Continent.....	2,245**	598,755	3.75	8 1/2	5,089	2.27
Continental.....	2,574	309,406	8.32	9	2,785	1.08
Colonial.....	2,351	515,600	4.56	8	4,125	1.75
All American.....	1,741	513,660	3.39	3	1,541	.88

\* As of Nov. 24, 1951 and to the nearest half.

\*\* Giving effect to full conversion of debentures and options.

SOURCE: CAB Forms 41; Wall Street Journal (quotations); National Quotation Daily Quotation (quotations).

## Investors See Stability in Air Transport

As a result, market price has moved closer to equity;  
postwar stock sold for over five times book value.

Airline equities, as a group, no  
longer command the wide market pre-  
miums prevalent in past years.

While basic earning power remains  
a prime determinant in establishing  
market evaluations of airline prop-  
erties, quotations no longer stray too  
wide of book values. This is indicated  
by the accompanying table.

► **Moderate Premiums**—It can be seen  
that the general average reveals most  
of the equities command market pre-  
miums of moderate proportions, and  
only in two instances, more than twice  
that of book values. During the airline  
boom in the immediate postwar period,  
market quotations of at least five times  
and in many instances, higher, were  
not uncommon for air carrier shares.

The present relationship of quota-  
tions to book values is a significant in-  
dication of the stability that has de-  
veloped for the air transport industry.  
No longer are future prospects dis-  
counted in liberal terms as was the prac-  
tice of previous years.

Earnings of the group for 1950 were  
at an all-time peak, with 1951 expected  
to set a new high mark. Yet, market  
evaluations no longer attach the same  
premium to such earnings that applied  
in previous times. The best evidence  
of this is that with much higher earn-  
ings, airline equities all sell at lower  
market levels than when reported profits  
were much below current results.

► **Capital Protection**—Being a regulated

industry with many characteristics sim-  
ilar to public utilities, the air carriers  
have a vital protection in their invested  
capital position. This has been an im-  
portant consideration in the process  
of rate-making by the Civil Aeronautics  
Board. However, as the Board has now  
moved to take certain airlines out of  
the subsidized category, the amount of  
invested capital no longer has the same  
significance for this group.

For example, the "Big Four" have  
now been labeled subsidy-free by CAB.  
This would imply that the group would  
have little concern in having its earn-  
ings limited or measured by a rate of  
return on its investment.

American commands the biggest pre-  
mium in the group and in the entire  
industry. The leverage present in Amer-  
ican's capital structure and represented  
by \$70 million in securities taking  
precedence over its common stock,  
probably accounts for this wide spread.

► **Discount From Book**—It is significant  
that four carriers—Northwest, Chicago  
& Southern, Northeast and All Amer-  
ican—all are available at slight discounts  
to their book values. All of these air-  
lines are dependent on subsidy support  
in varying degrees.

It is possible that an unnatural weight  
existed on the market quotations of  
Chicago & Southern due to the voting  
trust arrangement prevailing for most  
of the equity. This device has long  
been frowned upon in public corporate

practice and stock exchange authorities  
have moved to correct this practice at  
every opportunity.

The C & S voting trustee has now  
belatedly moved to abolish this voting  
trust arrangement well in advance of  
its expiration date. This may now per-  
mit broader marketability and afford a  
cleaner tone to the equity.

Mid-Continent, while subsidized to  
a material degree, has a wide market  
due to the heavy leverage present in  
its capital structure.

A handsome premium in the market  
quotations over book also prevails for  
Colonial, but probably for a different  
reason. A well-advertised candidate for  
a merger, Colonial probably has at-  
tracted interest from that standpoint,  
and not necessarily through earnings.

In 1939, shortly after the enactment  
of the Civil Aeronautics Act of 1938,  
the total net worth of all of the coun-  
try's air carriers was valued in the  
market at less than \$30 million. To-  
day, American Airlines alone commands  
a market price on its common stock  
of more than three times that of the  
entire industry twelve years ago.

Another significant contrast is pres-  
ent in that the common stock of the  
New York Central Railroad has a mar-  
ket valuation of only \$110 million, but  
its book value was last reported as \$872  
million or nearly eight times its market  
quotation.

This illustrates the overriding fact  
that in the final analysis the key to any  
market evaluation is largely influenced  
by actual or potential earning power.

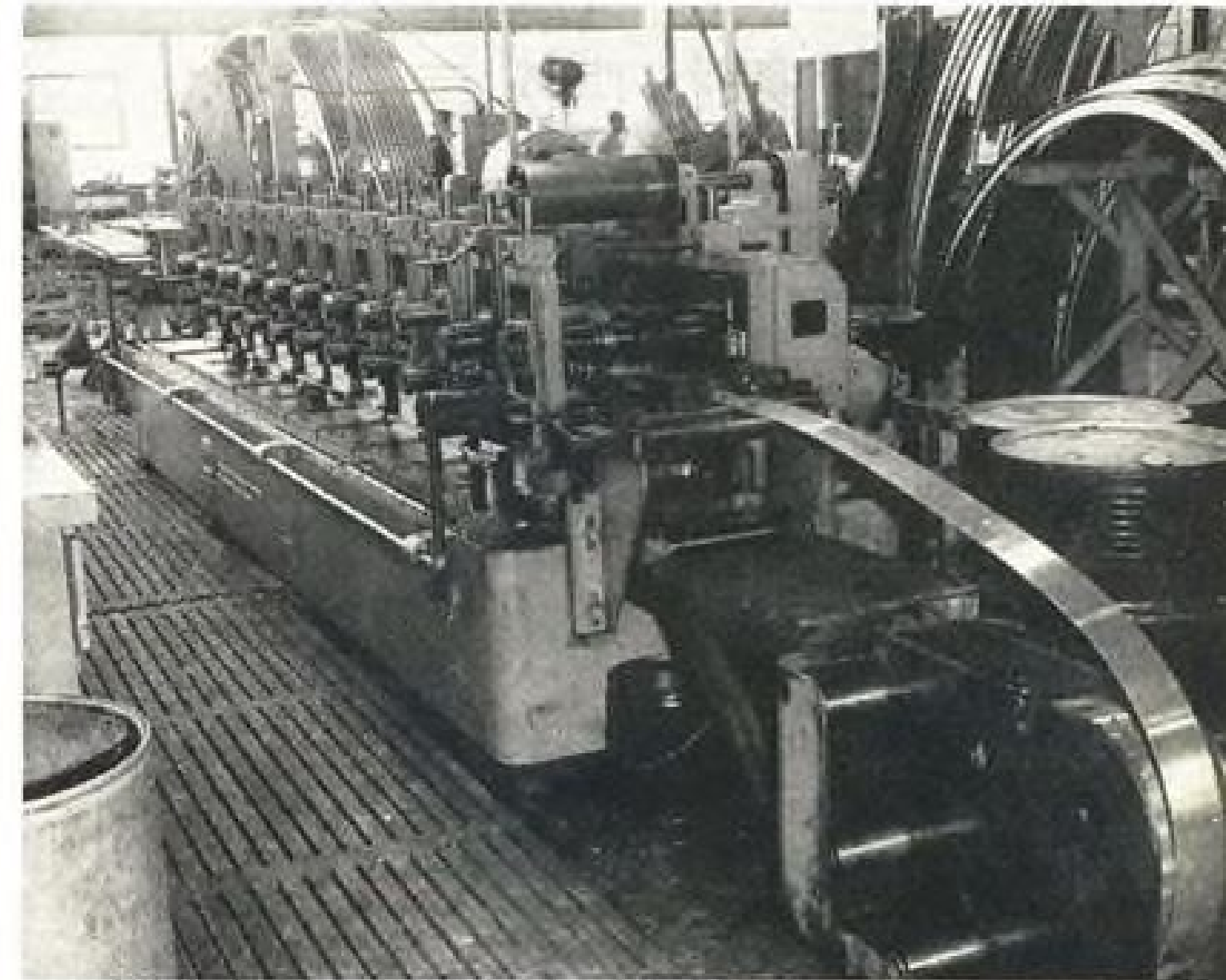
—Selig Altschul



# PRODUCTION ENGINEERING



**1** Stock of sheetmetal strips, appropriately tagged and marked, is stored, ready for use, immediately adjacent to the . . .



**2** Yoder rolls, onto which they are fed from reel at right, and come out at far end in desired shape. They are now handy for . . .

## Streamlined Rolls Setup Boosts Output



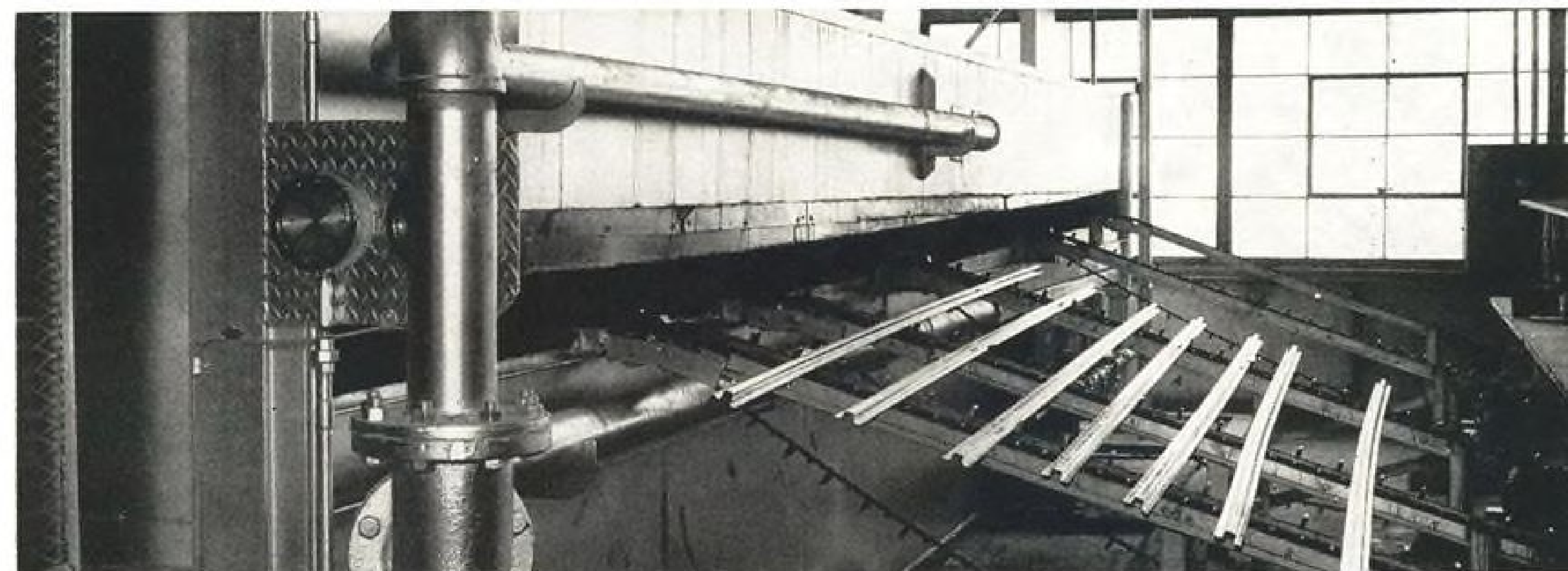
**3** Checker who slides template along sample part to pass on dimensions and shape. From Yoder rolls, part goes for further treatment up . . .

Douglas' streamlined rolls section is turning out from three to four times as much work as formerly, and using a smaller shop force to do it (AVIATION WEEK Dec. 10, p. 26).

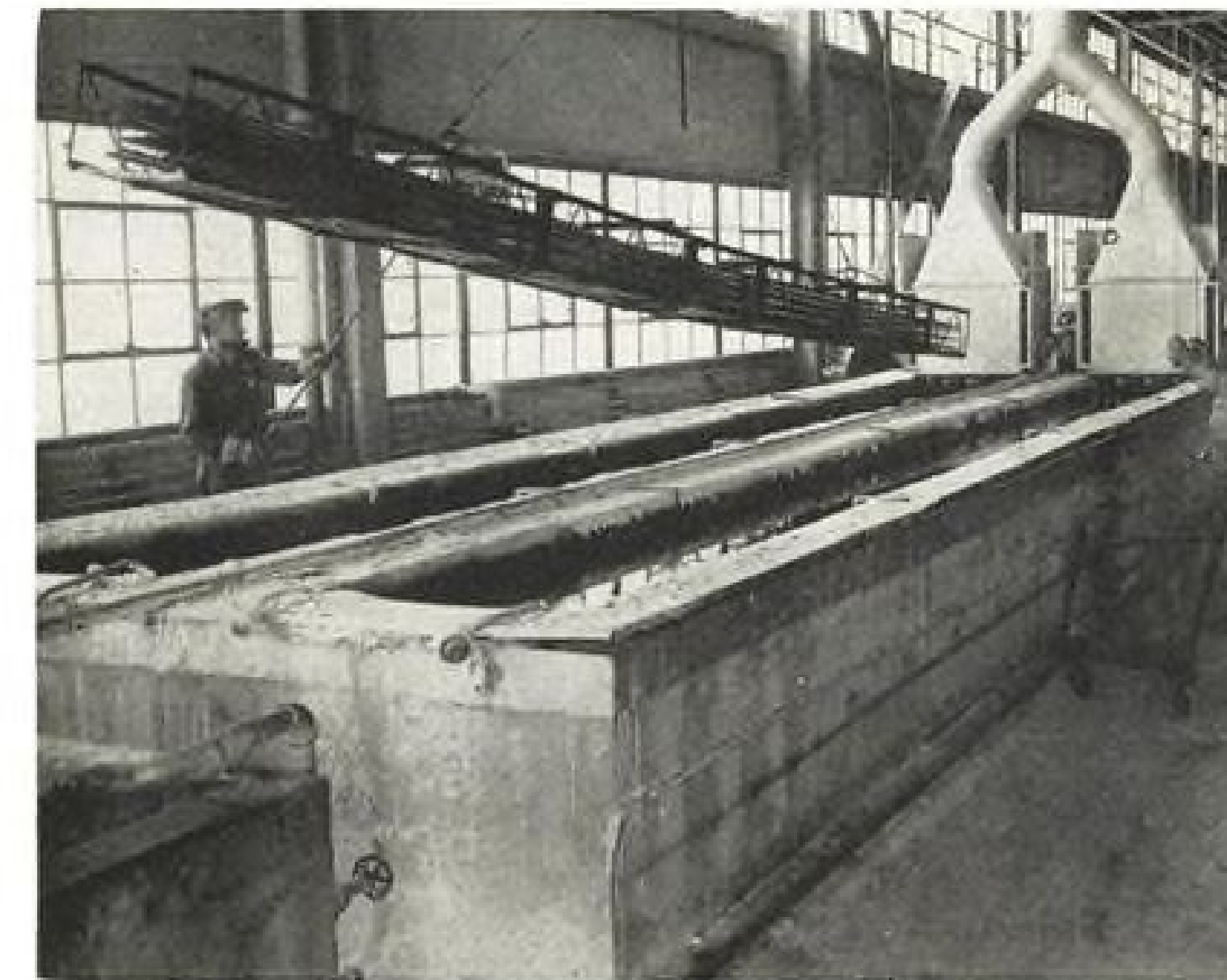
By gathering all operations into one compact setup, the Santa Monica shop has eliminated much time-wasting movement from one activity to the next. Tote boxes have been eliminated, giving more space on the main fabricating floor.

Forms from the Yoder rolls no longer have to go to the basement for degreasing, then back to the main floor for heat treatment.

Another bonus is improved quality control, as a result of decreased travel time of formed units from heat treat to quench tank.



**4** Toothed conveyor belts which carry it into degreasing tank for cleaning. It passes along to adjacent dryer for next step in process. Strips of same material and specification are then carried together in rack by crane for next step in . . .



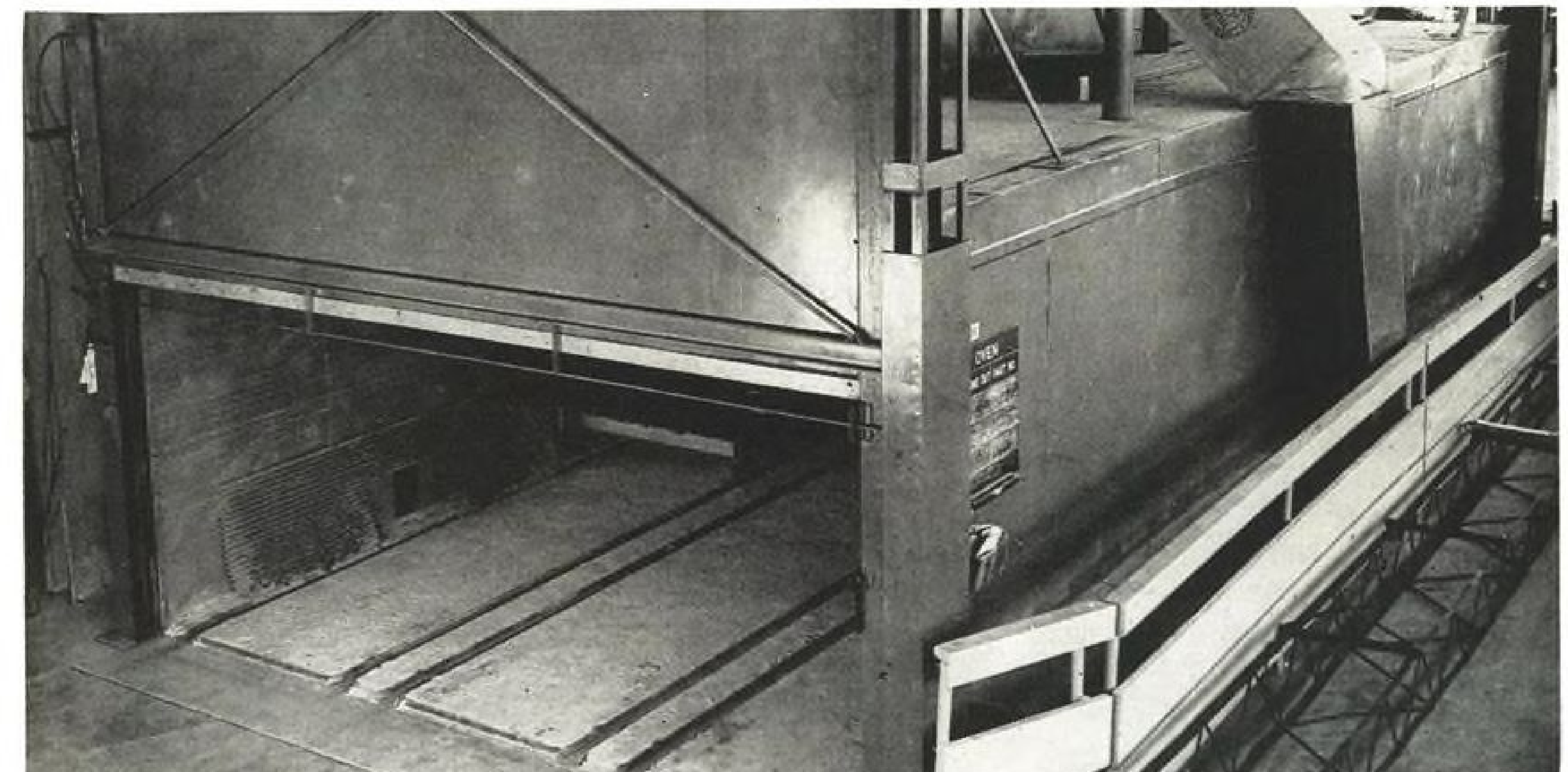
**5** Nitrate tank for heat-treating. Time in the bath varies, depending on desired properties, before move to . . .



**6** Quench and cleaning bath (nitrate tank abuts it, upper left rear). This takes but a few seconds. Next step is to . . .

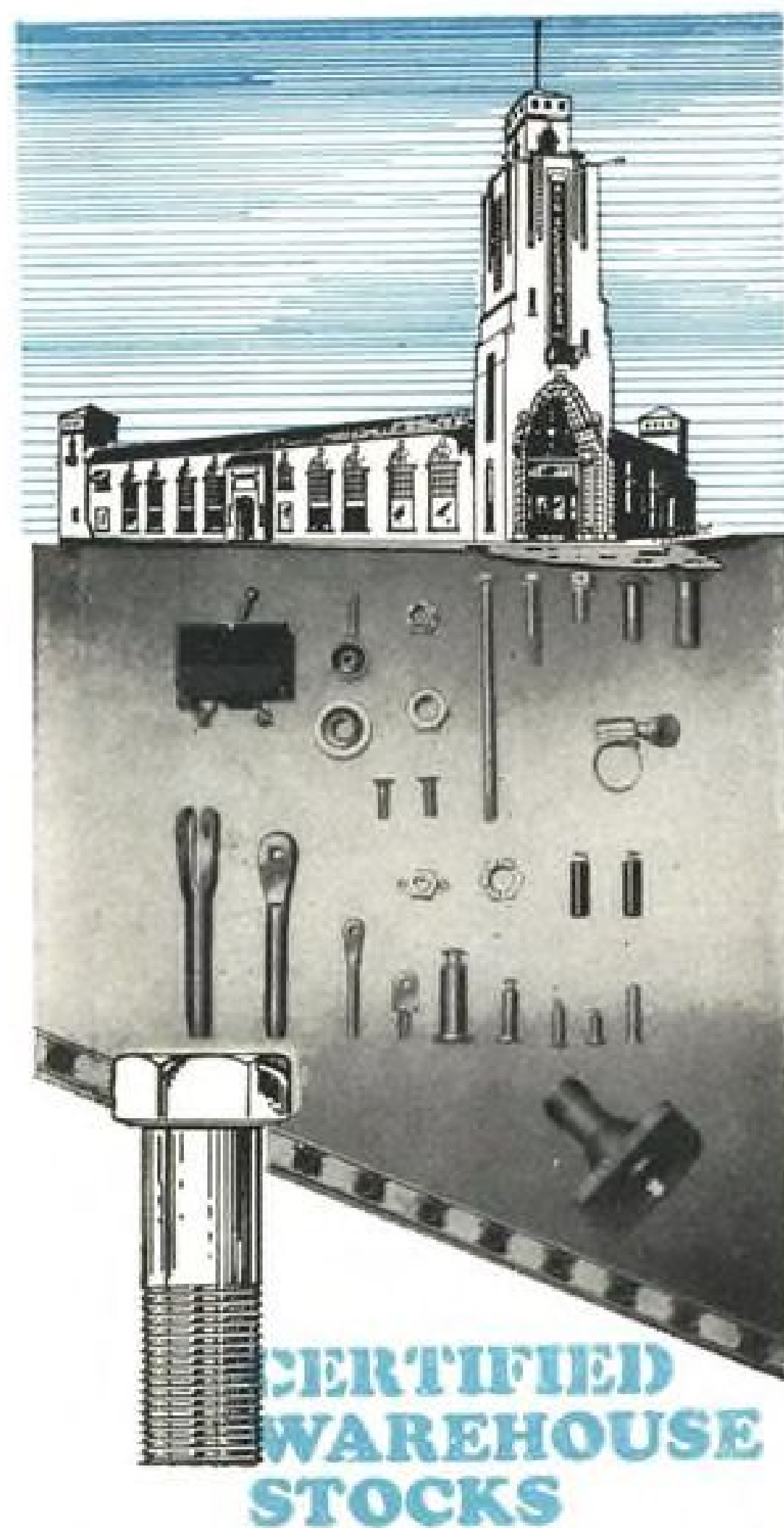


**7** Hufford stretch-leveler, about 25 ft. from the quench bath. Kinked strips are pulled into straightness by the two jaws on the stretch-leveler. Occasionally strips which fall short of strength specifications fail during this process. Last stop is . . .



**8** Aging oven, where certain materials get final treatment. Other materials, not requiring this treatment, go directly out of the shop from the stretch-leveler. Douglas reports that this centralized production setup has boosted rolls section output three to four times.





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### 3 New Ideas for Rocket Fuels

Beam of light, stream of electrons, nuclear propulsion possible, but there are a lot of "buts" involved.

It's possible to propel a rocket with a beam of light. If you don't like the idea of using light, you can choose a stream of electrons. Or you can design a nuclear rocket. Any one of these three types of powerplant promises performance far in advance of any now produceable by chemical fuels.

► **Yes, But . . .**—But there's a rub. The gap between what is theoretically provable and practically possible is immense, for these three cases.

In spite of this, rocket technical literature is full of speculation about various means of propulsion, without much in the line of calculations to prove or disprove them.

So T. F. Reinhardt, of the U. S. Naval Air Rocket Test Station at Lake Denmark, N. J., took another look at these proposals and made some calculations. And he presented those calculations and his conclusions in a paper called "Unusual Applications of the Momentum Principle," at the recent annual meeting of the American Rocket Society.

It makes fascinating reading. And even though some of the schemes sound fantastic, Reinhardt says, "We are reminded of the prophet of only 50 years ago who proclaimed . . . that heavier-than-air flight was impossible unless the law of gravity could be repealed."

► **Plus and Minus**—The great advantage of a rocket is in its ability to operate where there is no air, that is, at extreme altitudes or in interplanetary space. The great disadvantage of the rocket is in its fuel-gulping qualities. And until the rocket can be improved to be competitive with other engines it will be hard to sell.

It's unfortunate that any chemical propellant system now known to rocketeers does not produce significantly higher performance than those commonly in use today.

This conclusion follows from calculations of chemical fuel systems and is based on the concept of specific impulse.

(The specific impulse of a rocket motor is a unit which expresses the pounds of thrust obtained per pound of fuel burned per second. The unit of specific impulse is the second. Another way of looking at the specific impulse is that it is the reciprocal of specific fuel consumption.)

Fuels chemists have calculated specific impulses obtainable from groups of oxidation-reduction reactions. Of

those currently favored for rocket propulsion, the highest specific impulse comes from the reaction of hydrogen and fluorine.

The value is 370 sec., which is considerably more than that now obtained from alcohol and liquid oxygen. (As a bench mark, a typical value of impulse for lox-alcohol is 210 sec.)

► **Power Required**—By rearranging several equations which relate specific impulse, heat content, efficiency and a few other parameters, it's possible to derive an expression for the power required to generate one pound of thrust. And this is a very convenient way to rate any proposal for a new type of powerplant.

The final expression works out to be a constant times the specific impulse, divided by the thermal efficiency.

From this it is apparent that high specific impulse and high efficiency are not the same thing. In fact, the opposite is true.

Reinhardt states that in order to make the rocket competitive with other types of jet engines, specific impulses of at least 1,200 sec. are required, with eventual goals of 4,000 to 5,000 sec.

(A comparable figure for current turbojets would be around 3,000 sec.; a reciprocating engine with propeller can have specific impulses around 15,000 sec. at zero forward speed. This terrific value decreases about linearly to become equal to turbojet values at around 500 mph.)

► **Propulsion by Light**—A beam of light, with a jet velocity of some 982 million fps., shows a specific impulse of 30.5 million sec. This is encouraging, but only part of the story.

The power required to produce one pound of thrust by this means is about 1,330,000 kilowatts, equal to the total hydroelectric power output of Niagara Falls.

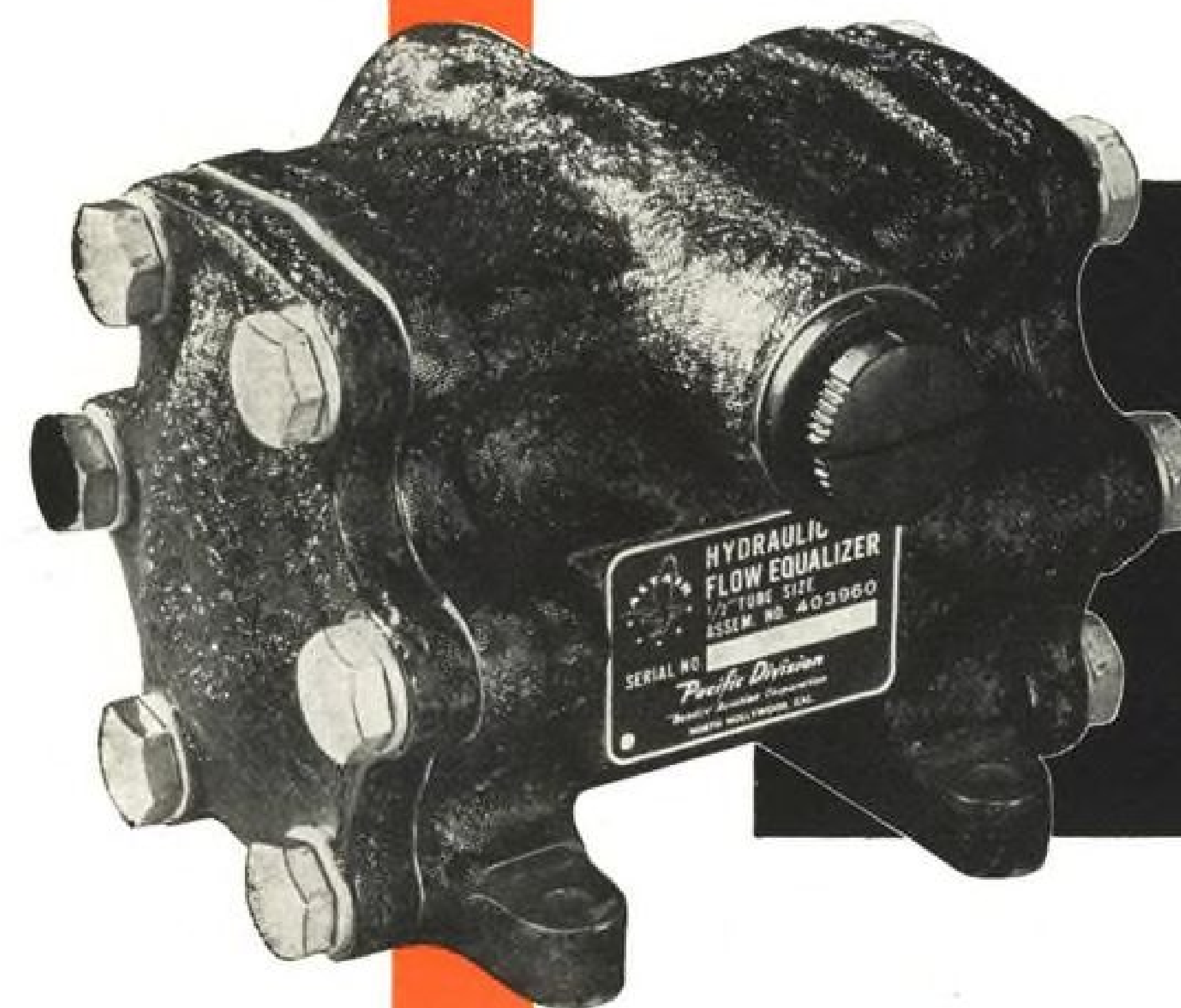
With nuclear energy, this amount of power can be supplied without the need to carry around a hydroelectric plant. But the engineering drawback is the powerplant weight.

For a 10,000-lb. light-beam rocket, the power required would be 13.3 billion kw.

Supplied electrically to the light source, the voltage would be 13.3 million and the current would be 1 million amp. A copper conductor to carry 1 million amp. would be about 20 in. in diameter and would weigh about 1,200 lb. per ft.

Ideally the light source should be

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*that divides OR combines  
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Write for bulletin BA-100A.

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The planes shown above are typical designs that incorporate Aerotec Automatic Controls. The Republic F-84F Thunderjet, a combat-proven craft, uses Aerotec pressure switches and a new dual float switch suitable for tip or pylon mounted auxiliary fuel tanks. Boeing has long used Aerotec valves, float switches, and pressure switches on their famous planes.

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a point, but the surface temperature of such a source would be astronomical. By limiting the surface temperature to a practical value like 10,000°F (which is the temperature of a carbon arc) the surface area of the light source grows to about 60 acres.

So the final requirement is that the complete propulsion unit include a power source which must produce about 140 times the total electrical generating capacity of the United States. And of course this powerplant must not have an installed weight of more than 5,000 lb.

As Reinhardt states, "... (surely) the designers of the flying saucers have had to abandon this scheme in favor of a more practical propulsion system."

► **Electron Stream**—It has been suggested that electron streams be used to propel a rocket. This comes from the knowledge that chemical energy is derived from changes in the energy level of the outer shell of electrons of the atom; the mass of the atomic nucleus contributes nothing to chemical energy output.

Assuming that free electrons in the gaseous phase behave like any monatomic gas (and it has been shown theoretically that free electrons have the properties of a monatomic gas), some calculations of a propulsion system can be made.

It's possible to make a table which shows voltage, current and power consumption as a function of specific impulse.

This table shows that one is faced with the choice of either fantastic currents for low power consumptions or fantastic power consumptions for reasonable currents.

One example selects a specific impulse of 1 million. Power required is 31,200 kw. to produce only a single pound of thrust. And for a laboratory-scale rocket, this is a tremendous amount of power. In the present state of the art, this proposition is a long way from reality.

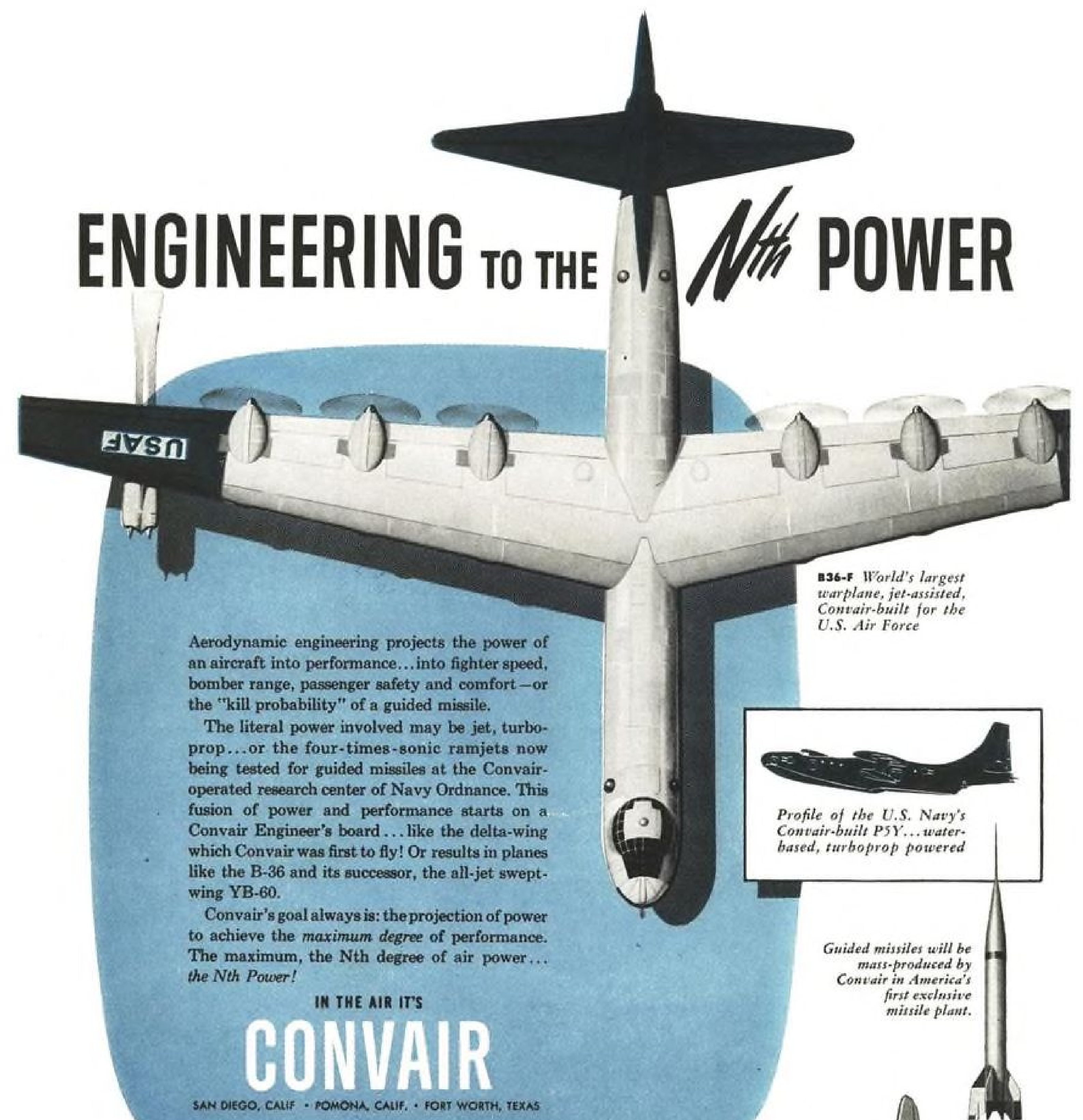
► **Condenser Storage**—The electron gas could be stored in a condenser aboard the vehicle, similar to the storage of any high-pressure gas in a cylinder. As a specific example, Reinhardt considers the requirements of 10,000-lb. thrust for 100 sec., with a specific impulse of 10 million sec. For such a case, the capacity of the condenser turns out to be 131,500 farads.

This is large by today's standards, but not completely impractical. The condenser could be charged over a period of time by a generator of modest capacity.

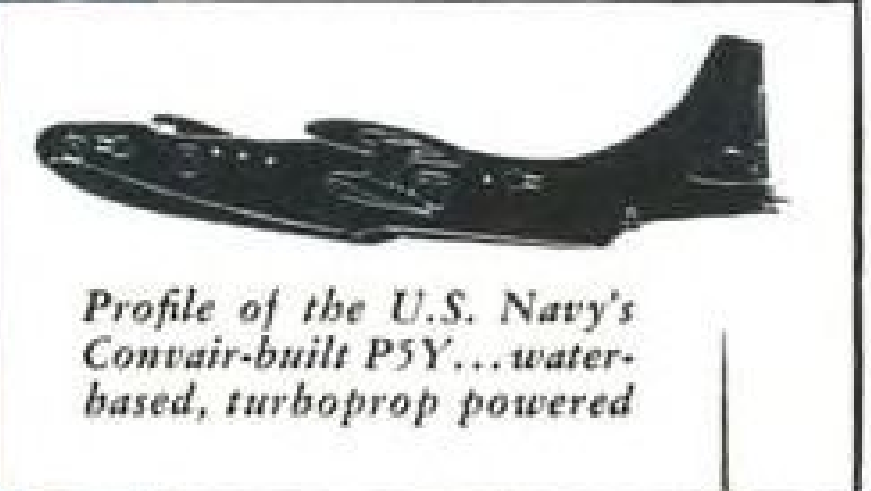
But it shouldn't be forgotten that the missile will be charged to 100,000 v. and is therefore quite a personnel hazard.

Designing the emitting cathode is

## ENGINEERING TO THE Nth POWER



B-36-F World's largest warplane, jet-assisted, Convair-built for the U.S. Air Force



Profile of the U.S. Navy's Convair-built P5Y...water-based, turboprop powered

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difficult. A conventional heated tungsten cathode operating at about 4,000F can only handle about  $\frac{1}{2}$  amp. per sq. in. Even at the highest value of accelerating voltage proposed (38,800 v.) a disc 45 in. diameter would be required to produce one pound of thrust. So for practical sizes, the unit emission of the cathode would have to be increased about 10,000 times.

► **Delusion?**—The use of the electron stream brings up the question of whether or not the consideration of such a scheme is a delusion. This comes from the equation for altitude performance of a sounding rocket, which is a function of the mass ratio of the rocket. (Mass ratio is the ratio between initial and final weight of the rocket.)

Assume that the electron rocket just discussed could be built for 5,000-lb. weight. The only difference between initial and final weight lies in the weight of the propellant, the stream of electrons. As a result, the mass ratio of the rocket is approximately one. Peak altitude is 644,000 ft. But a rocket with chemical fuels with specific impulse of only 250 sec. and a mass ratio of 4 will have a summit altitude of nearly 2 million ft.

This, says Reinhardt, is not an encouraging picture for the future of the electronic rocket; but in all fairness it must be stated that a thorough study of the possible applications has not been made.

► **Energy Addition**—The energy addition system is the scheme which is generally the subject of speculation

whenever the subject of the nuclear rocket is mentioned.

In such a powerplant, an inert working fluid has heat added to it from a nuclear reactor. The high-energy fluid then is expanded through a nozzle to produce thrust.

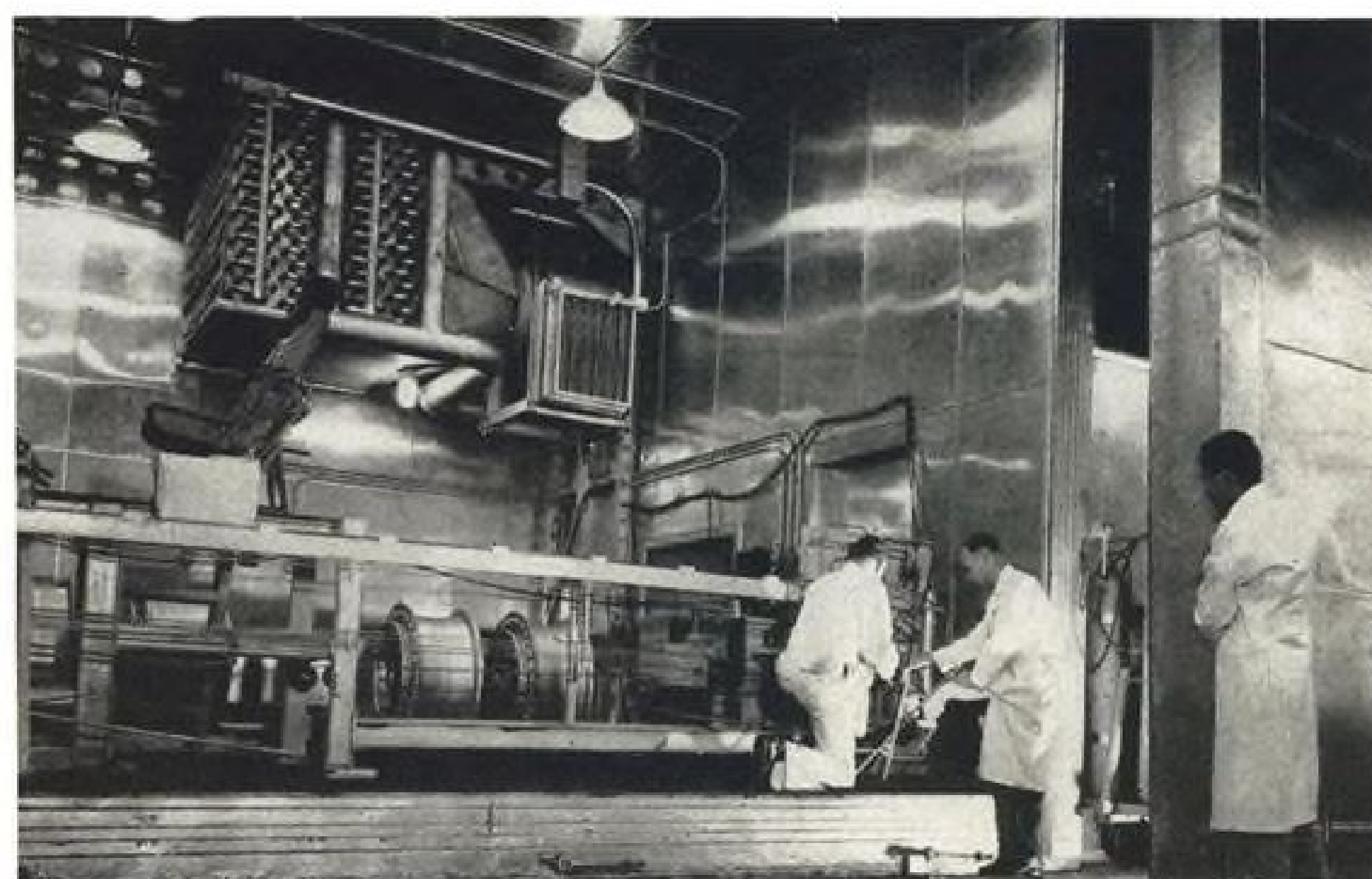
Generally hydrogen is considered to be the working fluid. The specific impulse which is obtained by this method is not astronomical, as are some of the others, but it is an impressive value when compared to today's figures for chemical fuels.

Hydrogen gas in chemical equilibrium at about 4,900F and 20 atmospheres pressure has a heat content of 22,600 Btu. per lb.

It will produce a specific impulse of 750 sec. at sea level. And the power requirement figures out to be 32 kw. per lb. of thrust. Reinhardt states that to achieve high mass ratios, and because the propellant weight is not negligible, the power source should be able to produce at least 150 kw. per lb. of weight, a big order even for a nuclear reactor.

► **Drawbacks**—Hydrogen has disadvantages as a working fluid. It has a low boiling point and low density. The bulk and weight of storage tanks would seriously penalize performance. So for this reason, other working fluids have to be considered.

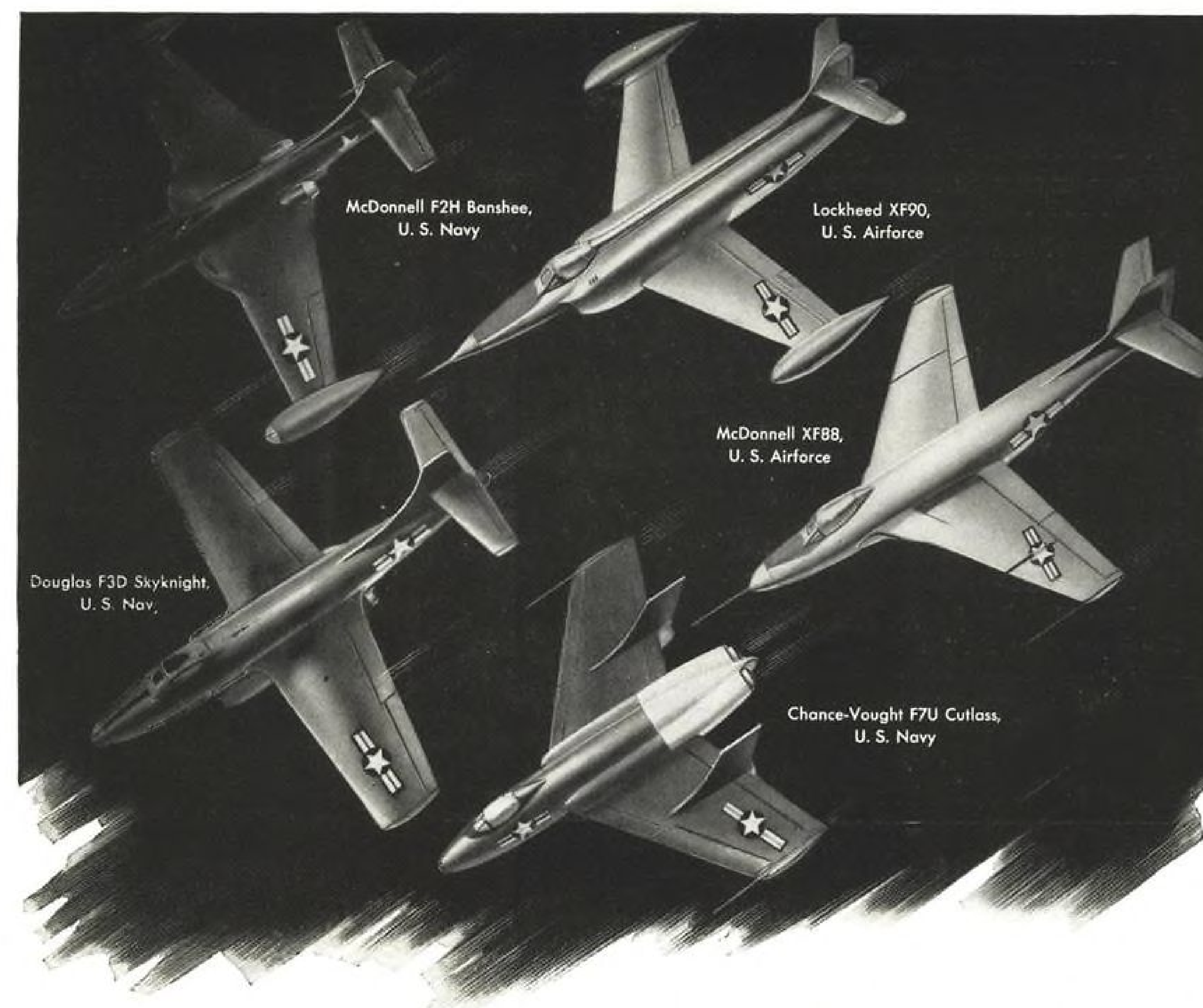
Limiting the temperature of the fluid to some arbitrary value like 4,900F eliminates other fluids from consideration, because they are all inferior to hydrogen. Liquid ammonia, for example, gives a specific impulse of only



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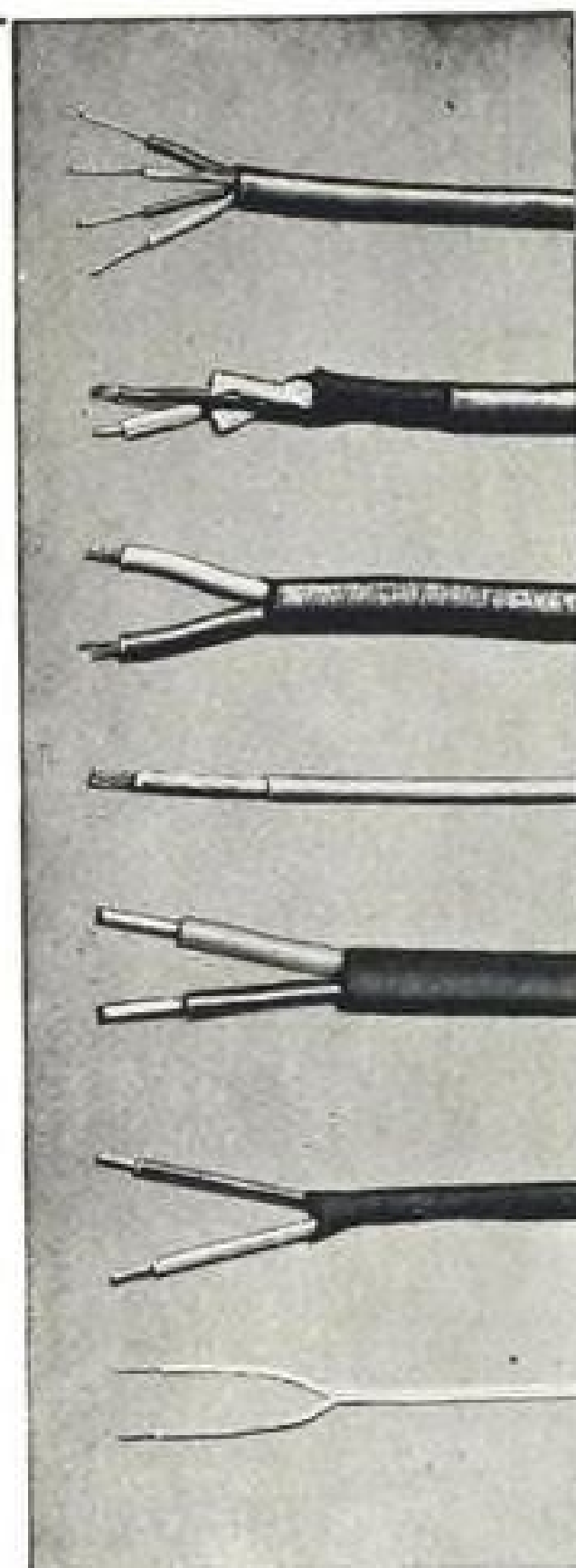
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360 sec. There is some compensation in that liquid ammonia has a higher density than hydrogen, plus the fact that only 15 kw. per lb. of thrust are required.

But right now, chemical propellants are available which will produce impulses of nearly 360 sec. without all the fuss of auxiliary power sources.

Therefore, it seems that the temperature of the working fluid must be raised far above the 4,900F arbitrary limit.

But this limit can't be too high because of material considerations. It would seem that a little under 5,000F is the upper limit—only carbon and tungsten could be used at these temperatures for any direct heat transfer process.

Reinhardt says that it would be more desirable to produce the energy at a lower temperature (2,000F), convert it to electrical energy and use an arc or induction heating to raise the working fluid temperature.

► An Example—By this method, the author continues, it should be possible to raise the temperature of the working fluid above 5,000F without overheating other parts of the rocket structure.

For example, a specific impulse of 1,200 sec. can be achieved with ammonia by heating it to 14,200F. At this temperature, the ammonia is completely disassociated into atomic hydrogen and atomic nitrogen. Energy content would be 42,600 Btu per lb. and the power requirement would be 37.4 kw. per lb. of thrust.

Such an engine would be competitive with today's jet engines.

► Conclusions—The heart of any of the schemes considered here is the powerplant.

Reinhardt says that most designers of conventional powerplants will shake their heads sadly at the thought of designing an engine which produces 150 or more kw. per lb. of installed weight.

But he points out that the V-2 engine has already done this. Its propulsion unit weight weighed 2,050 lb. and produced 55,000 lb. of thrust at a specific impulse of 210 sec. This figures out to be 724,000 kw. or 353 kw. per lb. of weight.

Reinhardt concludes that the future limit of high-energy rocket propulsion depends on the ability to design nuclear powerplants with a very high power-to-weight ratio. There does not appear to be any possibility that rocket powerplants will become competitive with air-breathing engines from the efficiency standpoint.

The justification of the rocket engine must stay as it is now—in ultra-high performance plus the ability to operate outside the atmosphere, according to Reinhardt.

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It's Sunday, June 29, 1935, at Stanley Switlik's summer place a few miles outside of Trenton. Here, today, are gathered some of the most famous people in aviation—among them, Amelia Earhart, America's great aviatrix. They are here to witness the first American demonstration of a parachute tower. The tower was designed by engineers of the Switlik Parachute Company in order to develop parachute mindedness in the public and to further safety in training.

The development was such a success that the armed forces adopted it as a fundamental part of their paratrooper training program.

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## Steel Study

- Second volume is issued on metal machinability.
- Effect of microstructure is reported in detail.

The Air Materiel Command has released the second volume of a series of reports dealing with the machinability of metals and their alloys.

The book is entitled, "Increased Production, Reduced Costs through a Better Understanding of the Machining Process and Control of Materials, Tools, Machines."

► **How It Began**—The project began in 1948, when AMC engineers recognized the need for machinability research as a vital part of mobilization. Under the sponsorship of the Industrial Resources division, Director of Procurement and Production, the Curtiss-Wright Corp. published the first report in 1950.

This book contained a review of metalworking research, including an analysis of the machining process, a glossary of microstructures, notes on machine-tool and cemented-carbide selection, case histories, and up-to-date information on the machining of high-temperature jet-engine alloys, cast irons, and one alloy steel.

► **Steel Study**—The present 196-page volume is devoted to the machining of commonly used steels.

Attaining high-production machining at lowest cost requires careful analysis of the machinability problem. The new volume concentrates on one aspect—the effect of the microstructures of plain-carbon, alloy, and stainless steels on tool life.

The twelve steels selected for testing represent widely used industrial types. By correlating the microstructure of any of the hundreds of other steels with one of the structures tested herein, satisfactory estimates of cutting conditions can be made.

► **Contents**—In brief, here is what the book contains:

Data are arranged in handbook fashion for ready reference. The practical use of the data and their interpretation, which consists of tool-life charts and photomicrographs, is discussed in Section One.

Section Two is the handbook section. Then come the significant comparisons. Cutting characteristics are shown to be similar for like microstructures of several steels. Correlation between cutting temperature and tool life is shown. Machining properties in terms of cutting power, coefficient of friction and shear strength in cutting are also given. Effects of machining practice on resi-

UP THERE WITH THE BIG NAMES...CHAPTER NUMBER 10



## new safety for "luxury in the sky"

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# SKYDROL





dual stress and endurance limit are discussed in Section Four. It has been recognized for some time that machining methods alter the fatigue characteristics of a part. In addition to specific test data, the recently developed concept of the statistical nature of fatigue life is explained.

Section Five reports on recent developments in the machining of titanium and its alloys. At present titanium production is very small, but the problems are being solved rapidly and its use will soon become widespread.

Since production machining depends heavily on metallurgical control of the work material, an appendix has been

included to explain briefly what happens to steels when they are heat treated. Understanding the newer cycle-annealing methods requires a knowledge of the behavior of steel as it is cooled and reheated.

►Where to Get It—A limited number of copies of this book may be obtained by writing to Curtiss-Wright Corp., Wood-Ridge, N. J.

At the same time, the Armed Services Technical Indexing Agency (formerly CADO) is making microfilm copies of the book for dissemination to government contractors.

This agency also has microfilm copies of Volume I (ATI 90790) for distribu-

tion. Microfilm copies of both booklets may be obtained by writing to Central Air Documents Office, U. B. Bldg., Dayton, Attn: CADO-D.

## Columbia Plans New Engineering Center

Columbia University's \$22-million Engineering Center, scheduled for completion in 1954, is planned around a new design for the integration of engineering training and research. Major aim of the new center is to strengthen engineering science and education at the highest professional levels.

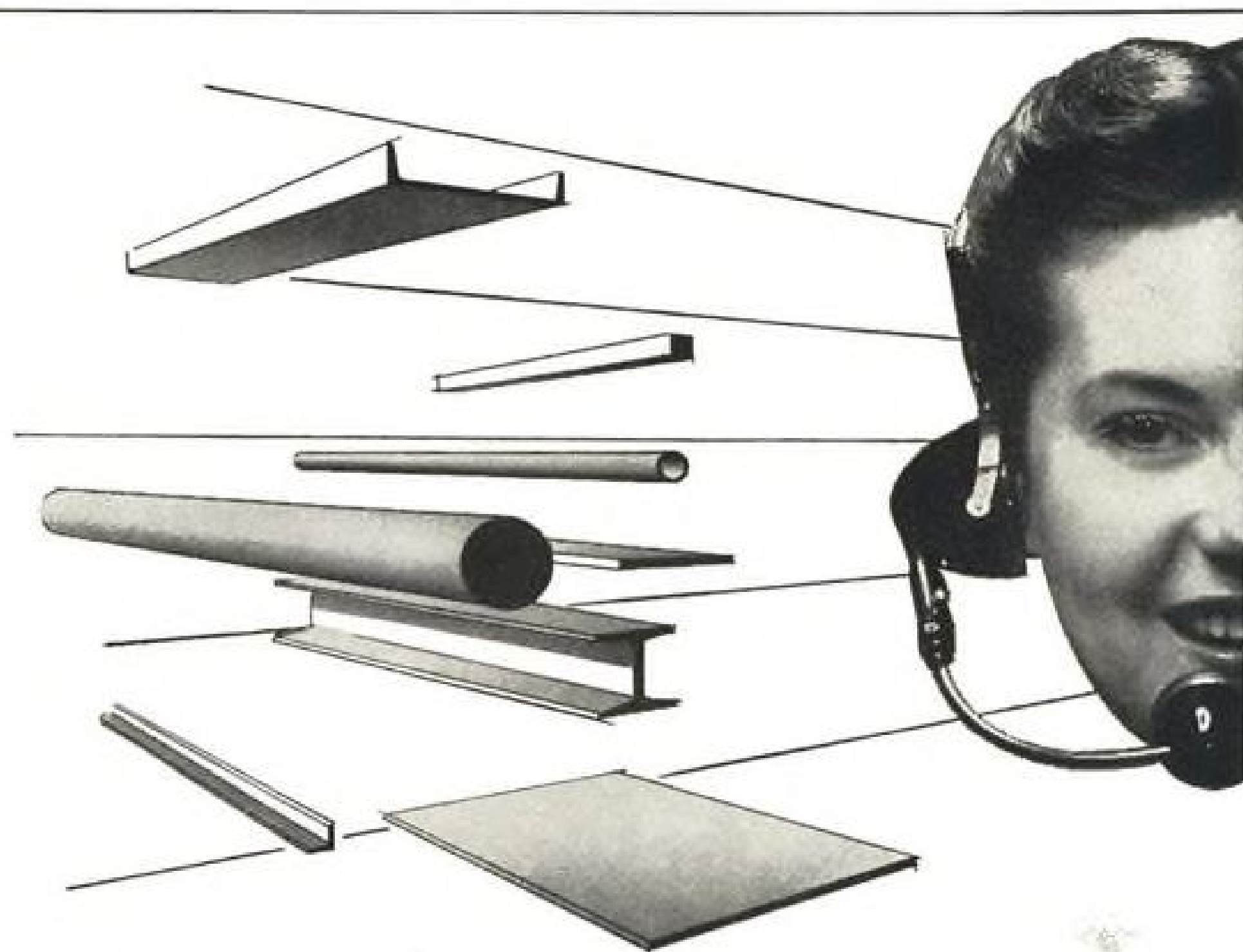
As part of this plan, the Center will expand the effectiveness of Columbia's School of Engineering through two new arms—an International Institute for Advanced Engineering Science and a Division of Cooperative Engineering Research.

This program was recently made public at the start of a fund-raising campaign by Dr. John R. Dunning, dean of engineering, acting in behalf of Pres. Dwight D. Eisenhower and the trustees.

The institute is intended to stimulate both teaching and fundamental research. Its program calls for full-time, highly advanced post-doctoral study. Industry will be invited to send candidates for advanced training, and its scientists will be used as consultants.

Special research projects, dedicated to the development of new designs and processes, will be the basic job of the Cooperative Engineering Research division. Special fields of effort will include nuclear technology, petroleum, electronics and fluid mechanics.

To put this program into effect, Columbia University is currently conducting a drive for funds. Sought immediately is about \$14 million for the buildings and equipment. Subsequently \$8½ million will be required for professorships, fellowships and scholarships.



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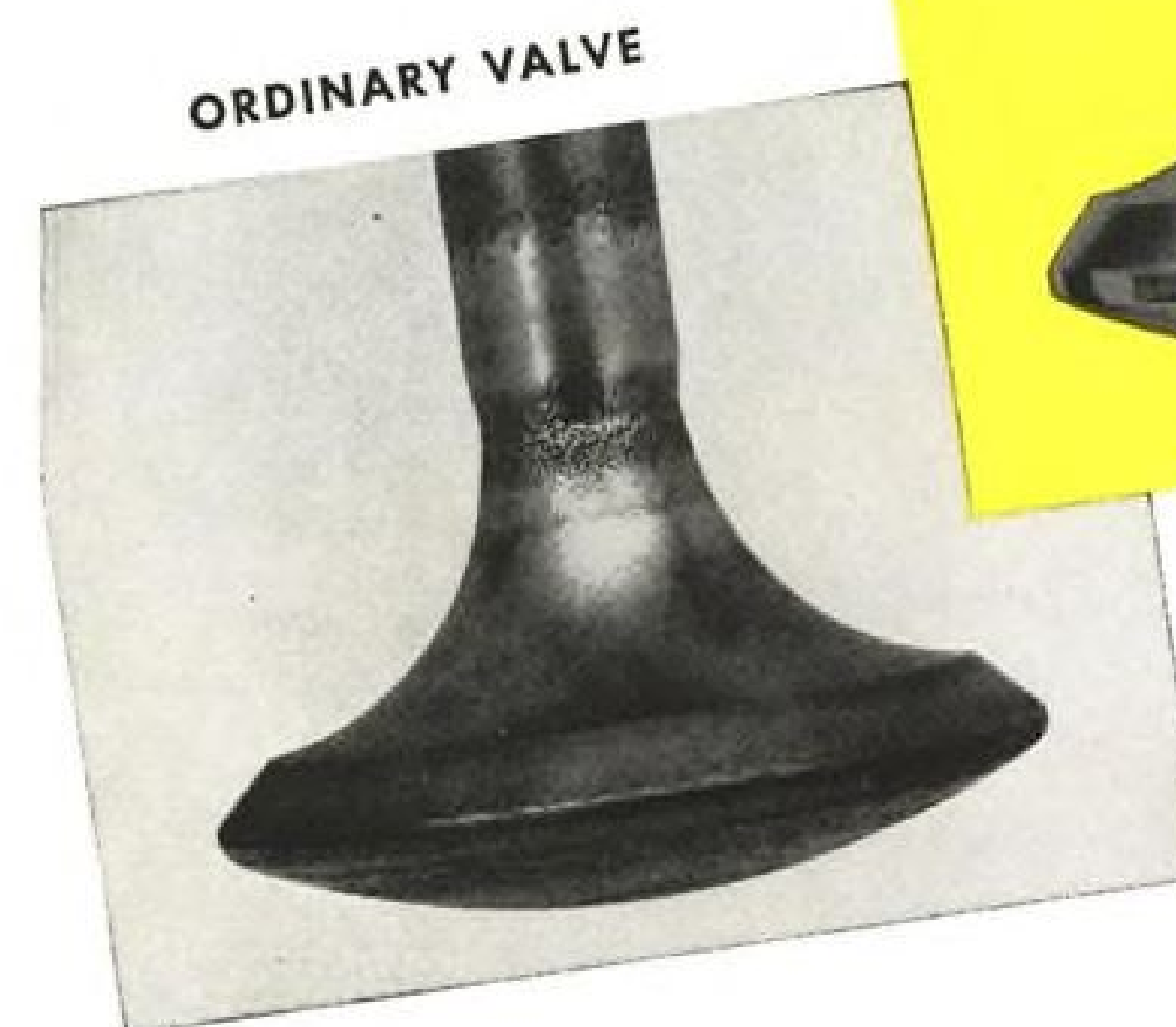
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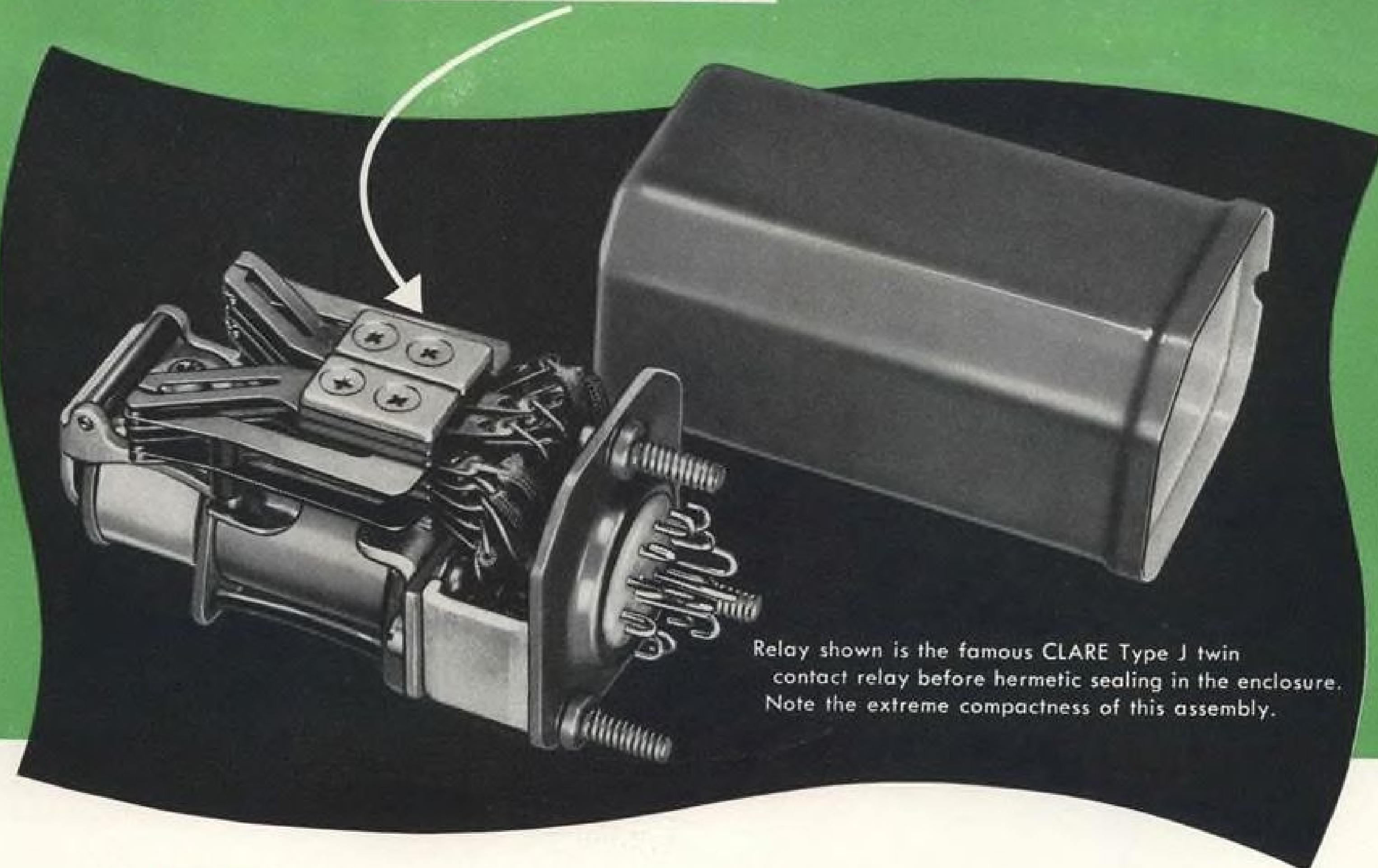
T.P.M. is the new valve material developed by Thompson to give greater corrosion resistance and higher strength at valve operating temperatures. T.P.M. is a result of Thompson's vast experience in valve development and knowledge of the behavior of metals at high temperatures.

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# CLARE RELAYS

**First in the Industrial Field**

## NAA Expands L.A. Facilities

**Increased F-86 work puts pinch on coast plant; 486,500 sq. ft. of space being added at cost of \$3¼ million.**

Los Angeles—The pinch of insufficient space for production engineering, and related activities is being eased at North American Aviation, Inc. by new facilities in this area, encompassing more than 486,500 sq. ft. and costing in excess of \$3¼ million.

The new buildings will take up the work loads imposed by demands of present and projected production of the F-86D, E and H at Los Angeles, and will be used for some support of NAA's Columbus, Ohio, plant in the fabrication of the F-86F.

Here is a rundown of the facilities recently completed or scheduled for operation soon:

- **Drop hammer shop**, covering 12,800 sq. ft., is slated for occupancy by next Feb. 15, and will accommodate machine tools moved from the main plant.

- **Fabrication building and annex**, stretching over 171,900 sq. ft., for the manufacture and forming of detail sheet metal parts, heat-treat and degreasing operations. These operations formerly were conducted, and in some instances still are, in the main plant. The new main fabrication building was finished late last August. The annex is under construction and should be completed by mid-April.

- **Heavy machinery plant**, taking in 114,300 sq. ft. and scheduled for completion about Dec. 15, will house skin and spar mills, grid machines for wing fabrication, electric anodizing, cleaning and rinsing, air aging and painting. The facility will take some machinery from the main plant and also will be set up with new tools and equipment now on order.

- **Mezzanine for tooling building**, covering about 15,000 sq. ft., will house the main factory template section. Completion date is set for Mar. 1, although construction has not yet begun.

- **Processing building**, encompassing 32,400 sq. ft., will be used to conduct different types of operations such as heat-aging, anodizing, chromodizing, spray prime, spotting by template for skin rivet holes, caustic etch for stainless steel. The facility is now being erected and will be completed April 1.

- **Warehouse and shed additions**, spreading over 117,200 sq. ft., serve as an addition to the existing Douglas St. storage area. The new units have just been completed.

- **Engineering tracing vault** of 4,500 sq. ft. is a three-story building completed last June and houses original engineering tracings.

- **Armament building** of 1,200 sq. ft. will be a storage facility—for ammunition. Construction is slated to begin at an early date, with completion set for Mar. 15.

- **Thermal dynamics facility** will be used primarily for research work, and plans for its makeup have only recently been started. Completion date is set for Apr. 1.

- **Personnel building** of 7,200 sq. ft. on two stories will streamline the processing and hiring of all new employees for the entire NAA plant, which has outgrown its present personnel facility under the present work program. Plans for the new building have just been completed and bids are being asked.

- **Sound abatement cells** of two types, just completed. One is for testing jet engines, the other for run-up in the completed plane. The engine cell is a heavy steel structure composed of two shells sandwiching insulation material. The abutting control room is separated from the cell with bullet-proof glass. The sound abatement building,

accommodating the installation of the engine in the aircraft, is a different design to take the tail end of the ship.

- **Canteen** for servicing the new facilities will cover 10,000 sq. ft. It is planned for completion Apr. 1.

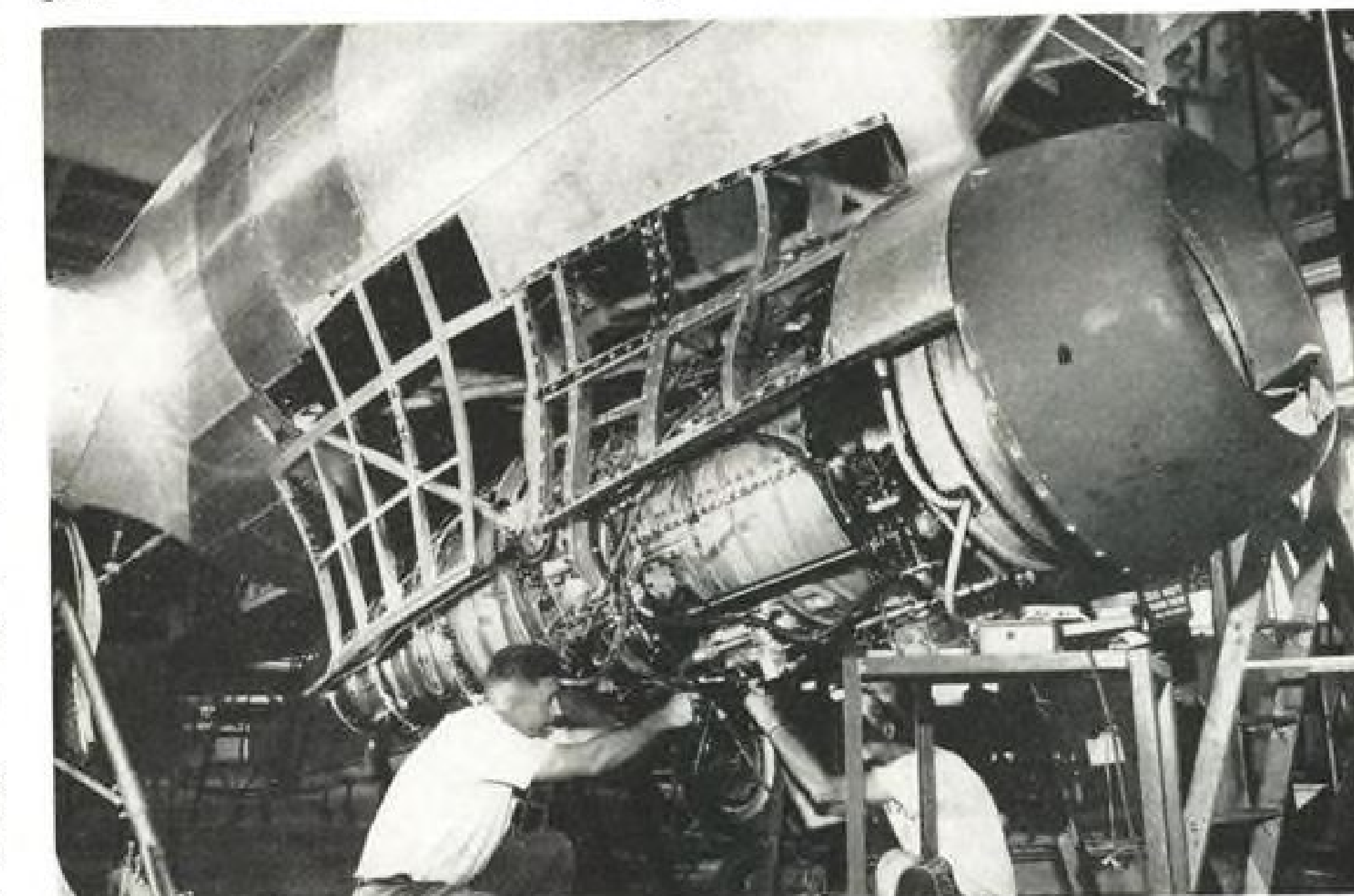
- In addition to these new buildings, there are numerous other leased facilities for various work, ranging in area from 10,000 to 120,000 sq. ft. All of these leased facilities are now occupied. Included are flight hangars built by the City of Los Angeles. Covering 60,000 sq. ft., they will be used for final check-out of production planes.

Operation of many of the new work areas will give sorely needed room in the main plant and in many instances will involve rearrangement of manufacturing schemes.—IS

## Orenda's New Punch

More push will be packed in A. V. Roe Canada Ltd.'s Orenda jet engine for the company's CF-100 all-weather fighter by addition of an afterburner. This should boost the Orenda's thrust from a basic value of just over 7,000 lb. to 9,000-10,000 lb.

Installation of the afterburner will be held up, for Avro reports that considerable time will be required for its development, which is being carried out under contract by Solar Aircraft Co.

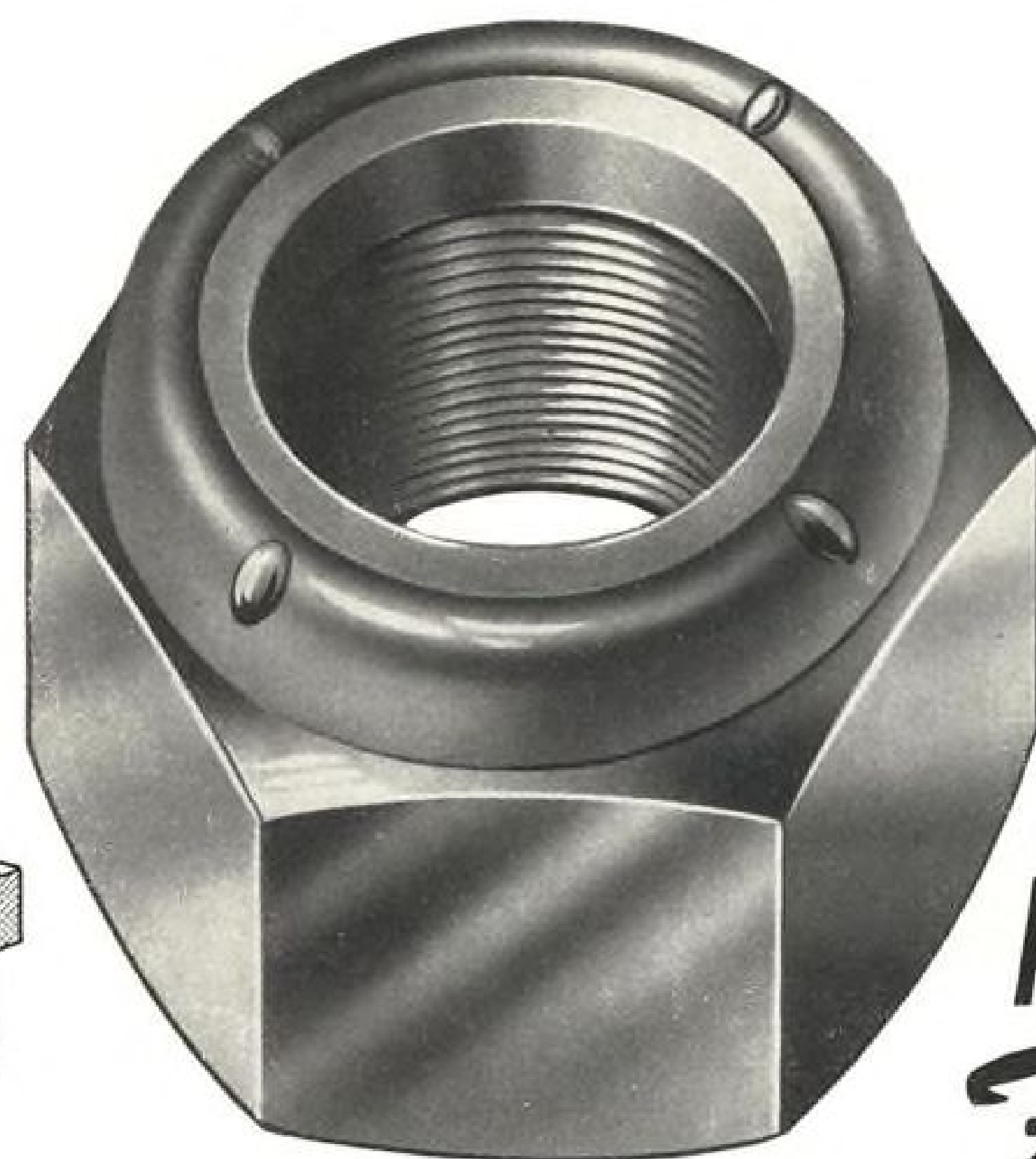


**SAPPHIRE SLUNG FOR AERIAL TESTS**

Wright Aeronautical Corp. is putting this Armstrong Siddeley-built Sapphire through extensive flight tests. The engine is slung under the nose of the Air Force B-17 that formerly carried aloft Wright Aero's T-35 turboprop and the Turbo-Compound R-3350-30W for aerial trials. The plane has been fitted with a new section forward of the cockpit to accommodate the special tubular mount for slinging the engine, and a pod structure to fair the engine as a

nacelle. The jet's centerline is slanted aft 4 deg. down from the fuselage centerline to direct the exhaust stream away from the bomb bay doors, which are insulated with Thermoflex for additional protection. The engine, fitted with some American-made accessories, began its flight trials early in October from Caldwell Wright Airport, N. J. The test program includes altitude trials and studies of blowout, restarting and windmilling characteristics.





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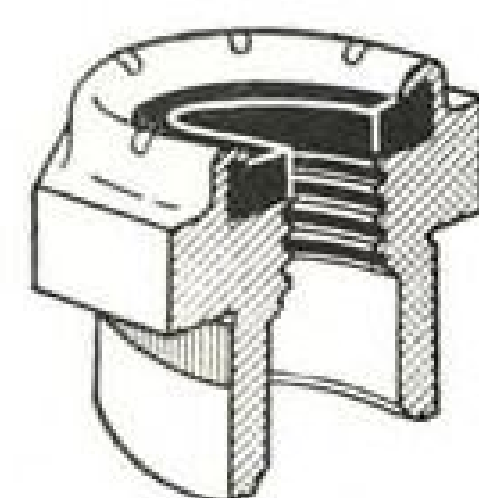
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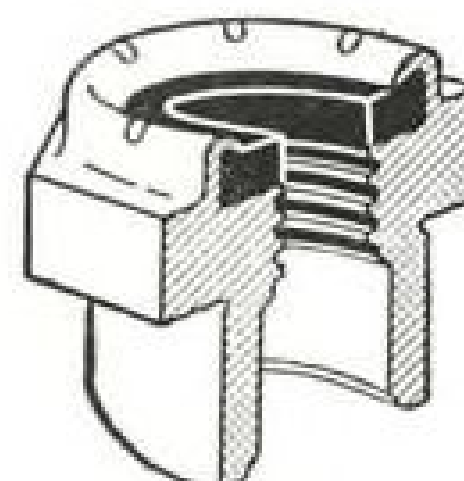
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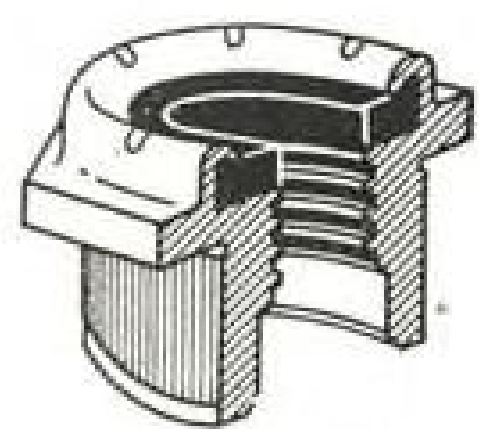
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CLINCH TYPE



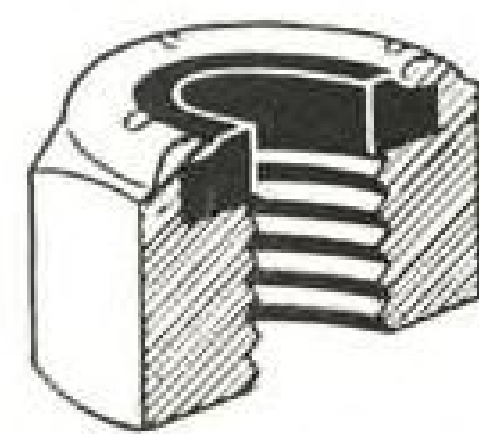
INSTRUMENT MOUNTING



SPLINE TYPE



THIN TYPE



STANDARD



OPTICAL tooling alignment scope (top) has built-in autocollimating illuminator, and optical square (bottom) establishes plane at right angles to scope's line of sight, which were shown at Convair meeting.



### U. S. Optical Tooling Instruments Shown

Further refinements of the optical tooling system were demonstrated recently to representatives of 16 aircraft and instrument companies at Consolidated Vultee Aircraft Corp.'s Ft. Worth plant.

In a one-day session, conducted jointly by Republic Aviation Corp. technicians and Convair tooling engineers, the optical system was applied to check alignment of tooling docks and assembly tools fabricated in them. This application at Ft. Worth was selected by the Air Material Command for the demonstration, because the tooling dock is the largest of its kind in the industry—measuring 80 ft.

► **Special Jigs**—Convair's Ft. Worth chief tool engineer reported the demonstration successful: "It is felt the application of optics to the master tooling dock will stimulate interest in the value of both techniques ... and may bring about real savings of time and money in aircraft tooling."

Republic engineers made some special jigs to apply parts of the optical system to the tooling dock. One of the units employed was the Hilger and Watts microptic theodolite. This is an English instrument calibrated to 1 sec. of angle.

Republic also is still using the British-produced Taylor-Hobson optical com-

ponents at the Ft. Worth plant. The instrument companies were included in the Convair demonstration to awaken interest in producing American-made counterparts of the British optical instruments, to forestall a shortage if the latter should come into tight supply.

One company, at least, has anticipated this condition and also the potential for optical instruments in the aircraft industry.

New instruments manufactured by the Farrand Optical Co., Inc., include an alignment telescope, with autocollimating illuminator built in as op-

tional equipment; and an optical square, which establishes plane at right angles to scope's line of sight.

Scope magnification is 60 X or less; range is 20 in. to infinity; field is 17 in. at 100 ft; resolution is 2 sec. of arc, and accuracy is 2 sec. or .001 in., whichever is larger.

The company also has inaugurated a consulting service covering survey of present tool facilities and the analysis of tool requirements to establish optical tooling systems for a particular plant; and the inclusion of a program of instruction for plant personnel in the use of optical tooling.



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All LEWIS thermocouple indicators are fully cold-end compensated, magnetically shielded and are available for use with iron-constantan, copper-constantan or chromel-alumel thermocouples in all standard ranges for the thermocouple material used. A few typical ranges are listed below.

**MODEL 17B, 2 3/4" case to AND 10401**  
—50 to +300°C Cylinder Temp. (AN 5536-1A or T1A)  
—50 to +300°C Bearing Temp. . . .  
0 to +1000°C Exhaust Temp.

**MODEL 49B, 1 7/8" case to AND 10403**  
—50 to +300°C Cylinder Temp. . . .  
0 to +1000°C Exhaust Temp.

**MODEL 76B dual, 2 3/4" case to AND 10401**  
—50 to +300°C Cylinder Temp. (AN 5536-2A or T2A)  
—50 to 300°C Bearing Temp. . . .  
0 to +1000°C Exhaust Temp.



MODEL 17B



MODEL 49B



MODEL 76B

### RESISTANCE TYPE

Accurate ratiometers, these LEWIS indicators are remarkably free of voltage error, have nearly linear scales (not crowded at the ends) and are magnetically shielded. A few typical ranges are given below. Not shown is Model 46B, 2 3/4" single.

**MODEL 47B, 1 7/8" case to AND 10403**  
—70 to +150°C AN 5790-6 or AN 5790T6  
0 to +125°C Oil Temp. . . .  
—50 to +50°C Air Temp.

**MODEL 77B dual, 2 3/4" case to AND 10403**  
—70 to +150°C AN 5795-6 or AN 5795T6  
+30 to +230°F Oil Temp. . . .  
+100 to +300°C Cylinder Temp.



MODEL 47B



MODEL 77B

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## Crane Co. Buys Hydro-Aire

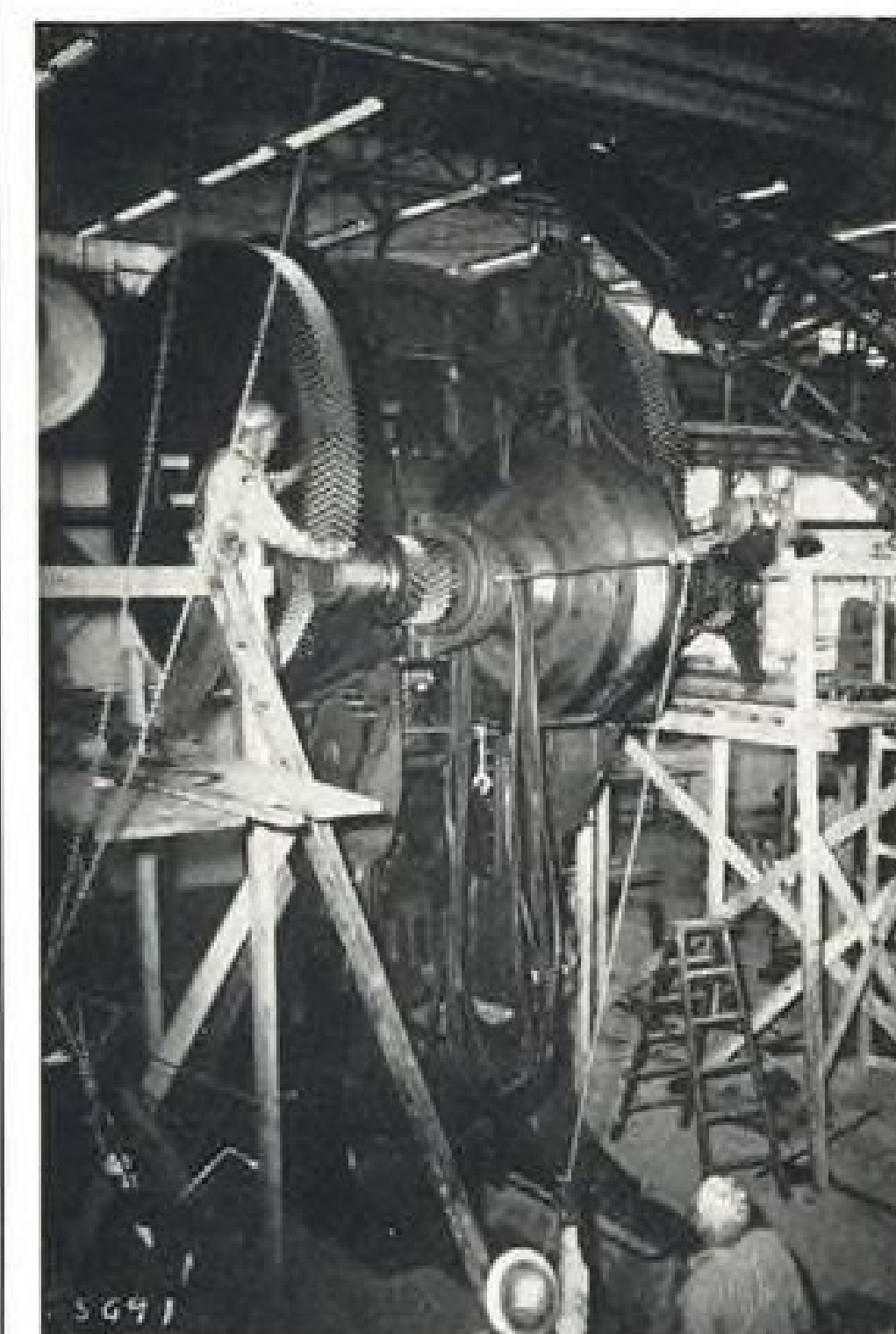
A major manufacturer of industrial valves, fittings and piping has stepped into an allied field in aviation, marking another instance where long-established firms are becoming connected with aircraft activities.

In a transaction reportedly involving \$4 million, 96-year-old Crane Co. of Chicago acquired the assets of Hydro-Aire of Burbank, Calif., and will operate it as a subsidiary. Hydro-Aire is a top-ranking producer of aircraft valves, filters, actuators, and other hydraulic, pneumatic and electric accessories. Another prominent Hydro-Aire product is the Hytrol anti-skid braking device.

Altogether the company has marketed some 1,500 separate items of aircraft equipment and has a backlog of approximately \$10 million.

Crane Co. plans to initiate considerable expansion of its new acquisition and should be able to use its resources with considerable effect in stepping up future Hydro-Aire output.

H. H. Rhoads and J. H. Overholser, partners in Hydro-Aire, will be president and vice president, respectively, of the company.



### ANOTHER LOCKHEED GIANT

New addition to Lockheed's battery of heavies is this E. W. Bliss 1,000-ton impact-extrusion press (AVIATION WEEK Sept. 10, p. 30) soon to be put in operation for quick forming of parts from aluminum alloy. Fabrication scheme is similar to that for making toothpaste tubes, where slug of metal is hit with such force that it flows. Initially, 15 parts are scheduled to be transferred to the method from machining procedure, to give a saving of more than \$50,000 yearly, Lockheed estimates.

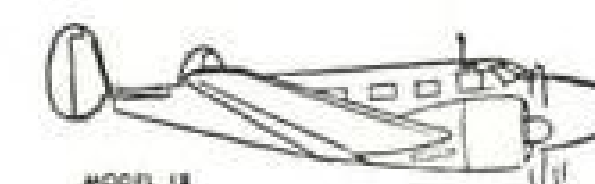


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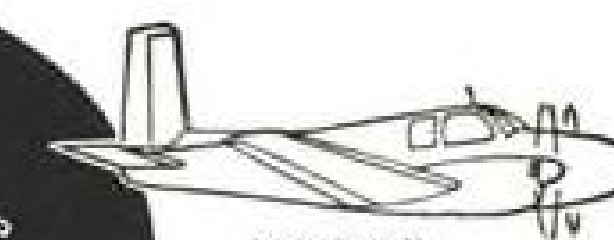
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## THRUST & DRAG

Not what, but whom you know is the key factor for success in the minds of several hundred young engineers, says E. W. O'Brien. He's vice president of W. R. C. Smith Publishing Co., and he's been conducting an informal survey of young engineers for several years. After connections, the engineers listed articulateness, personality, friendship, engineering fundamentals, self-analysis, experience, objectives—and in last place—loyalty to job or company.

More antenna research is the aim of a new laboratory being built at Natick, Mass. by the Workshop Associates, a division of the Gabriel Co. Scheduled for completion in mid-1952, the lab will be located on a 46-acre tract with several distant range stations for pattern work. Roof of the two-story building will be specially planned for outdoor antenna work.

A new seat armor being tested for liaison airplane pilots is a nylon laminate formed to fit the seat—of the plane, that is. Similar types of body armor, developed by the Army Quartermaster Corps, is capable of stopping a .45cal. bullet at point-blank range.

Extra education for employees is being arranged by Convair and Lockheed, among other firms in the industry. Convair's Fort Worth division has set up three undergraduate courses in engineering taught by Southern Methodist University faculty. Convair pays half the tuition; if the student gets better than a B average, Convair foots the bill for the other half. Lockheed's program is expected to supply future technical managerial stock. It was designed to develop specialists in selected technical fields. Job rotation, on-the-job training, and payment of half the tuition of outside studies are included in the program.

Northrop says they've set a world's record for a complete powerplant change by removing and replacing the righthand engine in a Scorpion in just short of 21 min. A five-man crew of Northrop mechanics did the work, and the plane was in flight status at the start and finish of the change. About 9 min. were consumed removing, and 12 replacing, the engine.

Warping and shrinking of metal dies is a problem—and Armour Research Foundation of Illinois Institute of Technology has developed one answer to the problem. By the application of flexible tubes to cool the metal dies during their forming, Armour's method



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Flying from carriers like the Valley Forge and Philippine Seas, these planes have demonstrated the effectiveness of this versatile Douglas design. To date,



multiple variations of the airplanes have been manufactured, and in each design, Cherry Blind Rivets are specified in the fabrication of elevators, dive brake assemblies and other important parts.

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Former role of "project engineer" in U. S. aviation industry is fast disappearing. Previously, in a 4-5 year period he usually gained wide overall experience on as many as 6 or 7 design or manufacturing projects. Today, these projects take so much longer that in a 4-5 year stretch he may only be on one project. On this he is sort of "general contractor" who has to delegate his responsibilities to a number of "specialists." These latter have increased so much lately that great care must be exercised to insure coordination and avoid danger of specialties becoming too "vertical."

Officials of the Society of British Aircraft Constructors and other bigwigs of British aero industry, who recently toured U. S. aviation plants, weren't particularly interested in our design progress, because they felt they were abreast or ahead of us in this phase. Our production schemes held their interest, for in this field alone, they felt, could they really learn something to take back home.

## 20 Firms Get 40% On '51 Defense Cash

The five corporations that got the biggest slice of defense prime contracts in the '51 fiscal year are all engaged in aviation work, a survey by Munitions Board reveals.

In this listing, 20 companies drew the biggest dollar volume of military prime contracts—a share of over 40% of the total—first figure represents prime military contracts in millions of dollars; figure in parenthesis is percent of total volume of military contracts.

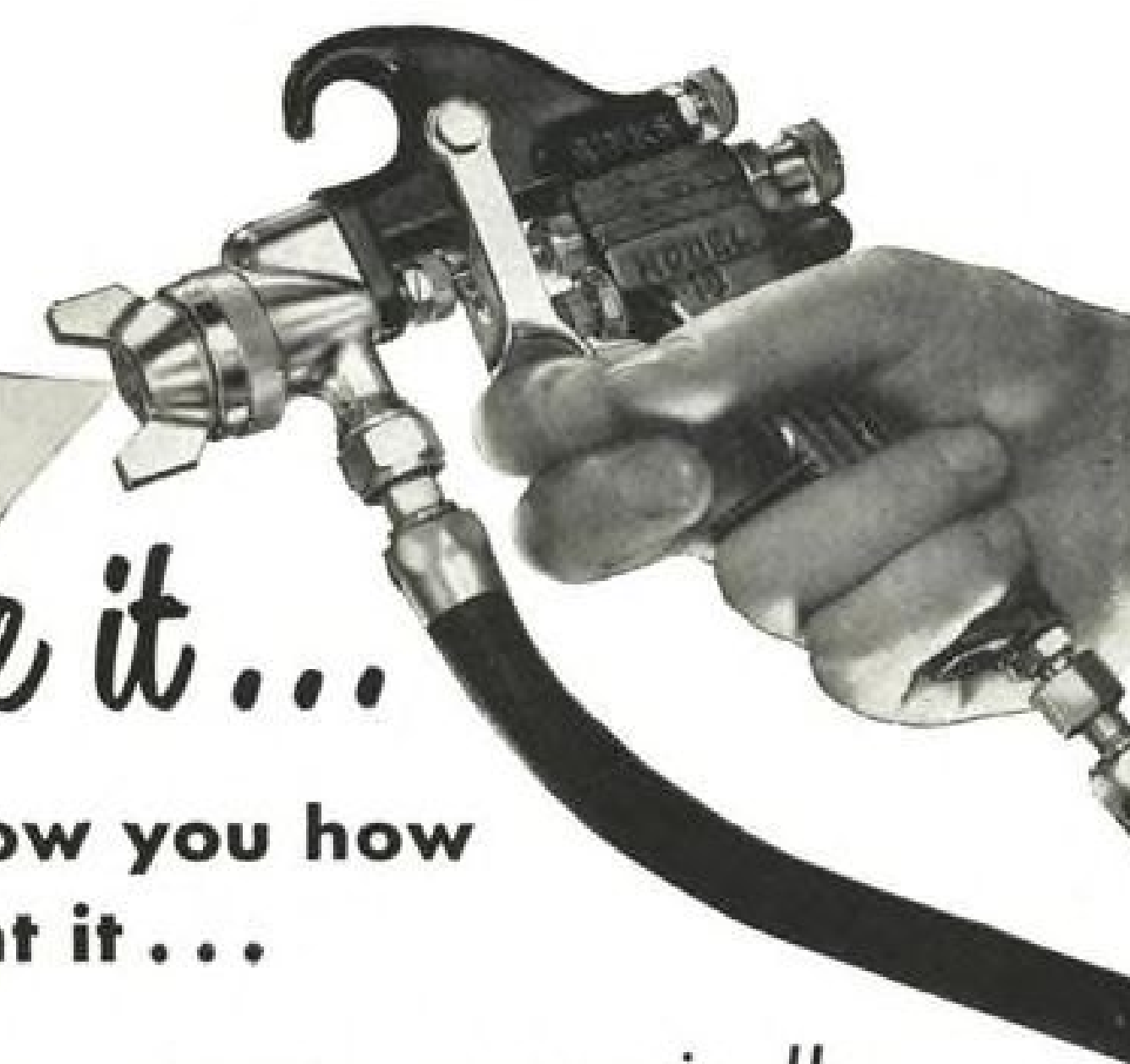
1. General Motors Corp., \$2,372.5 (8.0%)
2. United Aircraft Corp., \$1,228.0 (4.1%)
3. Douglas Aircraft Co., Inc., \$735.5 (2.5%)
4. Grumman Aircraft Engineering Corp., \$702.6 (2.4%)
5. General Electric Co., \$654.2 (2.2%)
6. Republic Aviation Corp., \$650.4 (2.2%)

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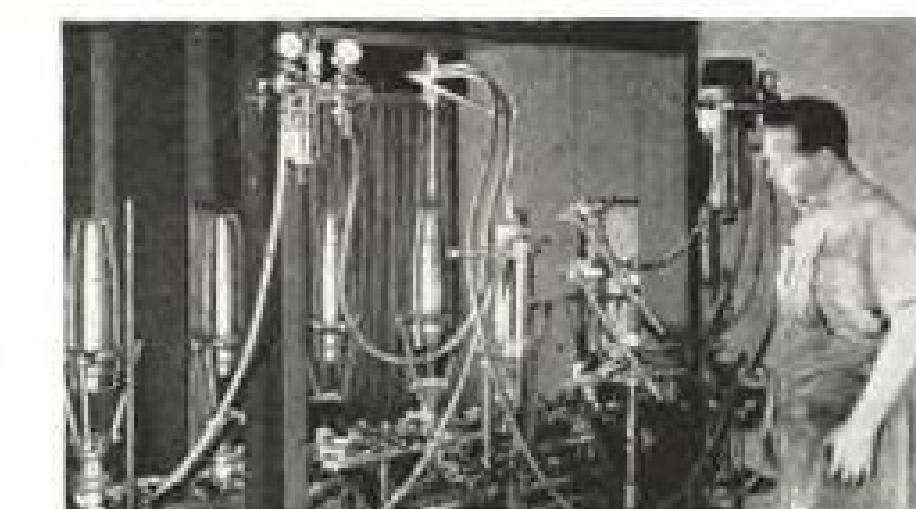
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7. American Locomotive Co., \$607.8 (2.1%)
8. Lockheed Aircraft Corp., \$607.3 (2.1%)
9. North American Aviation, Inc., \$507.0 (1.7%)
10. Boeing Airplane Co., \$482.2 (1.6%)
11. International Harvester Co., \$467.2 (1.6%)
12. Curtiss-Wright Corp., \$447.4 (1.5%)
13. Chrysler Corp., \$415.5 (1.4%)
14. American Telephone and Telegraph, \$400.7 (1.3%)
15. Ford Motor Co., \$400.0 (1.3%)
16. Bendix Aviation Corp., \$368.7 (1.2%)
17. Sperry Corp., The, \$343.3 (1.2%)
18. Westinghouse Electric Corp., \$324.4 (1.1%)
19. Northrop Aircraft, Inc., \$236.9 (0.8%)
20. American Woolen Co., \$223.1 (0.8%)

Of the other companies that figured in the Munitions Board survey of the 100 corporations with the biggest volume of defense price contracts, there were these aviation concerns (number indicates placing among the 100 corporations):

21. Consolidated Vultee Aircraft Corp., \$216.6 (0.7%)
22. Goodyear Tire and Rubber Co., Inc., \$200.5 (0.7%)
23. Willys-Overland Motors, Inc., \$172.2 (0.6%)
24. Allis-Chalmers Manufacturing Co., \$167.4 (0.6%)
25. Hughes Tool Co., \$163.2 (0.5%)
26. Studebaker Corp., The, \$157.7 (0.5%)
27. Avco Manufacturing Corp., \$153.6 (0.5%)
28. Martin Co., The Glenn L., \$147.8 (0.5%)
29. Fairchild Engine and Airplane Corp., \$138.1 (0.5%)
30. McDonnell Aircraft Corp., \$130.8 (0.4%)
31. Firestone Tire & Rubber Co., The, \$130.4 (0.4%)
32. Continental Motors Corp., \$118.8 (0.4%)
33. Collins Radio Co., \$102.1 (0.3%)

40. Bell Aircraft Corp., \$98.9 (0.3%)
43. Kaiser-Frazer Corp., \$91.7 (0.3%)
45. Packard Motor Car Co., \$87.7 (0.3%)
49. Raytheon Manufacturing Co., \$79.8 (0.3%)
50. Emerson Electric Manufacturing Co., \$78.3 (0.3%)
51. Piasecki Helicopter Corp., \$75.8 (0.3%)
61. General Tire and Rubber Co., The, \$59.1 (0.2%)
66. Gillilan Brothers, Inc., \$52.6 (0.2%)
67. Goodrich Co., The B. F., \$51.0 (0.2%)
76. Rheem Manufacturing Co., \$41.9 (0.1%)
78. Beech Aircraft Corp., \$40.7 (0.1%)
90. Grand Central Aircraft Co., \$31.6 (0.1%)
95. Radioplane Co., Inc., \$29.5 (0.1%)

## British Earn Millions On Jet Engine Sales

Britain has received orders for over \$30-million worth of jet engines from the U. S. and Canada during 1951, and in addition will collect millions more in royalties for engines being built in these countries under license.

The latest contract was for about \$25-million worth of Rolls-Royce Nenes to Canada, covering an initial batch of 1,000 engines to power the Lockheed T-33 which will be built under license by Canadair at Montreal. Later a plant is to be erected in Montreal to build the engines, and British component makers expect this to be source of business for some years.

British jet engine makers have made licensee agreements with 12 firms in ten different countries.



## B-47 Assembly Travels by Rail

This overall view of one of the production lines at Texas Engineering & Manufacturing Co., Inc., shows how the company handles its Boeing B-47 rear fuselage installation operation.

The assemblies travel on an elevated track to progressive positions via wheels bolted to the shipping rings at either end of the section. Suspended platforms (arrow) travel with the units and provide proper work level for each operation.

Air and electric floor outlets are positioned at five-foot intervals to eliminate long hoses, cables or overhead

drops. Parts are housed in bins at each work station.

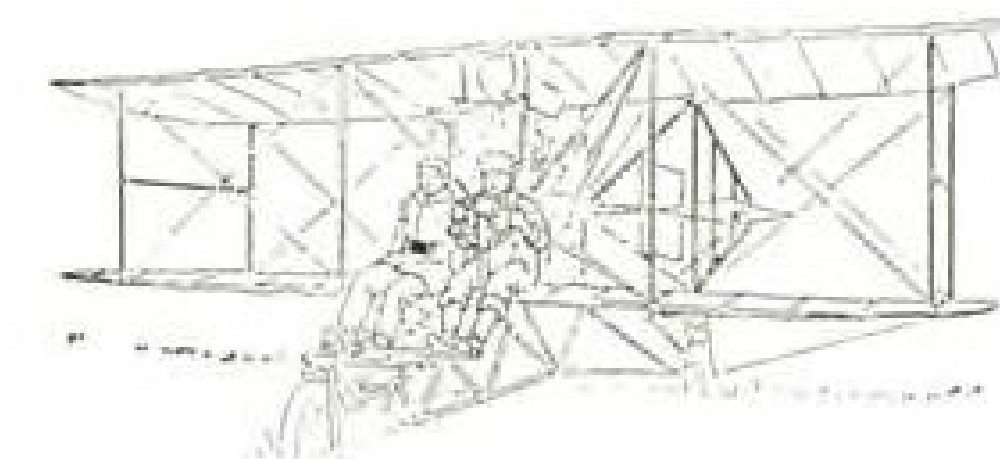
When Temco first installed the elevated line, the units were placed on the track alternately, with the front end of one unit adjacent to the aft end of the next. Temco's chief industrial engineer, W. A. Tweedie, found this gave greater space utilization but did not lend itself to line flow of parts.

After additional space opened up, it was determined that parts flow provided by facing all units in the same direction more than made up in added efficiency for extra space required.



## Flying Forgings-

THE MODERN AIRPLANE IS LARGELY MADE UP OF HAMMERED METAL PARTS



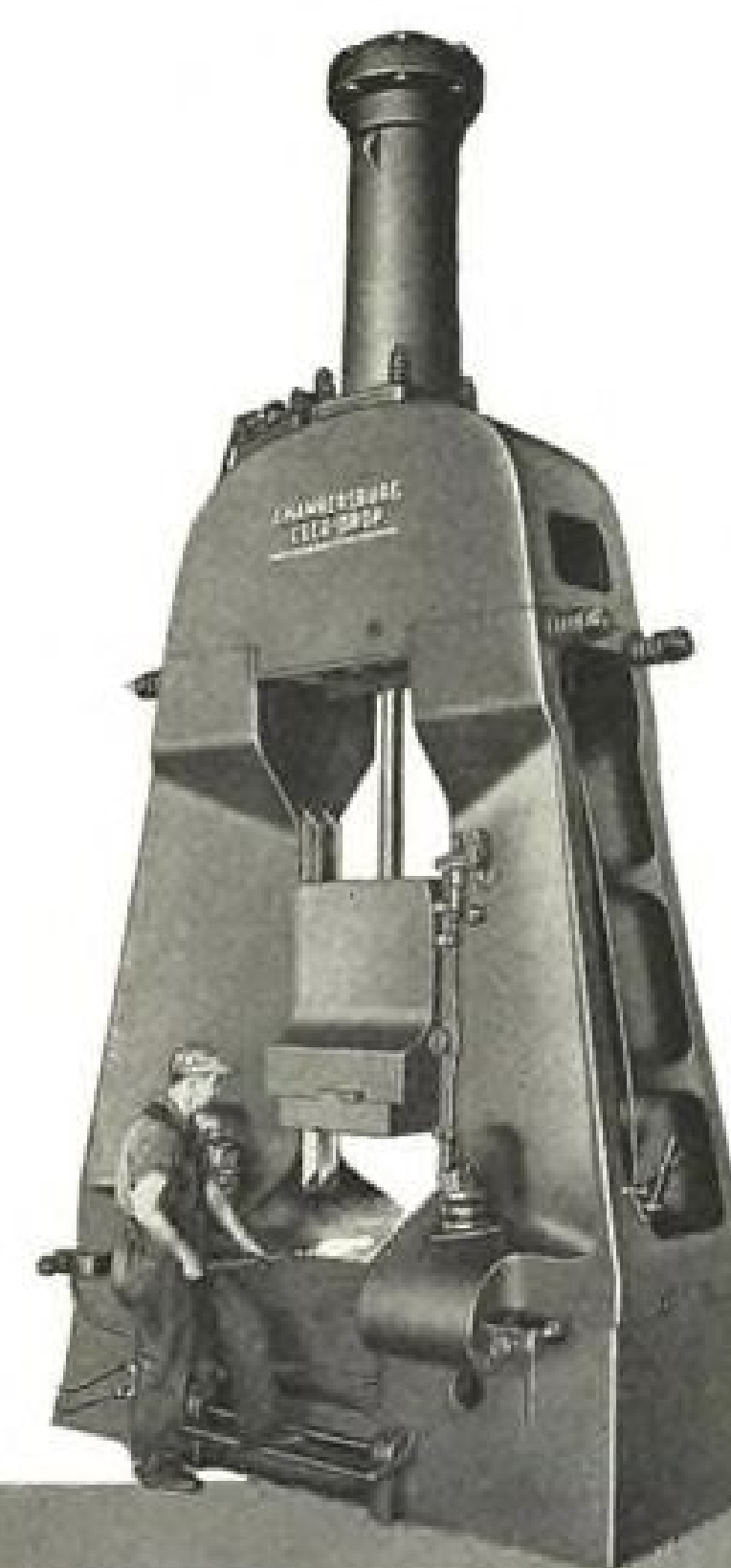
THERE WERE FEW FORGINGS IN THE BAMBOO-AND-VARNISHED-LINEN AIRPLANE OF 1911 BUT EVEN THEN THE PRIMITIVE AIRPLANE ENGINE HAD THEM

The original Wright plane that went into production—the Model B—had a high speed of 42 m.p.h., carried 2 people, had a little over 2 hours gasoline supply and a service ceiling at full load of about 8000 feet.

Today's plane—40 years later—has a high speed of 600 m.p.h., carries 125 passengers, has enormous gas capacity and ceilings up to 50,000 feet.

Tomorrow's plane, says Grover A. Loening, may cruise at 1200 to 1500 m.p.h. (N.Y. to Europe in 3 hours, California in 2 hours, Florida in 45 minutes) may land almost vertically and may be fireproof in crashes. And it, too, will be built largely of hammered metal parts.

IT is hard to associate flight through the air, —the flight of birds, the flight of planes— with weight, strain, stress, impact; yet the greater the size of the plane, the higher the speed, the heavier the load, the greater become the forces tending to pull it apart. That is why the toughness and strength of the metal parts that make up the modern plane are so important, why drop forgings and hammered sheet metal parts are essential in airplane construction—why the hammers built by Chambersburg are busy night and day in the aircraft industry, as in all other manufacturing industries which use metal parts that must not fail.



CHAMBERSBURG ENGINEERING CO. CHAMBERSBURG, PA.

# CHAMBERSBURG

## THE HAMMER BUILDERS

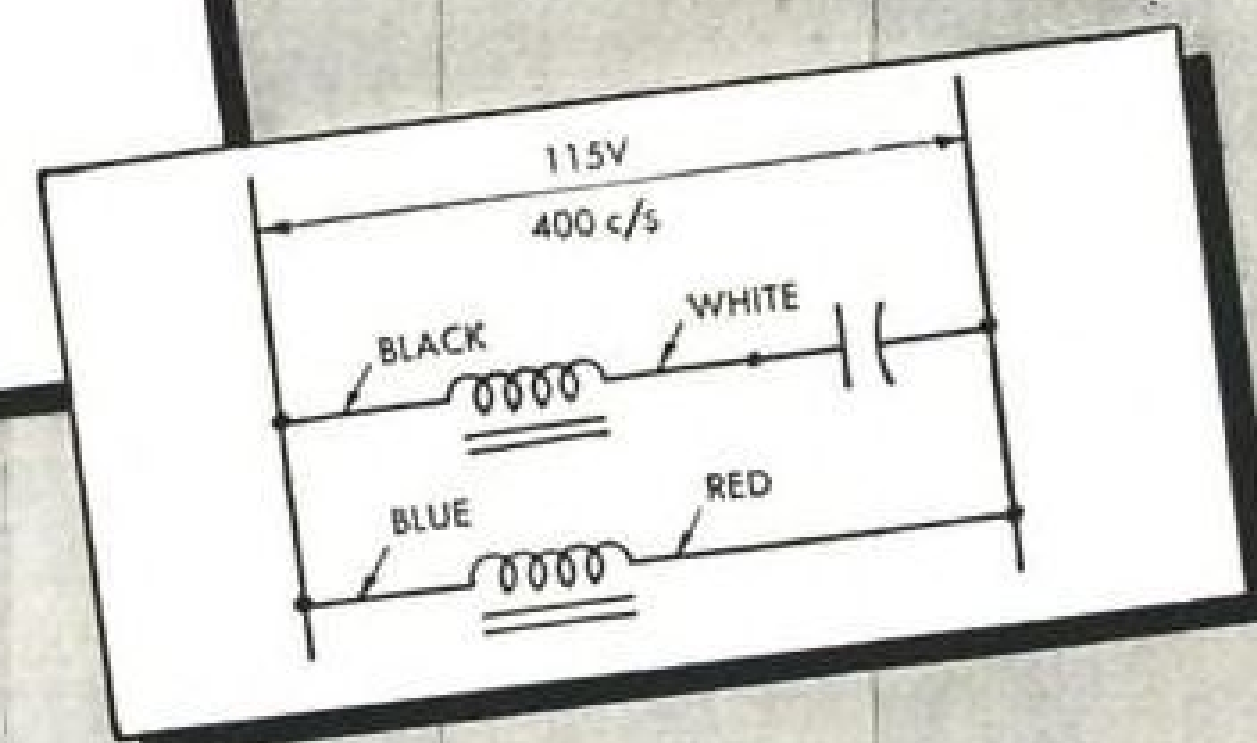
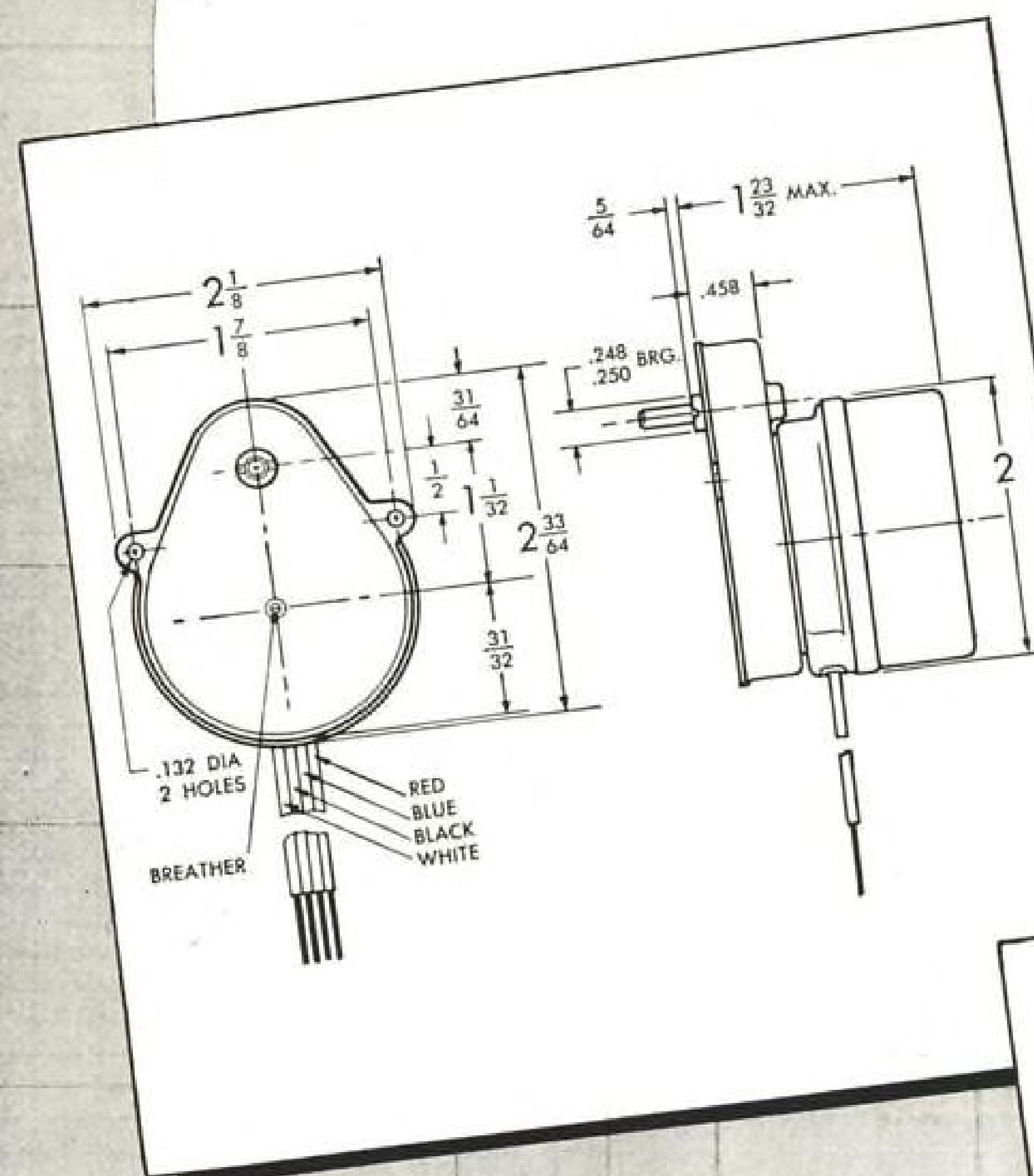


# Another **HAYDON**



## 400 CYCLE

HAYDON research and engineering staffs constantly seek to develop new and build better products. One example is the HAYDON 400 cycle timing motor. This is an hysteresis type synchronous timing motor, for use as a separate motor or in many different types of timers. HAYDON personnel and plant are equipped to build motors and timers using D.C., 60 cycle or 400 cycle for military or civilian applications.



# FIRST *in Timing*

## SYNCHRONOUS TIMING MOTORS and TIMERS

### SPECIFICATIONS:

Hysteresis type synchronous timing motor, essentially two phase . . . furnished with capacitor for self-starting operation on single phase . . . standard gear trains available, special designs available for quantity production . . . speeds available with standard gear trains range from 1/60 to 30 rpm . . . weighs approximately 6-1/2 oz. . . . dimensions, except for slightly greater depth, closely follow those of HAYDON 60 cycle timing motors.

### FEATURES:

Inherently accurate approach to timing problems. Not affected by variations in temperature, supply voltage, load and altitude. R-F filtering or shielding not required. Brush life or wear not a problem. Where primary current supply is 400 cycle, rectifying equipment and duplication of wiring may be reduced or eliminated.



Write for a copy of Engineering Bulletin #2 for complete information on the 400 cycle motor.

**HAYDON**  
AT TORRINGTON

HEADQUARTERS FOR  
**TIMING**

**HAYDON Manufacturing Co., Inc.**  
SUBSIDIARY OF GENERAL TIME CORPORATION  
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Required for senior Engineering position with large Canadian Aircraft manufacturing organization in the Montreal area.

Send resume of experience to Personnel Manager

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P. O. Box 6087, Montreal, Canada

## PRODUCTION BRIEFING

► **Kaman Aircraft Corp.**, Windsor Locks, Conn., has leased recently completed National Guard hangar and office space at Bradley Field, Conn. The building gives Kaman 60,000 sq. ft. additional space—a 40% boost—and will enable the helicopter manufacturer to expand its HTK-1 production lines and other facilities.

► **Minneapolis-Honeywell Regulator Co.** has opened a new office at Harrisburg, Pa., to handle increased local demand for process measuring and controlling instruments.

► **Grand Central Aircraft Co.**, Glendale, Calif., has installed two auxiliary 200-gal. fuel tanks in outer wing panels of DC-3Cs owned by Standard Oil of New Jersey. Modification is claimed to extend craft's range by four hours.

► **Hotpoint, Inc.**, Chicago, has bought 400-acre tract to provide site for 1-million sq. ft. manufacturing facilities. Appliance manufacturer is now tooling for production of jet engine components and aircraft turbosuperchargers.

► **Northrop Aircraft, Inc.**, Hawthorne, Calif., delivered first production model of new tank fire control unit to Ordnance Corps 90 days after breaking ground for Anaheim plant where control is being made.

► **General Electric Co.'s** flight test center at Schenectady has acquired a Lockheed F-94A jet fighter on loan under bailment arrangement from USAF. Craft will be used to test automatic fire control equipment. It joins a Douglas B-26 and North American B-25 at the center.

► **Steel Improvement & Forge Co.**, Cleveland, is expanding to meet stepped-up demand by USAF for forging production. Company has acquired 38,000-sq. ft. factory adjoining present plant in Cleveland which increases space by 20%, and is building new plant near Toronto, Canada, to forge jet engine blades for Avro Orenda jet engine.

► **Republic Aviation Corp.**, Farmingdale, N. Y., has acquired 100,000-sq. ft. warehousing facility at Montauk, Long Island, N. Y. Facility was built by Navy in World War II as torpedo test base.

► **Aero Bolt & Screw Co.** has moved to new, larger quarters at 1071 W. Arbor Vitae St., Inglewood, Calif.

# At 111 U.S. Airports



## ...AIRLINES take on SHELL AVIATION FUEL

**111 more reasons why SHELL AVIATION FUEL**

flies **THE MOST PASSENGERS**  
**THE MOST AIR FREIGHT**

and **THE MOST AIR MAIL**  
**IN THE U. S. A. TODAY**



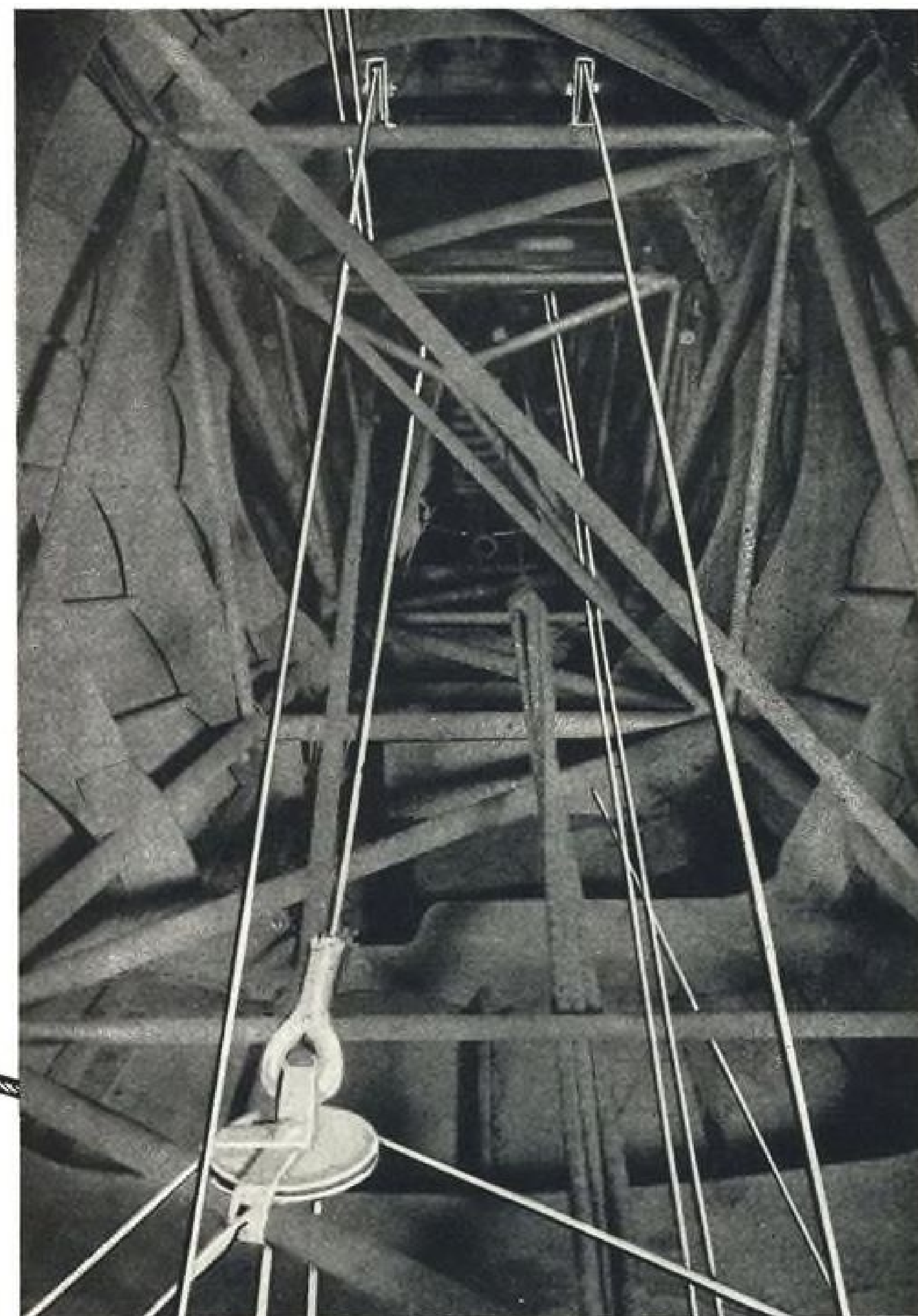
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## Aircraft Cable



### GIVES HIGH RESISTANCE TO BENDING FATIGUE

Bending fatigue encountered on small diameter pulleys calls for aircraft cable that best combines the required resistance characteristics. In Wickwire Aircraft Cable you can be sure that you always get the proper combination of physical properties for high fatigue resistance... toughness and strength to stand severe loading.

That's because Wickwire Aircraft Cable is under complete quality control from start to

finish beginning with actual steel making... rigidly tested and inspected through every step of fabrication including wire, strand and finished cable.

Wickwire Aircraft Cable is available in different sizes and constructions for use on all auxiliary and main controls. It can also be supplied with galvanized or tinned finish and in stainless steel. All Wickwire Aircraft Cable exceeds MIL specifications.

LOOK FOR THE YELLOW TRIANGLE ON THE REEL

Exclusive Distributors  
of Wickwire Aircraft  
Cable

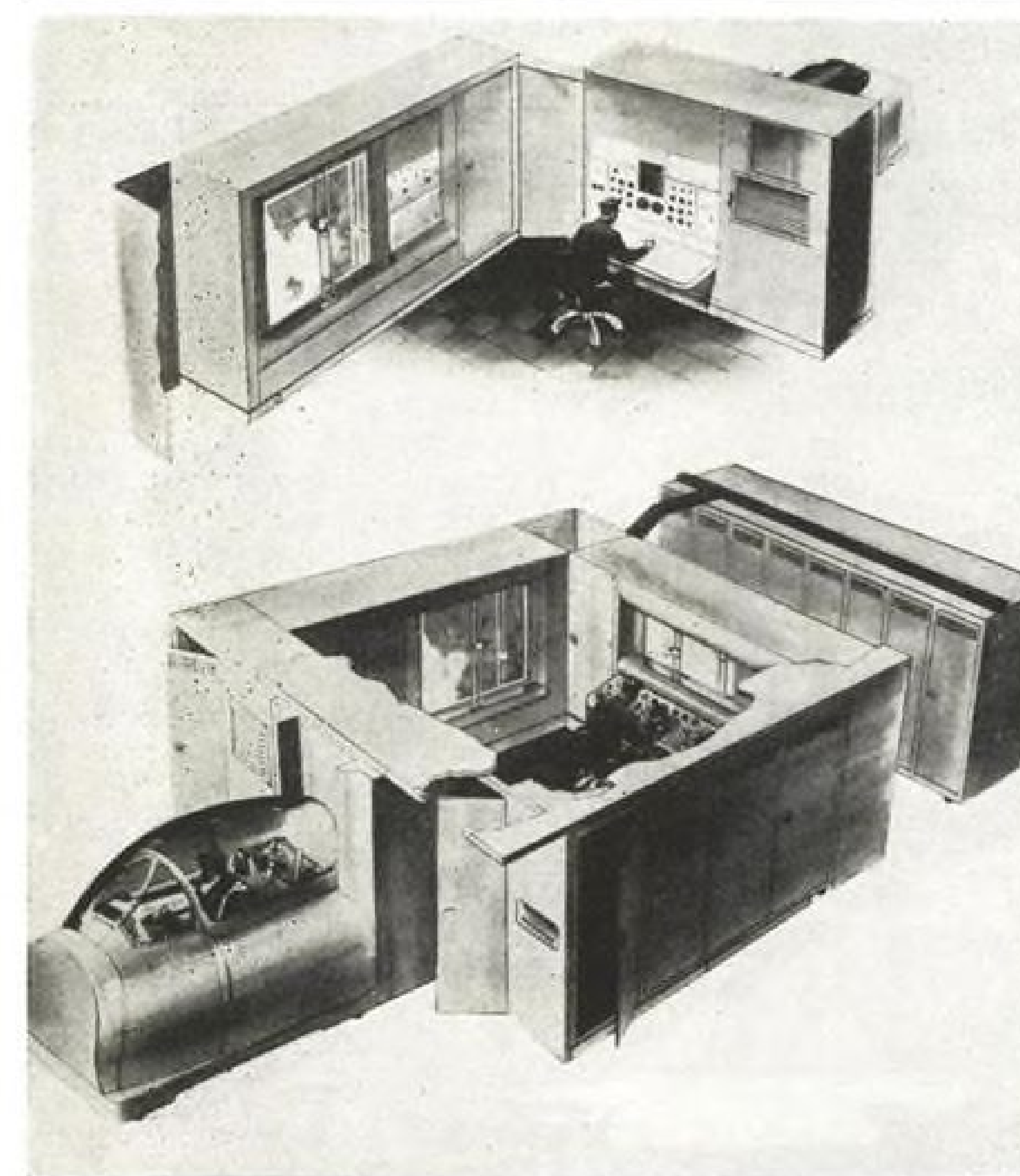
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## WICKWIRE ROPE



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THE COLORADO FUEL & IRON CORPORATION

## AVIONICS



Custom F-86D Fliteronic (left) in overall view. Above is view of Navy F8F cockpit trainer.

### Ground-Borne Missions Ready Pilots for Combat

USAF and Navy are turning more and more to electronic flight simulators for providing pre-combat training—permitting crews to gain proficiency in all types of missions without leaving the ground.

The avionic trainers not only provide realistic flying conditions and the injection of "mishaps" to test the crew's skill, but even have provisions for duplicating the presence of an enemy target to test the trainee's effectiveness in "combat."

And this invaluable flying experience can be gained without having to tie up large numbers of actual airplanes for training.

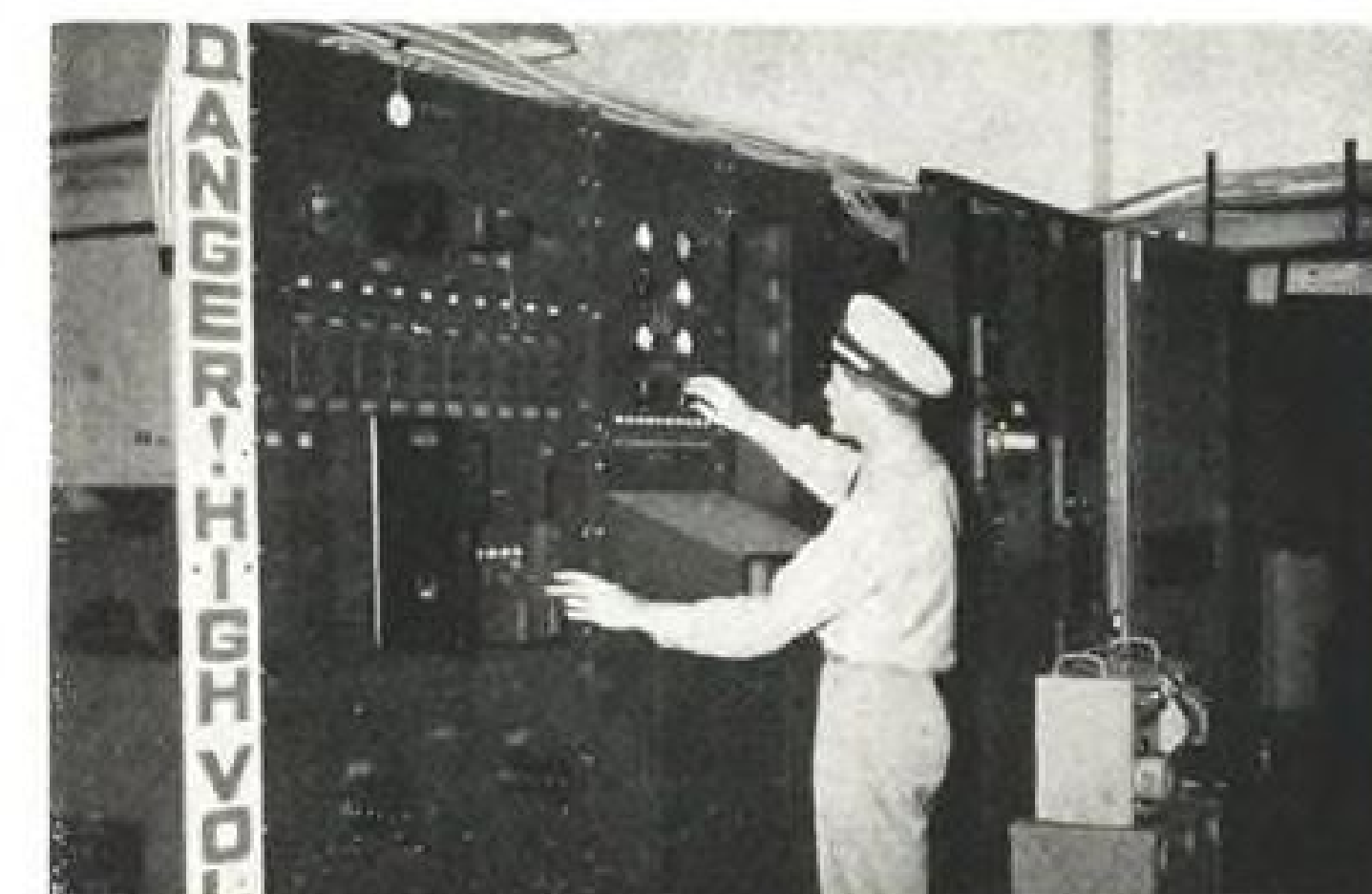
The new Sabre Fliteronic shown in the left photo at the top of the page is a 35,000-lb. complex package that contains 1,152 electronic tubes, 60 miles of wiring, takes up 600 feet of floor space and stands 10 feet high. It contains more than 100,000 parts, took about that many engineering hours to design.

► **AF Trainer**—Built by Engineering & Research Corp., Riverdale, Md., makers of the well-known Ercoupe personal plane, this simulator will provide realistic training in the operation of the North American F-86D all-weather fighter currently in production for the Air Force. So faithfully did it duplicate the F-86D prototype, that a vibration condition that was evident in the airplane also showed up in the trainer.

► **Navy Trainer**—The Navy simulator shown in the other views was designed and built by the Navy's special devices center at Sands Point, L. I., N. Y., to train pilots of all-weather squadrons based near Atlantic City, N. J. Somewhat less elaborate than the Erco simulator, it cost an estimated \$250,000. It comprises a standard Grumman F8F Bearcat Link trainer working with a maze of electronic devices for simulating flying and combat operations.

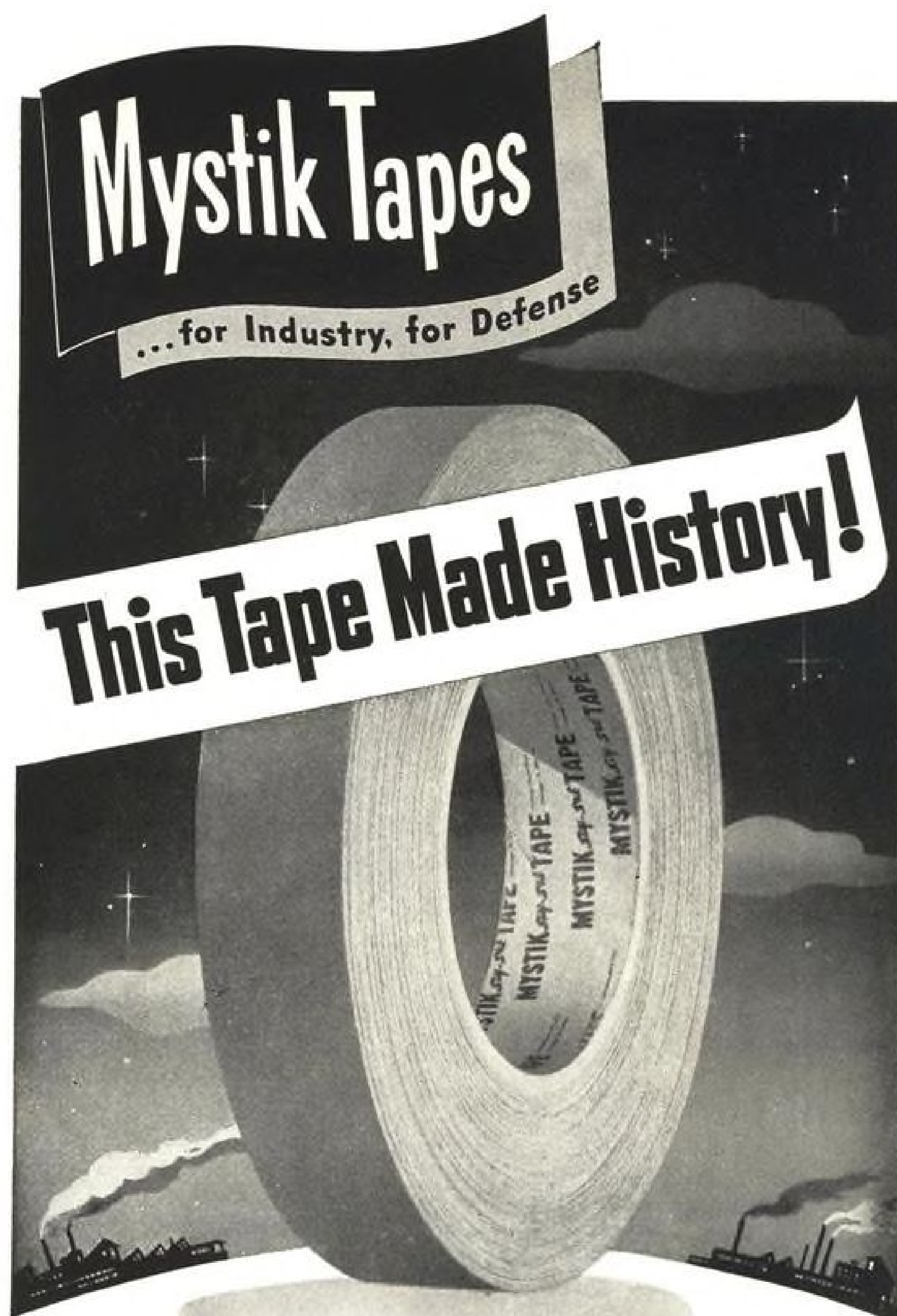


Operator can put "target" on Navy trainee's scope.



Complex electronic equipment for operating Navy trainer is set up in a separate room.





- Mystik Cloth Tapes
- Mystik Paper Masking Tapes
- Mystik Protecto-Mask
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When the chips were down in World War II, MYSTIK Cloth Tapes supplied 65% of the total needs of industry and the armed forces. Again MYSTIK has the answers to tremendous supply and protective shipping problems. Whatever your needs—protective or production—you can rely on MYSTIK Tapes to meet the toughest demands . . . government specifications or *your* specifications! Write for full information and samples now. Mystik Adhesive Products, 2643 N. Kildare, Chicago 39.

## Relay Withstands Vibrations up to 40G

The Hart Manufacturing Co., Hartford, Conn. says that its new relay has "a combination of important characteristics never before attained in an aircraft type, hermetically sealed relay."

These "Diamond H" relays are 4-pole, double-throw; they are designed to meet the requirements of USAF Spec. MIL-R-5757, but exceed several of the standard requirements by "significant margins."

The company has certified test sheets which show that the relays have operational shock resistance in excess of 50 G. Models which were tested showed resistance up to 64 G.

Standard vibration requirements call for 10 G, but the Hart units will take vibration in excess of 40 G while operating. The relay has withstood mechanical shock of 120 G, which was the upper limit of the test equipment used.

Altitude requirements are normally stated as 70,000 ft., but Hart says its relay will operate up to 80,000 ft.

Drop-out voltage for the "Diamond H" series is 7 v. as compared to the standard spec requirement of 13 v.

Satisfactory test results were obtained "over a much wider span" than the temperature design requirements of between minus 65C to plus 200C.

## Weather Chamber Tests Avionic Aids

A new testing device for simulating extremes of temperature, altitudes and humidity, valuable in proving new electronic equipment, has been installed at Radio Corporation of America's Engineering Products Department, Camden, N. J.

The chamber measures 18 ft. wide by 14 ft. high by 25 ft. deep and weighs 50 tons. It is designed to duplicate atmospheric pressures ranging from sea level to 70,000 ft., temperatures from 185 F to -85 F, and will also control relative humidity from 10% to 95%.

Designed and built by Tenney Engineering, Inc., Newark, N. J., RCA's new chamber has a two-ton door which moves on rollers. An effective seal is provided by air cylinders at each corner of the door which exert the required pressure. One-foot steel channel sections set on one-foot centers within all interior surfaces provide necessary reinforcement against external pressure when the vacuum system is being operated. The vacuum system can give a vacuum of 28 in. of mercury. Inner wall insulation of 9-in. thickness aids in maintaining precise temperature control.

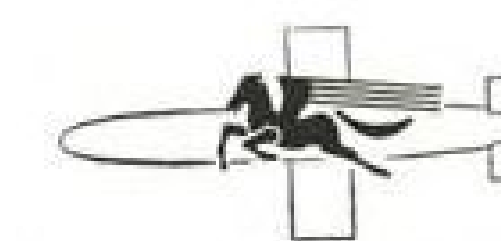
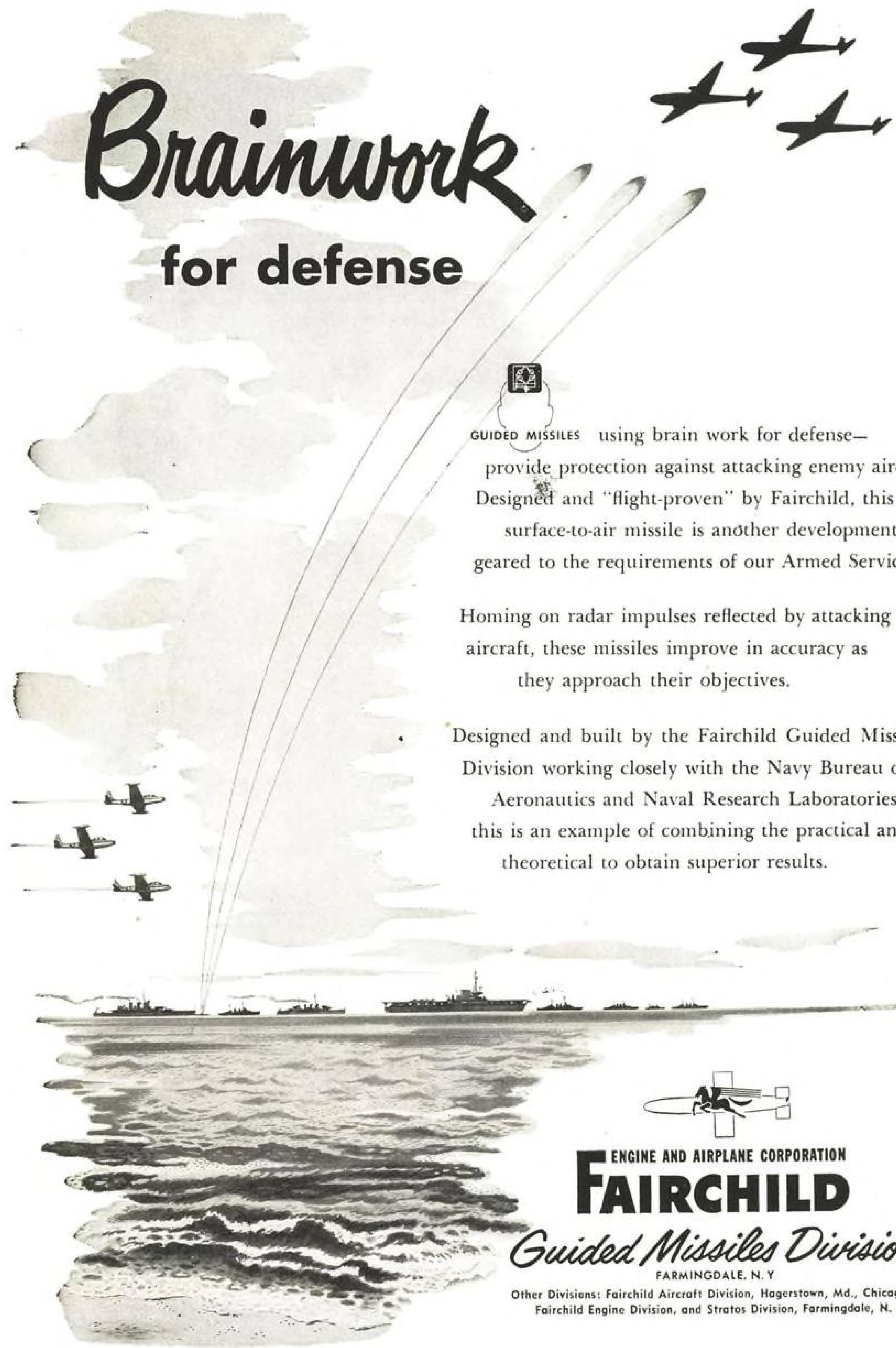
# Brainwork for defense



GUIDED MISSILES using brain work for defense—provide protection against attacking enemy aircraft. Designed and "flight-proven" by Fairchild, this surface-to-air missile is another development geared to the requirements of our Armed Services.

Homing on radar impulses reflected by attacking aircraft, these missiles improve in accuracy as they approach their objectives.

Designed and built by the Fairchild Guided Missiles Division working closely with the Navy Bureau of Aeronautics and Naval Research Laboratories, this is an example of combining the practical and theoretical to obtain superior results.



ENGINE AND AIRPLANE CORPORATION  
**FAIRCHILD**  
*Guided Missiles Division*  
FARMINGDALE, N. Y.

Other Divisions: Fairchild Aircraft Division, Hagerstown, Md., Chicago, Ill. Fairchild Engine Division, and Stratos Division, Farmingdale, N. Y.





## Building the World's Best Aircraft...

### for example, BELL H-13D HELICOPTERS

on the final assembly line  
at the Bell plant at  
Buffalo, New York.

The above photograph shows the popular H-13D helicopter in final inspection operations inside the Bell Aircraft Corporation plant at Niagara Falls Airport, Buffalo, New York. To date, these Bell Helicopters have been responsible for the evacuation of thousands of wounded in Korea. They can be equipped with Stokes litters, one on either side, enabling the plane to carry four passengers.

There is Reynolds Aluminum in almost every airplane that flies today  
The aircraft industry has learned to de-

pend on Reynolds for consistently high quality and technical aid in working out problems of development and engineering. Reynolds completely interrelated operations from the mining of raw bauxite to the delivery of aluminum in all its forms, assures dependability of supply. And remember, as the aircraft industry expands and grows, Reynolds Aluminum keeps pace in supplying and developing "Tomorrow's Main Metal".

## Helpful Material for Your Training Program

Reynolds Aluminum is on the job with literature and movies to help you with your personnel training program—add to your own know-how. The complete library of Reynolds Technical Books on aluminum design and fabrication is available to you for the asking. Please send your request on a business letterhead, otherwise the price of each book is one dollar.

- A-B-C's of Aluminum (from mine to finished products)
- Aluminum Data Book (Aluminum Alloys and Mill Products)
- Aluminum Structural Design
- Designing with Aluminum Extrusions
- Fastening Methods for Aluminum
- Finishes for Aluminum
- Forming Aluminum (about Dec. 1)
- Heat Treating Aluminum Alloys
- Machining Aluminum Alloys
- Metals Weight Slide Rule
- Welding Aluminum

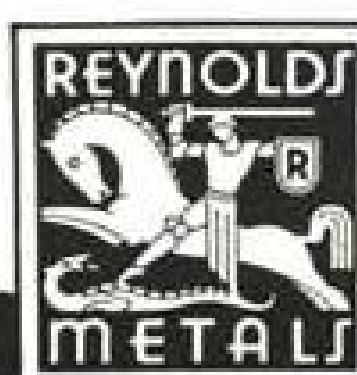
And to instruct large groups of personnel . . . to put more interest in your training program . . . get these 16mm, color-sound films from Reynolds Film Service.

● SHAPE OF THINGS TO COME. Interesting description of the aluminum extrusion process and the design opportunities it provides. Running time 30 minutes.

● TALE OF THE POWDERED PIG. Developments in aluminum powders and pastes including their application in protective and decorative coatings. Running time 22 minutes.

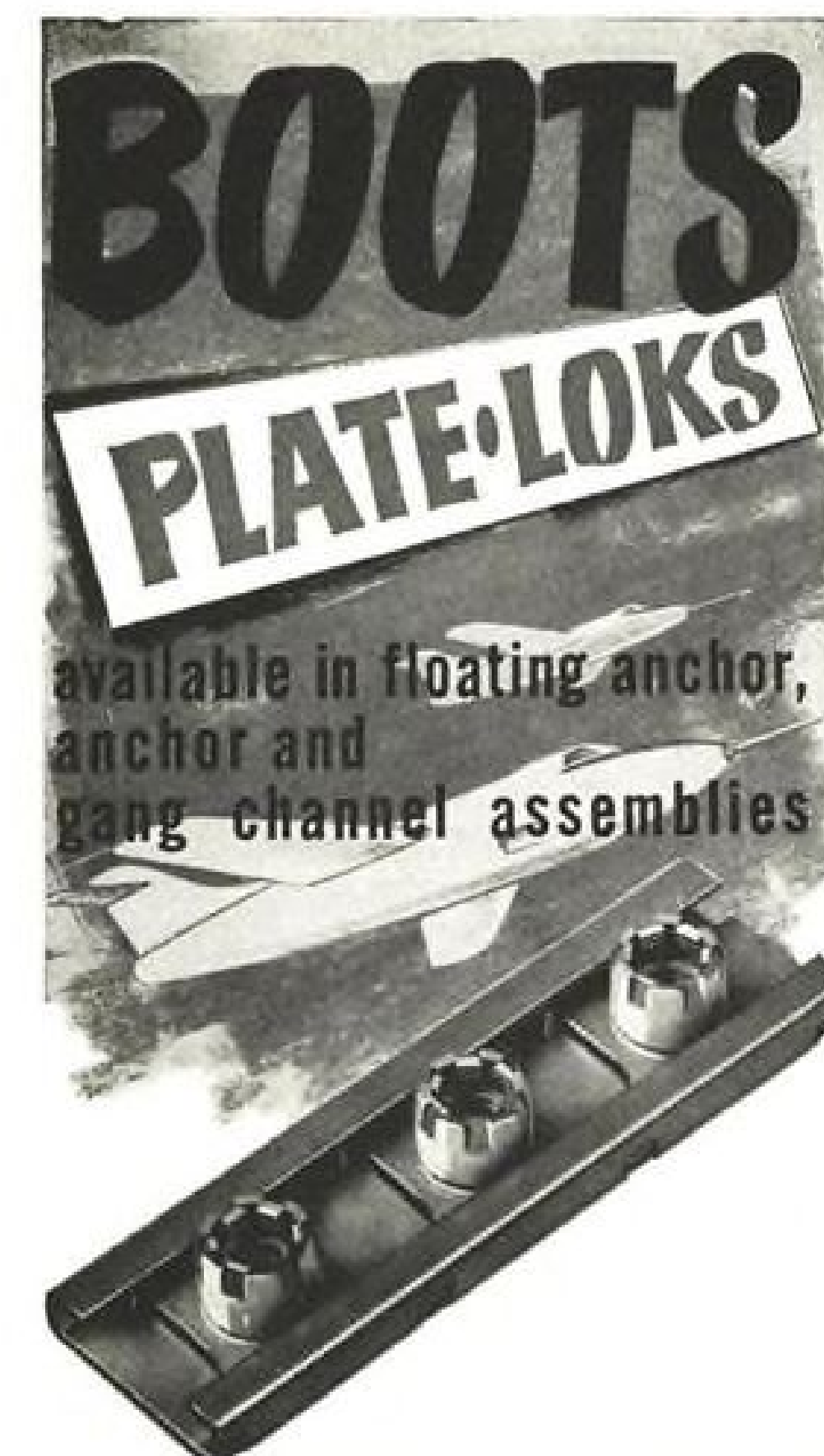
● PIGS AND PROGRESS. The complete story of aluminum from mine to finished products. Covers all forms of aluminum. Running time 22 minutes.

Write to Reynolds Metals Company, 2559 South Third Street, Louisville 1, Kentucky



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MODERN DESIGN HAS ALUMINUM IN MIND



available in floating anchor, anchor and gang channel assemblies

### GANG CHANNEL

The unique Plate-Lok Nut assembled into straight channels; removable or permanently attached nuts. Standard-length channels in a wide range of nut spacings are available; special lengths and spacings can be supplied to your order.

### ANCHOR BASES

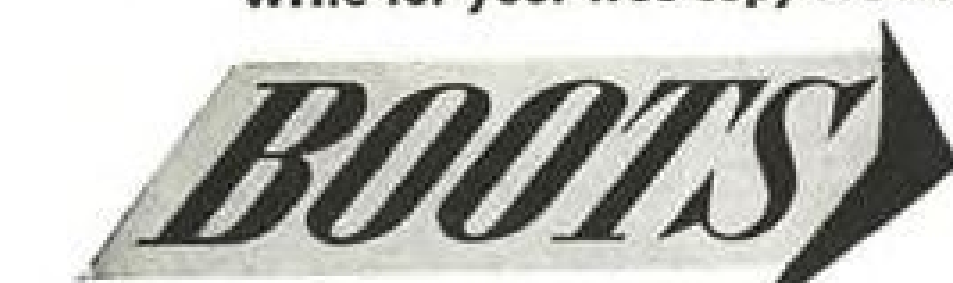
Plate-Loks in anchor bases to meet your every requirement—plain anchors, one-lug, corner, midjet, right-angle. The all metal Plate-Lok is fully approved under AN-N-5 and AN-N-10. Its positive locking action is proof against vibration and structural breakdown due to radical temperature changes.

### FLOATING ANCHOR

Now in one-lug, two-lug, and right-angle bases—for regular or countersunk rivets, for welding—permanently assembled or with removable nuts. For anchor applications where float is desirable—specify Plate-Lok!

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Tell us about your lock-nut problems. We'll supply experimental quantities free.  
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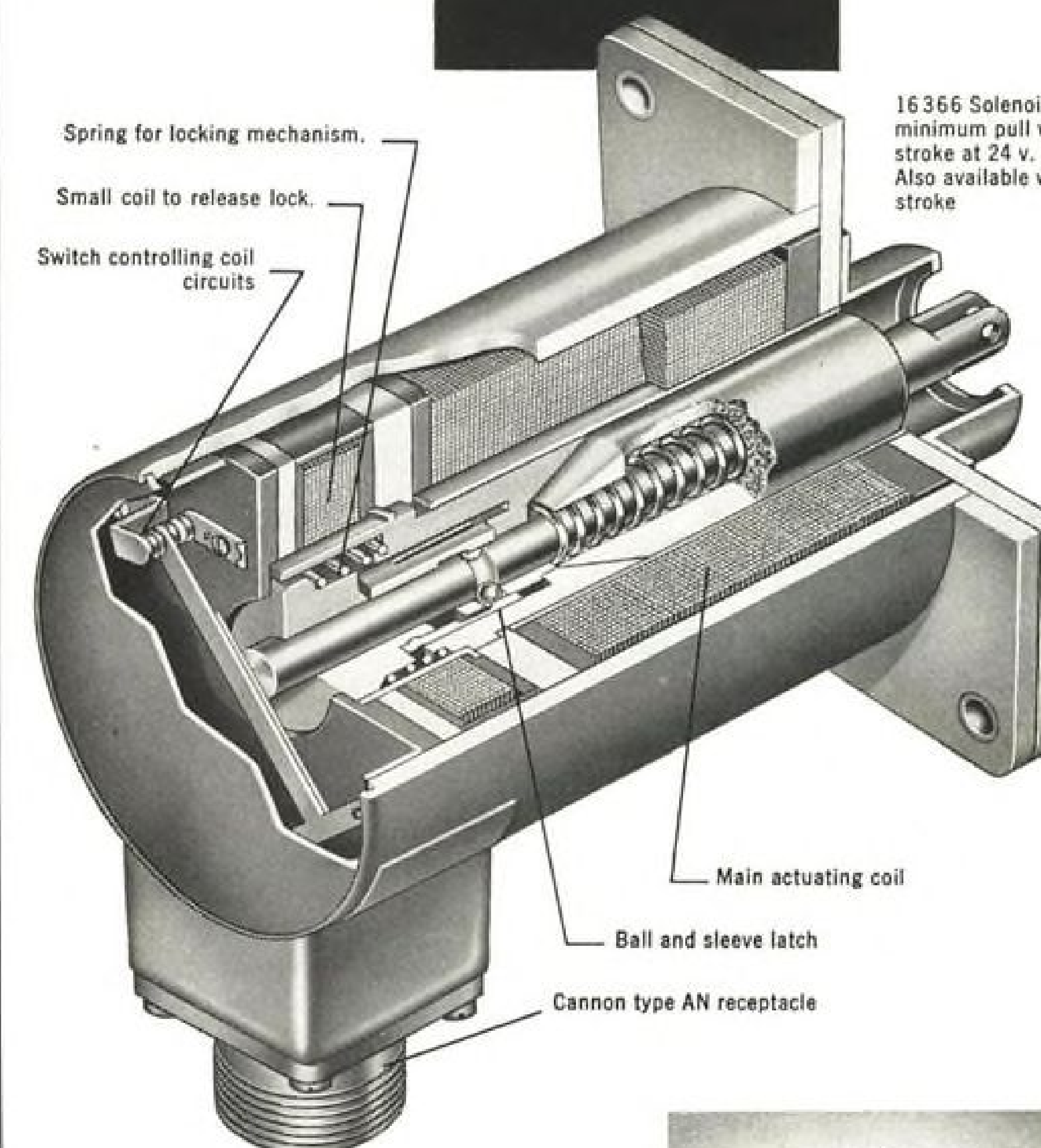


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16366 Solenoid—18.7 lb minimum pull with 1/2" stroke at 24 v. at 170°F. Also available with 1-1/6" stroke

Here's a special purpose Cannon D.C. Solenoid, #16366 for aircraft. Design and safety conditions require that the armature lock in the actuated position for an indefinite time, without relying on a continuous flow of current.

The ingenious ball-and-sleeve latch locks the armature as the main coil circuit is broken through the built-in switch. When current is applied to the smaller coil, motion of the sleeve releases the main armature. Study of the drawing shows how a smooth-acting, positive lock is accomplished.

This is one of more than 60 different Cannon D.C. Solenoids built around 18 basic coils for either continuous or intermittent service. Write for Solenoid Bulletin free on request.



#1154 an intermittent service solenoid, 12v, D.C.—10.5 amps.—stroke 9/32", weight 13 oz.



#4440 a continuous service solenoid, 24v, D.C.—3.6 amp. (starting) .42 amp. (holding)—stroke 3/8" weight 16 oz.



#11790 a continuous service solenoid, 24v, D.C.—3.6 amp. (starting) .42 amp. (holding)—stroke 3/8" weight 15.5 oz.

## CANNON ELECTRIC

Since 1915

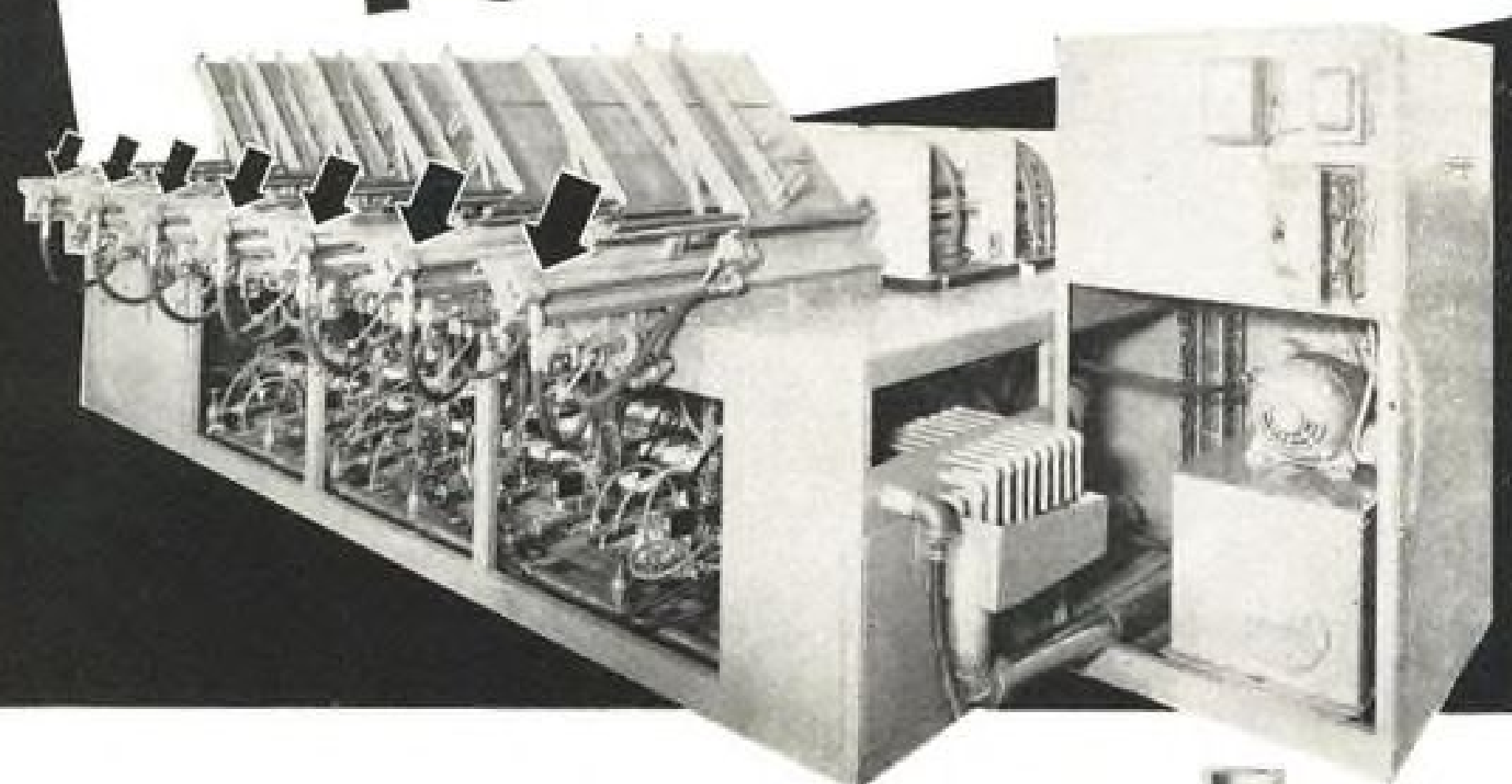
CANNON ELECTRIC COMPANY  
LOS ANGELES 13, CALIFORNIA

Factories in Los Angeles, Toronto, New Haven, Great Lakes Division, Benton Harbor, Mich. Representatives in principal cities. Address inquiries to Cannon Electric Co., Dept. L-110, P.O. Box 75, Lincoln Heights Sta., Los Angeles 31, Calif.



Job File No. 3259

# Feeds Automatically WITH T-J CYLINDERS



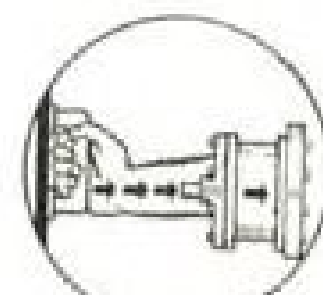
T-J Hydraulic Cylinders furnish efficient, automatic "push power" for feeding devices in this new Ajax-Northrup induction forge heating equipment.

This unit—manufactured by Ajax Electrothermic Corp., Trenton, N. J.—automatically heats steel forging stock in sizes ranging from 1 to 4 inches (rounds or squares) at 2250°F. at rate of 7500 to 8500 lbs. per hour. Has space for 8 heating stations... each with hydraulically operated billet feeding devices employing T-J Cylinders. These cylinders also eject heated bars automatically. Induction heating with this equipment results in uniformity of successive billets fed to the forge—thus controlling quality of finished forgings and reducing rejects.

Do you have a tough job in power movement—pushing, pulling or lifting? Let T-J help you *simplify machines, save labor and cut costs* by using T-J Air or Hydraulic Cylinders! Many standard sizes and styles... cushioned or non-cushioned... 100 lb. or 50,000 lb. Precision-built, long life. Write for more information. The Tomkins-Johnson Co., Jackson, Mich.



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IN ANY DIRECTION



100 LBS. or  
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● We, too, believe that PIASECKI is the most rapidly expanding company in the industry... that our pension plan is the most liberal in the industry. We would like to tell you more about BOTH, in detail, if you are seeking a connection with a company whose product has an acknowledged need in the defense of our country, with an equal appeal for the untapped commercial market when the defense job is completed.

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**PIASECKI**

Helicopter Corp.

Morton, Pa., Near Philadelphia

He's banking on the ground crew's know-how



WHEN A BOMBER PILOT circles in to land, he doesn't take time out to wonder if his ship will answer the controls. He knows the safety of his landing was assured before he left the ground—by the careful men of the ground crew and the dependable test equipment they used to check his plane.

The maintenance and testing machines made by Greer are incredibly accurate; they are designed and built to take the human element out of testing. It is precision equipment, famous for simple, rapid, depend-

able operation under all conditions.

Greer equipment is for all types of military aircraft, and for commercial and private planes as well. We are prepared to equip a complete maintenance shop with standard Greer machines. In addition, we offer a service for those who require special equipment for special jobs.

Write on your company letterhead or call. Our staff of *creative engineers* will meet with you at your convenience. There is no charge for this service, nor obligation.



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Greer's Standard Hydraulic Accessories Test Machine accurately checks the performance of hydraulic valves, pressure regulators, actuating cylinders, accumulators, hose lines, hand pumps, etc., operating at pressures up to 3400 psi and flow capacities to 20 gpm. A foot-pump circuit is provided for static and leakage tests. Write for complete data sheet.



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## EQUIPMENT

# MCA Undertakes Three-Phase Expansion

- \$5 million program includes converting DC-3 fleet to 24 seats and purchase of six Convair 340s.
- Airline also licks heat problem in its new hangar, just as it did in its operating transports.

By George L. Christian

Minneapolis—Mid-Continent Airlines is undertaking a \$5,125,000, three-phase expansion program. This is quite a bite for an airline its size, and indicative of the solid confidence it has in the future.

The principal elements of this expansion:

• **Purchase of six Convair 340s.** These planes will supplement, rather than replace, MCA's fleet of DC-3s. C. H. Calhoun, vice president, engineering and maintenance, told AVIATION WEEK. Anticipated traffic increases will keep them full, he predicted.

Equipment aboard the 340s includes the Bendix Omni-Mag, three VOR receivers (two for navigation and one for communication) and wiring for the Sperry engine analyzer.

The VOR communications unit will have all necessary navigational facilities in case of failure of the regular equipment.

Cost of the purchase will be approximately \$4 million, including spare engines, propellers, radio and related equipment.

• **Conversion of 23 DC-3s** from 21 to 24 seats. The three additional seats will be added in the forward part of the plane, extra windows being cut beside the seats. This will leave the same aisle width as in the 21 seat version.

Other DC-3 modernization modifications being performed concurrently are installation of hydraulically operated Air Stair doors, removal of right hand battery, main hydraulic system revision and oxygen system revision.

Four more DC-3s will be bought. Cost of the entire program will exceed \$625,000.

• **Erection of a new hangar,** service shops and office building at old-Chamberlain Field, Minneapolis. The steel-and-aluminum hangar will be 180 ft. wide, 160 ft. deep and will have an overhead clearance of 30 ft.

Novel feature of the hangar, dictated by the bitter winters during which the hangar doors have to be opened wide to roll airplanes in or out, is a heating trench running the full length of the

door. To counter temperatures ranging down to -30F, a recirculating blower picks hot air off the hangar roof and shoots it out of the heat trench. With doors closed, this blast of hot air just about nullifies cold air leakage past the door.

Added feature of the heating system is the instantaneous addition of steam heat through a heat exchanger to create a "hot air wall" when the hangar doors are opened. This thermostatically controlled system also shuts down the extra surge of heat when hangar temperature returns to normal after doors are closed.

It is expected to save many a man-hour of work during the winter because of reduced work disruption caused by the winds whipping through the hangar every time the doors are opened.

Completion of the hangar had to be postponed to about Dec. 1 when all special insulation for the building was lost in the Kansas City flood. Then the July 20 hurricane-like storm that struck the Twin Cities did considerable damage to the partially completed structure.

Cost of the hangars and associated buildings will be approximately \$500,000.

► **Heater Happy**—Flying in the frigid climates that it does, MCA is extraordinarily conscious of the problem of keeping its passengers warm, both on the ground and in the air.

Mid-Continent officials say the airline pioneered conversion of DC-3s from the originally installed steam heat (which was operative only when engines were running) to combustion-type heaters.

MCA has designed a new heating system for its 24-passenger DC-3s. Heart of the system is a 200,000-Btu. per hr. Janitrol combustion heater which will keep the cabin warm on the ground as well as in the air.

Similarly MCA realized, soon after placing its new Convair 240s into service, that the existing heating system was inadequate to the carrier's requirements. More heat was required in both cabin and cockpit during flight. And not having any heat on the ground was a serious problem, said MCA.

► **Auxiliary Heater**—So, taking a glance at its DC-3s, MCA engineers designed an auxiliary combustion heater installation, building the system around a 200,000-Btu Janitrol unit. This went into the carrier's entire fleet of 240s.

The Janitrol is installed in the ceiling of the left-hand forward baggage compartment. Associated equipment laid into the area includes fuel control canister (housing all fuel controls), combustion and ventilating air blowers, ignition box, and necessary duct work for proper heat distribution to cabin, cockpit and defrosters.

Heater operating controls—a CO<sub>2</sub> "on-off" switch and green start and red fire warning lights—are installed on the cockpit control pedestal.

► **How it Works**—Combustion air is drawn in from a small ram air scoop on the top fuselage skin by a blower. A special overboard exhaust duct has also been provided. The special duct is adjacent to the heater.

Ventilating air is drawn from the cabin through an inlet located a few inches above the floor of the heater cabinet.

Heated air is shoved into the cabin at the forward end of the left baggage rack, through a manually controlled damper, by the ventilating blower.

Fuel is taken from the left engine feed system and piped into the heater through two solenoid valves. One is the "on-off" control and the 300-deg. safety switch.

The other operates in conjunction with the 150-deg. cycling control and the 250-deg. safety switch.

Inlet air restriction, overheat and fire warning safety controls are also incorporated in the system.

MCA officials say their heaters are extremely popular with passengers and crew. Another advantage is that 100% of the heat from the Convair's normal heating system (augmentor tubes) may be diverted to the thermal anti-icing system if required.

► **Good Gauges**—MCA is happy with the performance of the Minneapolis-Honeywell fuel quantity gauges installed in the Convairs (this is not the usual installation). The Minneapolis-Honeywell units are accurate and exceptionally troublefree, according to company officials.

A home-made cabin supercharger test stand saves the airline considerable time and money.

The mobile unit mounts a 40-hp. electric motor driving a Vickers variable



### A FEW FLAT-TOP FEATURES

**NO REELS**... All hose lies flat—out of sight—on wide, flat metal grating above tank.

**UTMOST SAFETY**... Remote hydraulic drive from tractor engine, to slave pump, to high-speed fuel pump, keeps prime power far away from fuel outlets.

**HINGED LADDER**... Rises from flat position on grating; elevates and rotates as required; locks in place, with hose lifted on guide rails. No more auxiliary ladders to cause injury or damage.

**SINGLE VALVE TO DE-FUEL**... This is just one of many features for new simplicity and surety... for definite savings of time and labor with this extremely efficient tank truck equipment.

## ...ULTRA-MODERN AVIATION FUELING

### Cities Service joins with Eastern Air Lines to inaugurate another great advance

The *Flat-Tops* are on duty now—making notable service records. With these remarkable new tank trucks, Cities Service is fueling Eastern Air Lines planes at LaGuardia, Newark, and Boston's Logan Airport. Never before has there been any approach to the safe, speedy, convenient fueling now made possible by Cities Service *Flat-Tops*.

You'll be interested in major *Flat-Top* features listed here. Each one adds evidence that Cities Service is in the forefront of aviation progress. That's why fields offering Cities Service products are winning preference today, among those eager for topnotch quality and service.



Cities Service Aviation Gasolenes  
Cities Service Aero Oils  
Cities Service Cisco Solvent Engine Cleaner  
Cities Service Aero Greases  
and Aviation Specialty Products

New York • Chicago  
In the South: Arkansas Fuel Oil Co.





### Marines prove new assault tactics —

Late in September a fleet of big ten-place HRS Sikorsky helicopters flew an entire company of battle-ready U. S. Marines to an important objective atop a 3,000-foot mountain peak in Korea. In this single action—first of its kind in the world—helicopters abruptly and dramatically introduced revolutionary tactics in warfare over difficult terrain.

The entire operation, including the landing of 228 fully-equipped Marines, ammunition, almost nine tons of food, and the laying of telephone wire back to command headquarters, took just four hours—two days less than it could have been accomplished afoot. This paved

the way for a far larger airlift less than a month later—the flying of a full battalion of Marines, amounting to about 1,000 combat-ready fighting men, to front line positions on a Korean mountain.

These achievements in actual combat were the pay-off for almost four years of training and research by Marine Corps planners, and of even longer effort by Sikorsky engineers and technicians. And it established the helicopter as a tactical weapon of first rank . . . reason enough why today Sikorsky engineers are hard at work developing even more advanced helicopter designs to meet the increasingly important military and civilian tasks of the future.

# SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT

ONE OF THE FOUR DIVISIONS OF UNITED AIRCRAFT CORPORATION

displacement pump and a Pesco constant displacement hydraulic pump. Machine serves the dual purpose of driving superchargers in the airplane for testing, through external fittings; or powering blowers coming out of MCA's overhaul shop.

Continental Airlines was so impressed with the test stand that it has made plans to build one of its own along similar lines in the near future.

► **Analyzers**—Mid-Continent is sold on engine analyzers. Currently, engineering is being prepared to wire the Convals for the Sperry instrument. Plans, which include the 340s now on order, call for complete ignition analysis plus one detonation pick-up. Wiring installation for the 240s is scheduled for completion by February, 1952.

MCA now has one analyzer in its ignition shop where the mechanics are being thoroughly checked out in its use. The instrument will later be moved to the test cell the airline operates in conjunction with its maintenance hangars.

► **Test Cells**—Engine test cells are usually considered luxuries which only the large airlines can afford. But MCA has one which is a going concern and is economically sound, say its maintenance people.

Built at a cost of \$30,000 (before today's higher prices), it can handle 40 engines a month if operated 24 hours a day.

The test building, built onto a hangar, consists of a test cell, control room and utility space.

To solve the noise problem, especially acute because of the proximity of the test cell to other working areas, ten rows of baffles were installed in the intake and exhaust stacks of the cell. This, and the 12-in.-thick reinforced concrete walls of the cell itself, have reduced the noise level to acceptable proportions.

The airline expects large increases in passenger revenues when the 340s are put into service. And it also anticipates increases in overhaul efficiencies when the new hangar is completed.

### Sky Compass Lifts Trick From the Bees

Greater sensitivity for a sky compass recently developed for the Air Force has been achieved through use of a "striped polarizer," according to Polaroid, Inc.

The component is part of a compass developed by the Sperti Faraday Corp. for planes navigating in Arctic regions. It can be used in lieu of magnetic compasses, or sextants during the long winter nights there, since it uses polarized sky to give direction.

The striped polarizer, or cross-polar-

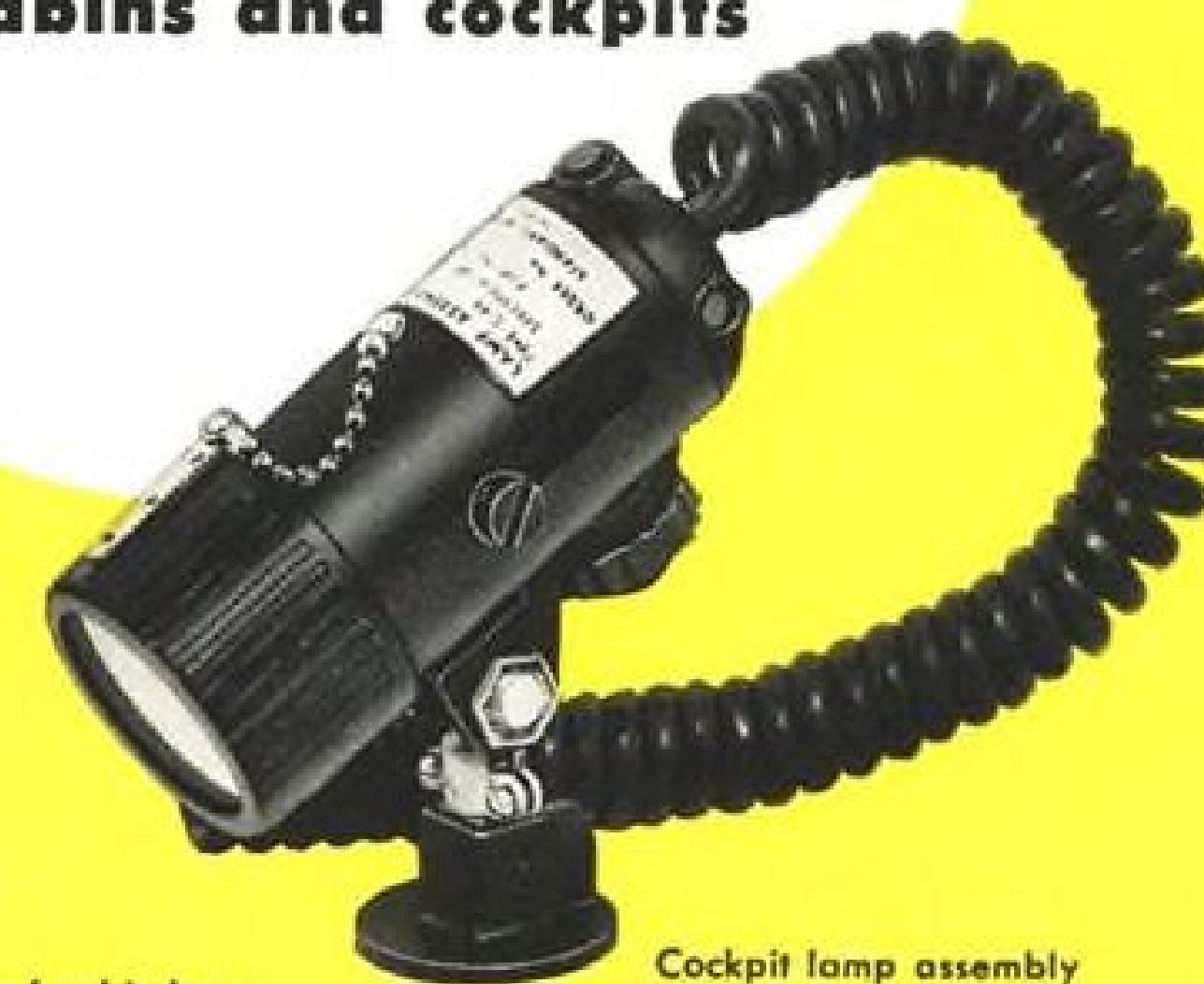
**Standard-Thomson**

*dependable lighting*

**for cabins and cockpits**



Vaporproof cabin lamp



Cockpit lamp assembly

**CABIN LAMPS:** These all-metal cabin dome lights are proof against vapor or moisture at any altitude. Regardless of atmospheric conditions, they assure clear, brilliant light. Weight: 1 lb., 10 oz. Diameter: 5 7/8"; length: 6 7/8". For complete information, write:

**COCKPIT LAMPS:** A sturdy source of dependable auxiliary light for all types of aircraft. Made to USAF specifications with chainlock filter and retractable cord. 13 or 28 volt bulb and rheostat. Weight: 11 oz.; length: 5 1/4"; diameter: 1 3/4". Also available with straight cord.

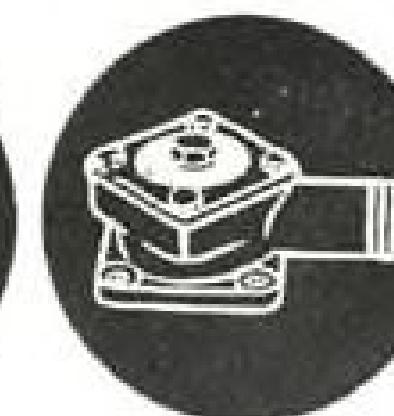
**STANDARD-THOMSON CORPORATION • DAYTON 2, OHIO**

**Standard-Thomson**

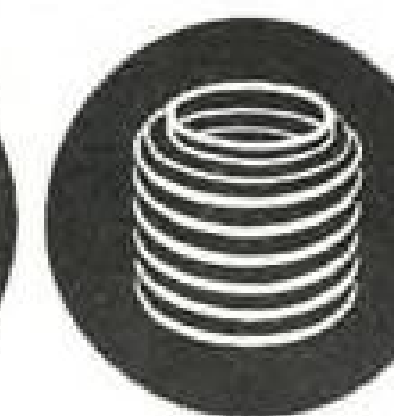
Makers of USAF-approved bellows • valves • lights



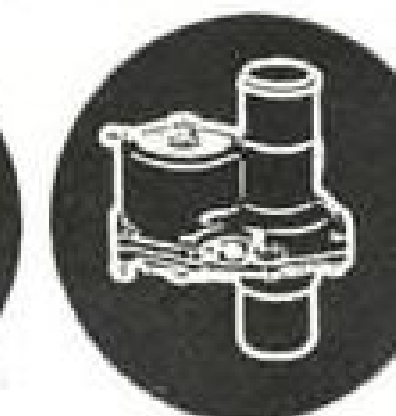
Shut-off  
Valves



Barometric  
Pressure Valves



Tech-Forge  
Flexible Couplings

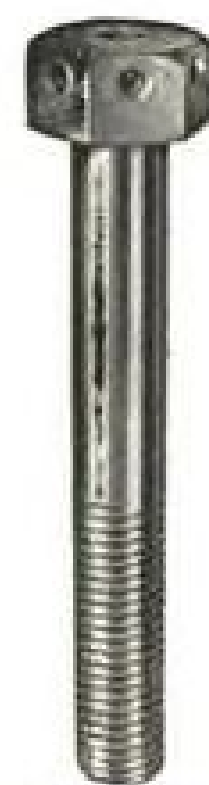


Crankcase  
Pressurizing Valve



## HIGH-STRENGTH, CLOSE-TOLERANCE FASTENERS for the AVIATION INDUSTRY

**UNBRAKO** SOCKET SCREW  
PRODUCTS



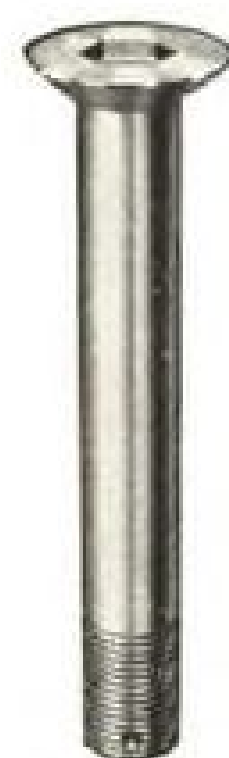
STANDARD "SIX-DIGIT" ENGINE BOLTS

all listed diameters—hex and internal wrenching types; AN specifications. Information on request. Address Dept. 678.



NAS INTERNAL WRENCHING AIRCRAFT BOLTS

latest NAS specs; threads fully formed by rolling after heat treatment; full range of sizes. Dept. 678.



NAS SHEAR BOLTS

close tolerance, high strength, flush-head type. Dept. 678.



NAS INTERNAL WRENCHING LOCK-NUTS

superior safety nuts. Sizes from 1/4" to 1 1/2". Dept. 678.

Several decades' experience in the manufacture of fasteners for the most critical applications is your assurance of complete reliability in every SPS Aircraft Product.

The finest equipment, workmanship and "know-how" are lavished on these vital aircraft parts. This has resulted in widespread acceptance and approval by government and civilian agencies alike.

**FLEXLOC**

SELF-LOCKING NUTS



"FLEXLOC" THIN NUTS

less than regular height, yet conforms to accepted standards, since every thread, including locking threads, carries its share of load. Has all "regular" FLEXLOC features; saves height and weight; sizes .#10 to 1". Dept. 51.



"FLEXLOC" EXTERNAL WRENCHING NUTS

incorporate famous FLEXLOC self-locking principle and one-piece, all metal construction. Latest NAS specs; sizes from 1/4" to 1 1/2" NF Thread Series; approved for temperatures to 550° F. Send for samples. Dept. 51.



"FLEXLOC" SELF LOCKING NUTS (REGULAR)

serve as both stop and lock-nuts. One-piece construction—resilient segments lock positively with uniform torque. Aircraft approval of sizes from #4 to 1" inclusive in steel, brass, aluminum. Since regular steel FLEXLOCs are approved for temperatures to 550° F., you need stock only one type locknut for this temperature range. Dept. 51.

For further information on products shown in this advertisement please address departments listed. Inquiries on other aircraft parts should be addressed to Department 678.

**-SPS** STANDARD PRESSED STEEL CO.  
JENKINTOWN 3, PENNSYLVANIA

ized striped plate, provides a sensitive means of detecting the direction of the sky's polarization. Polacoat found that by making a polarized plate with 1/4-in.-wide stripes with alternate direction of polarization, a sharp contrast is possible and accurate polarization direction can be obtained—even in small amounts.

The polarized compass works on the principle that the polarization of the sky is always maximum at right angles to the direction of the sun. By knowing the time and angle of maximum polarization, compass direction calculations can be made. The firm points out this trick of navigating was garnered from the bees who also use polarized sky to tell direction. Polacoat's address is 9750 Conklin Rd., Blue Ash, Ohio.

### MATS Planes Get Sperry Analyzers

Latest round reported in the close Sperry-Bendix engine analyzer competition goes to the Sperry Gyroscope Co. Lockheed Aircraft Service, Inc., New York International Airport, is installing Sperry engine analyzers in eight Lockheed C-121 Conquies operated by the Military Air Transport Service. The planes are getting the full treatment, with optional vibration pickup equipment included in the package. The analyzers are the type designed for permanent installation.

On the Bendix side of the picture, LAS previously installed portable analyzers made by the Scintilla Magneto division in a B-29 and C-54 for the Air Force.

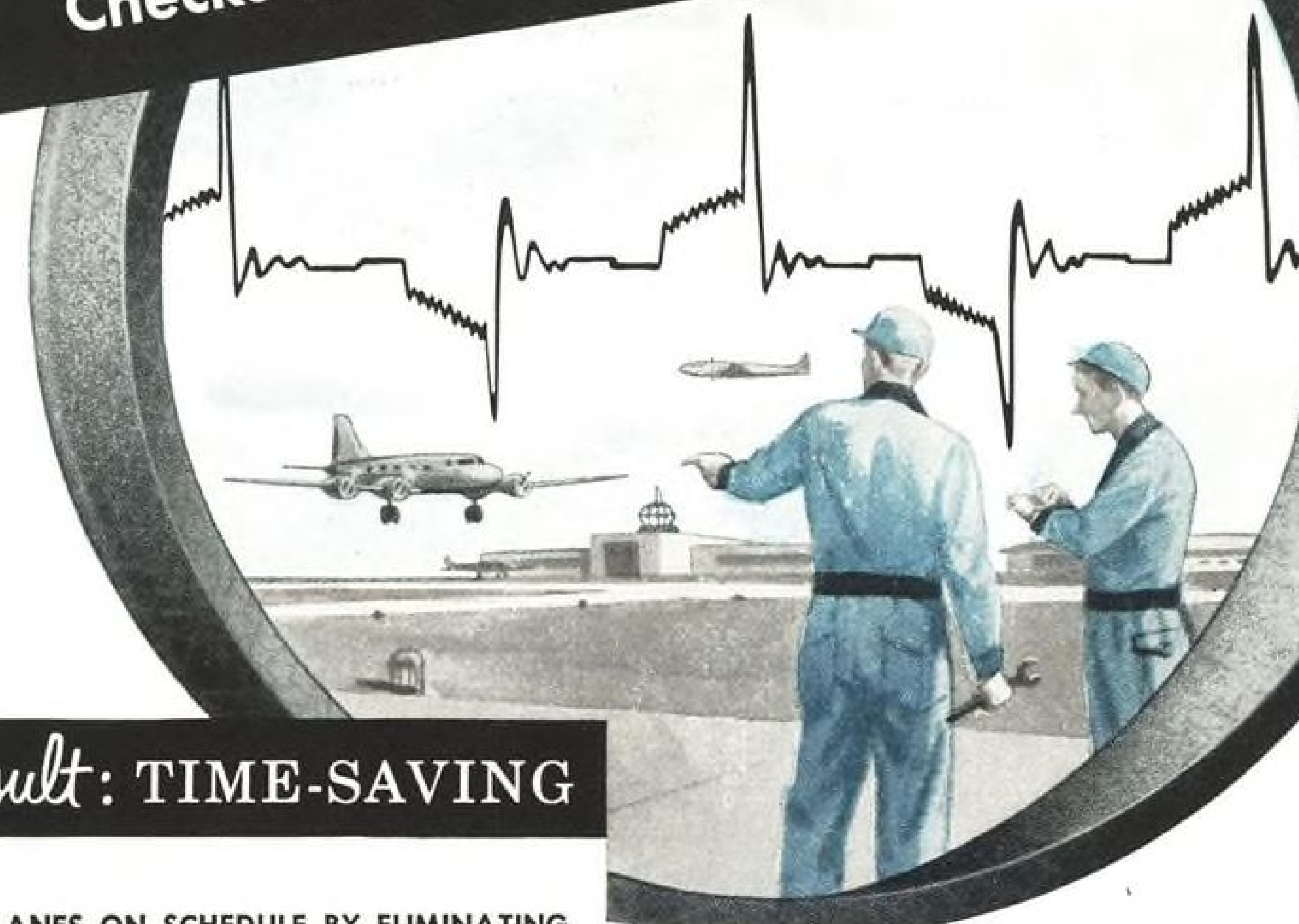
### New Radio Set-Up For Venezuela Ports

The Ministry of Communications of the Republic of Venezuela has signed a \$2,950,000 contract to supply a coordinated system of air navigation, plane location, air-to-ground and point-to-point communications facilities for 47 Venezuelan airports, with the International Standard Electric Corp., New York, the company announces.

The associate of the International Telephone and Telegraph Corp. will furnish radio direction finders and low frequency homing beacons for navigation purposes. Also to be supplied is VHF air-to-ground equipment. This, operating in conjunction with HF point-to-point communications apparatus will enable Air Traffic Control to keep track of flights from takeoff to landing.

A radio-teletype system will supply exchange of flight information, reservations, and routine orders between the

The BENDIX IGNITION ANALYZER  
Checks More Plugs Faster!



Result: TIME-SAVING

KEEPS PLANES ON SCHEDULE BY ELIMINATING  
HIT AND MISS TROUBLE SHOOTING

Even before the wheels touch the runway, the ignition fault has been pin-pointed and a maintenance crew stands by to make a fast repair. Minutes later the ship departs on schedule. The fast, certain repair job was possible because the trouble shooting was done in flight, by the operator of a Bendix Ignition Analyzer. While making a routine check of several plugs the scope reading showed a trouble pattern. The operator quickly analyzed the location and seriousness of the trouble and the word was radioed ahead. Meanwhile, the pilot reduced power of the malfunctioning engine to cool it in flight and ready it for maintenance. Just such a case as this is the reason why one airline has reduced turn-around time by 18% with the Bendix Ignition Analyzer. It can do the same for you and much more besides.

Write us for free literature concerning  
the Bendix Ignition Analyzer.

**Bendix**

SCINTILLA MAGNETO DIVISION OF  
SIDNEY, NEW YORK



Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

FACTORY BRANCH OFFICES: 117 E. Providencia Avenue, Burbank, California • Stephenson Building, 6560 Cass Avenue, Detroit 2, Michigan  
Brewer Building, 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 582 Market Street, San Francisco 4, California



Costs Less—Does More

The Bendix Ignition Analyzer is available for either airborne or portable-airborne installations. It can be used with either high or low tension magneto or battery ignition. It is the ignition analyzer that can predict spark plug failure before it occurs . . . make an efficient check of more than one spark plug at a time and do so on a large, easy to read screen . . . yet it costs less than comparable analyzers.



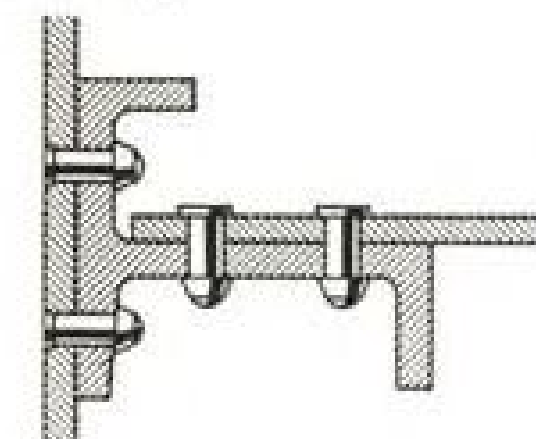
having  
fastener  
problems?



hi-shear

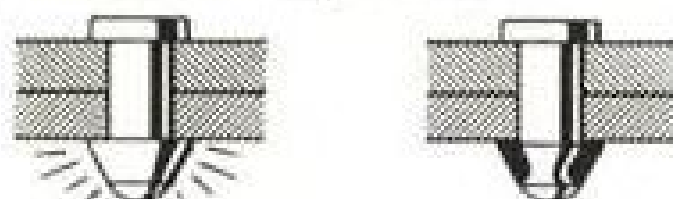
has many solutions  
HERE ARE  
THREE!

accessibility



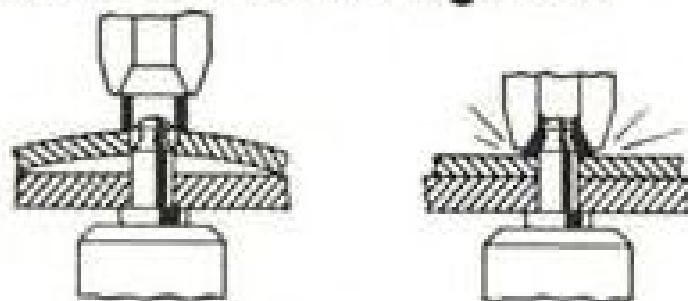
HI-SHEAR rivets simplify design and riveting problems. They are compact, require less tool clearance and have the smallest "headed ends" of any high strength fastener.

fast visual inspection



HI-SHEAR rivets are visually inspected, rapidly and accurately. When the outside of the collar is smooth and neatly trimmed the inspector KNOWS the collar fills the grooved pin end. Only HI-SHEAR trims the collar as it drives—the positive check for tool wear, correct pin length and complete driving.

draws the work together



The HI-SHEAR collar (opposing the pin head and acting as own draw set) automatically draws the work together, instantly and firmly. "Flashing" which occurs with conventional aluminum riveting is eliminated, thus reducing work spoilage.

U.S. and foreign patents — trademark registered

THE **hi-shear** RIVET TOOL CO.  
8924 BELLANCA AVENUE  
LOS ANGELES, CALIF.

main control center at the Maiquetia Airport (Caracas) and the other 46 airports involved in the program.

The overall system will also provide air-to-ground communications for international flights approaching or flying over Venezuela, according to the manufacturer.

## Champion Making Jet Igniter Plugs

Champion Spark Plug Co. revealed that it is in quantity production of a variety of jet igniter plugs for the Air Force and Navy.

Advantages claimed for the plugs are ability to provide instant ground starts for interceptor aircraft, an important factor in Korea, where the plugs are undergoing their first baptism of fire. The plugs are also capable of re-starting jet engines at extreme altitudes, a significant asset for such planes as the B-36 whose jets are operated only intermittently.

Because the igniter plugs operate in extremely hot temperatures, they are manufactured with stainless steel shells and special heat and corrosion-resistant

electrode alloys. Special inlets in the plugs admit cooling air from the compressor.

## Vickers Announces New Drive Pad

A hydraulic drive pad that provides constant speed power and permits heavy accessories (now directly driven at varying speeds) to be removed from engines and placed in any convenient location, is being produced by Vickers Inc.

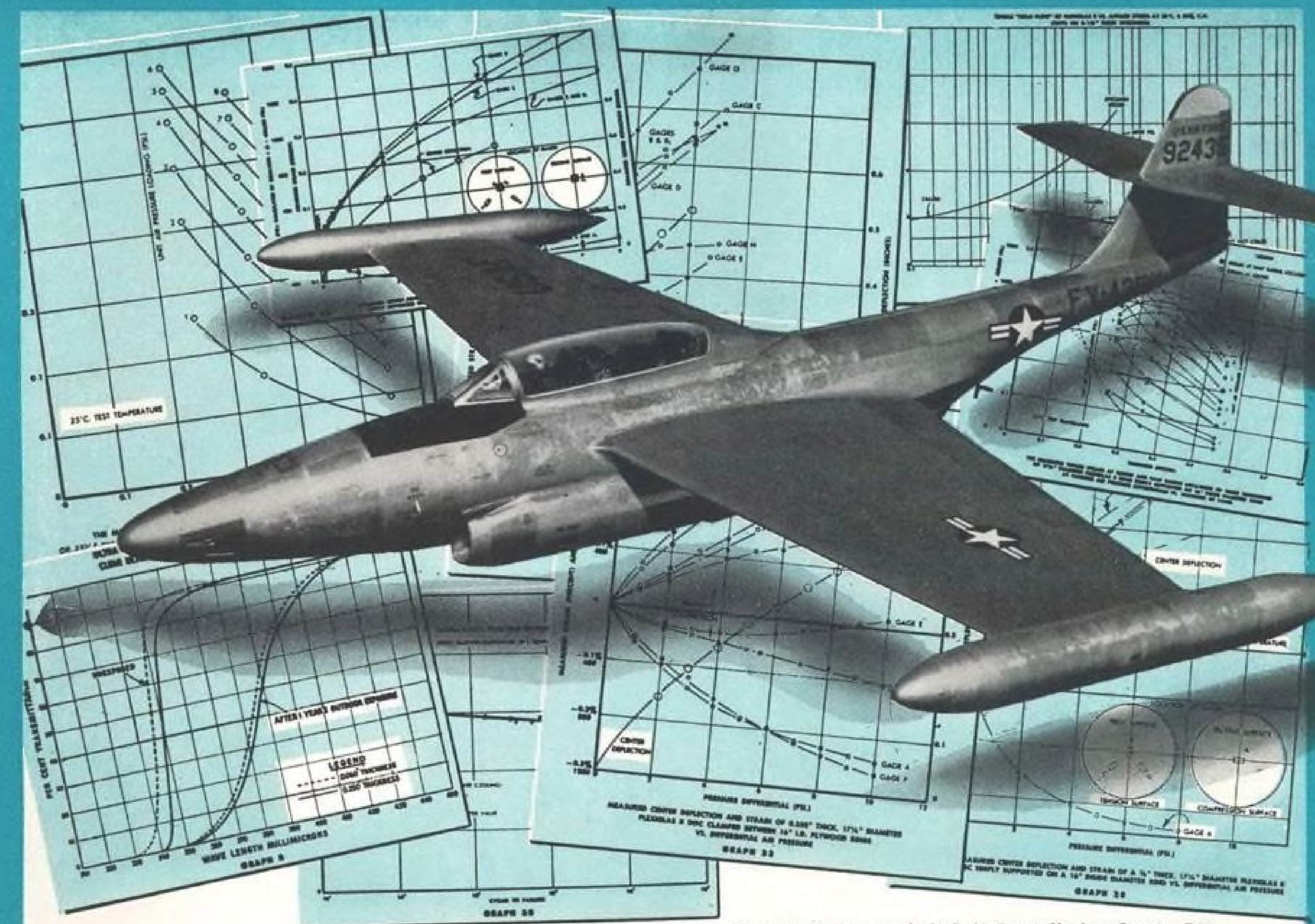
The drive was developed for the Navy and is intended primarily for operating electrical power alternators in anti-submarine lighter-than-air craft. Constant speed provided by the hydraulic drive enables the alternators to produce a more accurate output for operation of sensitive radar equipment. The drive is powered by a Vickers PV-3918 variable displacement pump, the largest hydraulic pump of its type for aircraft in existence. The system incorporates drive pads to handle a number of units. Because of military commitments on the unit, Vickers will not be able to supply it to commercial users for the present time.



### NORTHWEST'S CYLINDER COOKER

St. Paul, Minn.—This is Northwest Airlines' rotary hearth oven used to heat cylinders in the airline's engine overhaul shop. Purpose is to facilitate removal of valve seats and guides. It is an electrically heated, circulating type oven. The rotary hearth consists of a circular steel plate covered with a layer of hard asbestos and containing cut-outs to receive seven R-2000 cylinders. A hand crank and pinion rotates the hearth 1/7th of a revolution for every complete turn of the crank to position the cylinders

directly in front of the door. Result is that only one door is required since loading and unloading may be done through the same access. The rotary feature has the advantage of permitting removal of any of the seven cylinders being heated without disturbing the others. A foot pedal control on the pneumatic-cable operated door leaves operator's hands free to handle the cylinders. NWA says the oven, manufactured by Despatch Oven Co., Minneapolis, has given company efficient service since 1946.



PLEXIGLAS II canopy on the U. S. Air Force's Northrop Scorpion F-89.

## ... A BETTER MATERIAL FOR AIRCRAFT ENCLOSURES

# PLEXIGLAS II

For transparent enclosures on aircraft, there is a preferred material—PLEXIGLAS—aviation's standard transparent plastic for the past ten years. An improved grade of this acrylic plastic, PLEXIGLAS II, is now being used on many of today's aircraft. Developed in Rohm & Haas laboratories, and backed by intensive research and physical testing, PLEXIGLAS II has improved resistance to heat, weather, and crazing.

PLEXIGLAS II meets Army-Navy specifications (MIL-P-5425) for material used in transparent enclosures on current pressurized aircraft. For

the planes of the future, Rohm & Haas laboratories are working to raise the quality of transparent plastics to even higher levels.

In order to help you make the best use of PLEXIGLAS II, we have prepared a Handbook for Aircraft Engineers. Just off the press, this 66-page manual contains detailed technical data on the use of PLEXIGLAS in the design and installation of aircraft enclosures. Write to us for your copy.



CHEMICALS FOR INDUSTRY

**ROHM & HAAS  
COMPANY**

WASHINGTON SQUARE, PHILADELPHIA 5, PA.  
Representatives in principal foreign countries

PLEXIGLAS is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.  
Canadian Distributors: Crystal Glass & Plastics, Ltd.,  
130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada



# Instantaneous POWER



**WITH  
Cornelius  
PNEUMATIC SYSTEMS**

Aviation engineers look to Cornelius for Aircraft Pneumatic Systems. A valued recognition which has developed from many years of specialized work in this field.

To insure a satisfactory, trouble-free system specify Cornelius Pneumatic Equipment: Air-Compressors, Air Storage Bottles, Pressure Regulators, Pressure Switches, Pressure Relief Valves, Brake Valves, Check Valves.

Let us help you with your pneumatic system developments. Contact or write us for specific information.

**THE CORNELIUS COMPANY**  
MINNEAPOLIS 1, MINNESOTA  
Pneumatics do it **FASTER** with **LESS** weight



*Pioneers in  
Pneumatic Systems  
for Aircraft*

## OFF THE LINE

St. Paul, Minn.—Northwest Airlines is shifting the A-3 Sperry automatic pilot used on its DC-4s to the right-hand side of the instrument panel. Purpose is to leave room in front of the pilot for future additional navigational instruments, such as the Course Line Computer, omnirange and DME.

Approximately one-half of NWA's fleet of 23 DC-4s have been converted to date.

Teletrip Policy Co. will soon install in U. S. and Canada an improved, miniaturized trip insurance validating machine for air, rail and bus passengers. Among its improvements: so small it can fit on the ticket counter; policy forms are freely available in attached dispenser so more than one can fill out at a time; policy stub is automatically detached in the machine; policy is a self-mailer envelope with stamp.

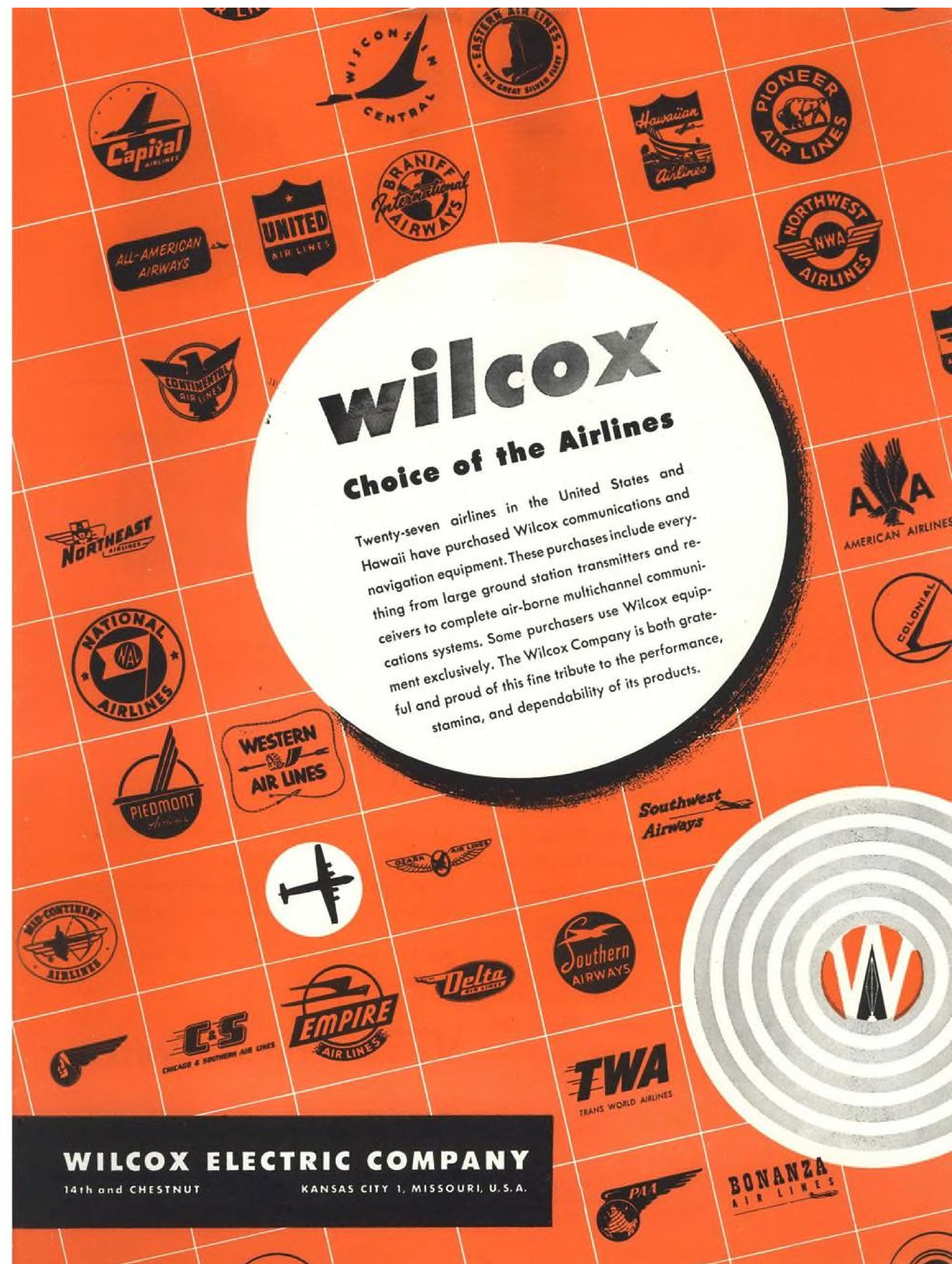
Broad worldwide distribution of Skydrol fire-resistant hydraulic fluid by Esso Export Corp., was recently announced by its manufacturer, Monsanto Chemical Co. Thus Skydrol will soon be available at major international airports.



**MICROWAVE RELAY**

Workmen install a reflector unit for the first microwave multiplex communication system in Hawaii, for use by Hawaiian Airlines. The reflector "bounces" radio signals and messages from main terminal in Honolulu to a VHF station high in the mountains, where they are transmitted on regular VHF radio to HAL's planes in the air and the carrier's ground stations. The system can handle voice or Morse, transmit signals to turn the VHF equipment on or off, change its frequency, and perform other desired functions.


AVIATION WEEK, December 17, 1951



# wilcox

## Choice of the Airlines

Twenty-seven airlines in the United States and Hawaii have purchased Wilcox communications and navigation equipment. These purchases include everything from large ground station transmitters and receivers to complete air-borne multichannel communications systems. Some purchasers use Wilcox equipment exclusively. The Wilcox Company is both grateful and proud of this fine tribute to the performance, stamina, and dependability of its products.



**WILCOX ELECTRIC COMPANY**  
14th and CHESTNUT KANSAS CITY 1, MISSOURI, U.S.A.





Vickers Model PFA2  
(AN-4148 & AN-6251-1) 1.9 hp/lb



Vickers Model PFA3Y-2  
(AN-4149) 1.5 hp/lb



Vickers Model PFA3Z-2  
(AN-6252-1) 1.7 hp/lb

## These **VICKERS** Piston Type Pumps CONSTANT DISPLACEMENT—3,000 PSI

# have AN approval

The Vickers Constant Displacement Piston Type Hydraulic Pumps shown above have AN approval. They meet the 2 and 3 gallon size requirements of AN-P-11b. The use of these items may help speed up your aircraft production.

Reliability and long service life are important features of these pumps. Volumetric (96%) and over-all (92%) efficiencies are very high. Small size and extremely high horsepower to weight ratio at rated loads and speeds are as noted. As

displacement is fixed, the delivery is constant at any given speed, and varies directly with the speed. The design includes a metered valve plate feature which results in negligible system pressure pulsations.

We shall welcome an opportunity to supply more detailed information.

### VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

1462 OAKMAN BLVD. • DETROIT 32, MICH

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

## NEW AVIATION PRODUCTS



### Oxygen Suitcase

From now on, when you see an executive aircraft pilot lugging a neat leather traveling bag, you won't know for sure whether he's carrying his personal belongings or complete oxygen equipment for himself and passengers.

The only giveaway might be a special zippered flap at one end of the bag which opens to oxygen supply lines. Scott Aviation Corp. is packing oxygen equipment in this manner for executive and corporation aircraft owners who want a convenient, portable kit for flying at high altitudes.

A growing popularity for the pressure pattern flying technique and the discovery that improved radio reception is often found at higher altitudes have been important factors in prompting wider use of oxygen by personal and business pilots—and Scott set to work last year developing the Aviox lightweight unit to fit this new market.

Prototype units were tested on six subjects of ages ranging from 16 to 58 years old in the Cornell Laboratories' altitude test chamber up to simulated altitudes of 30,000 ft., although normally the unit is seen as being used mostly at about 10,000 ft.

The compact kit weighs 29 lb., provides 2.4-hr. oxygen supply for four people. The bag contains a cylinder, gage to indicate supply, regulator and four hose outlets. Scott disposable masks are included, or rubber masks can



You get All Weather Protection  
with **SMITH-MORRIS**



Retractable  
**AIR  
INTAKE  
SCREENS**

A clear inlet is the best protection against obstruction by ice. Only retractable air inlet screens offer the advantage of a clear inlet for top performance plus the essential protection for axial flow compressors when on or near the ground.

And duct closing doors, as shown, can now be supplied for ground parking protection and reduction of drag in flight with an inoperative engine. This exclusive Smith-Morris development offers appreciable overall weight saving when both screens and duct closing doors are required.

## SMITH-MORRIS COMPANY

AIRCRAFT EXHAUST MANIFOLD SYSTEMS  
GAS TURBINE PARTS AND ASSEMBLIES

**FERNDAL 20, MICHIGAN**



## Hartwell Flush Latches



**300** available  
for over  
**COMBINATIONS**  
of door  
and frame  
thicknesses

Hartwell Trigger-action Flush Latches are produced in over 300 stock combinations of bolt and trigger offsets. We can supply a latch for any door of any thickness to be latched in a frame of any thickness to your specifications. No altering of panels and frames is necessary when Hartwell Flush Latches are installed. Offsets of bolt and trigger are stamped on each part for rapid and accurate selection of the correct latch for each installation. All Hartwell Flush Latches and Hinges are the result of over a decade of continuous specialized design and manufacture.



Write for new  
Flush Latch and  
Hinge Catalog.

## HARTWELL AVIATION SUPPLY COMPANY

9035 Venice Boulevard, Los Angeles 34, Calif.  
Branch Office: Wichita, Kansas

Manufacturers of:  
HARTWELL Flush Latches and Hinges  
HARTWELL Cable Terminals

be used as desired. The complete Aviox unit, with a dozen disposable masks, retails for \$296. A cloth zipper case will be available for protecting the luggage case at about \$10-\$12 extra. Delivery of the units is scheduled to start Jan. 2. As one of the conditions for handling the unit, distributors must set up service facilities for supplying oxygen refills.

Scott Aviation Corp., 275 Erie St., Lancaster, N. Y.

## Fabric Tubing

A flexible fabric tubing that can be used for conducting gases, liquids and many solids at low pressure under a variety of service conditions is being produced by Flexible Tubing Corp.

The product, called Spiratube, was developed initially for the Navy. Since it is quite flexible, no elbows or other fittings are needed. Sections are coupled by a special belt clamp.

Construction consists of preformed, continuous spring wire ribbing, overlapped with spirally wound fabric of several alternate types. Outer surface of the tubing is coated with a Geon latex, produced by B. F. Goodrich Co., to provide abrasion and chemical resistance.

Flexible Tubing Corp., Guilford, Conn.

## Lighter Plane Nut

A new self-locking nut about one-third lighter in weight than its predecessors of equal performance now is being produced by Boots Aircraft Nut Corp.

The nut is of one-piece, all-metal construction and is designed to meet AN366 and AN362 specifications. It is called the H65 Floating Anchor Plate-Lok Series and is available in sizes 8-32, 10-32 and 1-28; in steel, aluminum or stainless steel baskets. Nuts are supplied for use at temperatures up to 250 F. and 550 F.

Boots Aircraft Nut Corp., Stamford, Conn.

## Protects Plane Parts

A new transparent plastic tape developed at the request of a leading aircraft manufacturer for production-line use, has been placed on the market by Minnesota Mining and Mfg. Co.

The tape, "Scotch" brand No. 473, is designed to prevent galvanic corrosion between aluminum and magnesium aircraft parts and is especially useful for separating dissimilar metals in structural fabrication of aircraft, says the firm. It also gives good protection when used as overcoating for fuel line code bands.

The tape is thin enough to have

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SERIES #878  
Two #7001 Unit Mounts assembled on common tie plate with bonding jumper — Simplifies mounting and reduces assembly time — Load ranges from 1 to 20 lbs.



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TETERBORO, NEW JERSEY  
*Vibration Control Engineers*

AVIATION WEEK, December 17, 1951

U. S. Navy's A2D Douglas  
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Aeroproducts dual-  
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*dual-rotating propeller converts power of  
the T40 into maximum thrust*

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Years of research went into this amazing engine and propeller combination. Yes, years of research by some of the finest aeronautical engineers in the country—the men at Aeroproducts and Allison in cooperation with the Navy, which provided our Navy with a new and vastly more destructive weapon.

As a result, Aeroproducts is now preparing to deliver on the first production order existing for Turbine propellers.

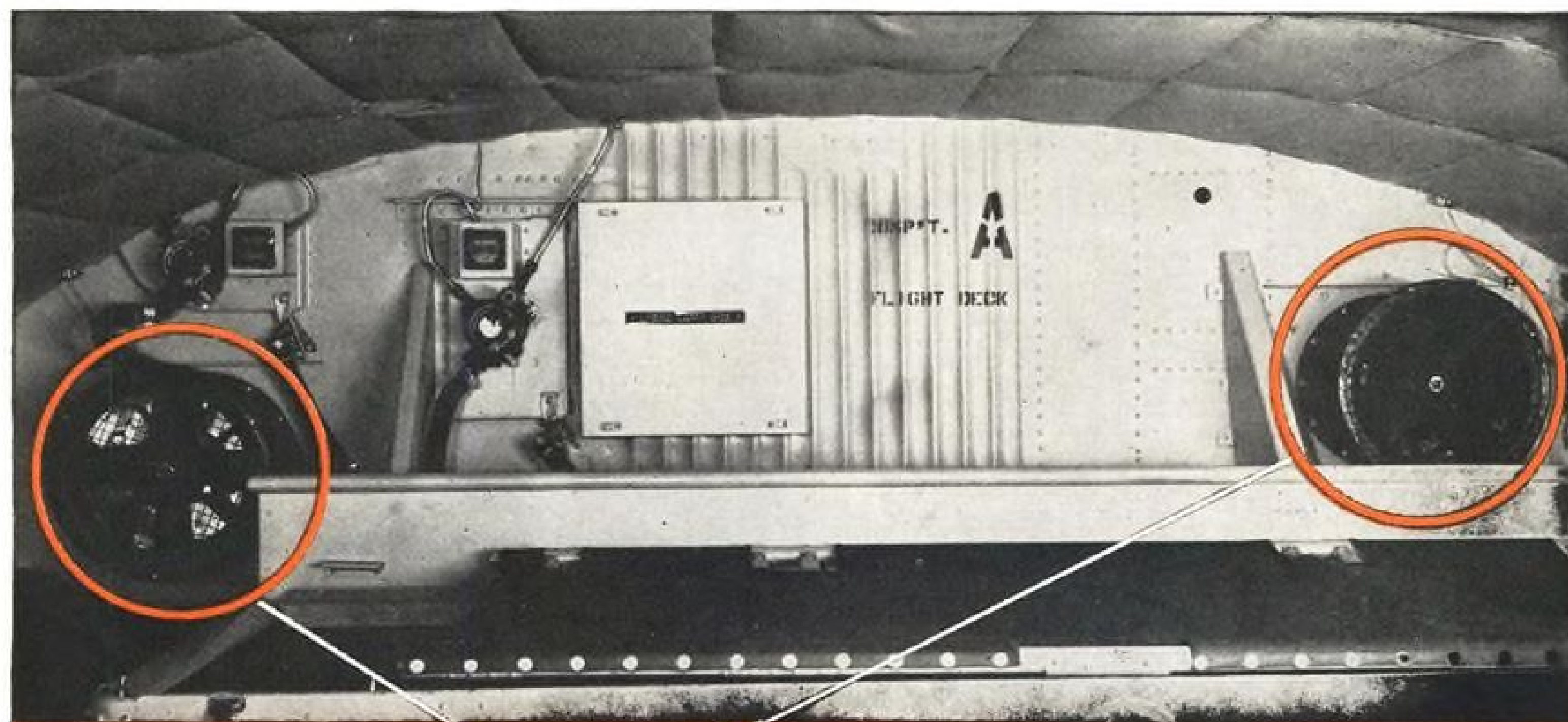
Aeroproducts engineers are available for consultation if you have any propeller requirements in the subsonic, transonic, or supersonic range. Aeroproducts—backed by the full facilities of General Motors—will be glad to serve you.

*Building for today  
Designing for tomorrow*

# Aeroproducts







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Each of these highly-efficient .6 H.P. blowers produces 1280 C.F.M. at 2.0" static pressure, yet weighs only 15.5 pounds and is only 9" in diameter. Distinctive advantages found in all Joy Aircraft Fans are compact design, shock-resistant strength, minimum operating noise, and the most favorable air volume-to-weight and electric-to-air power ratios.

W&D A3441

● Joy designs and builds each fan to the exact requirements for which it is intended. Each fan, therefore, is custom-engineered for highest efficiency. For many purposes stock fans can be supplied from the extensive line already designed. Both single and two-stage units available. Optional features include straight or flared inlets, beaded or flanged connections, radio noise-filters, anodization, and cooled motors where required.



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Write for Bulletin, or

*Consult a Joy Engineer*

100 Years of Engineering Leadership



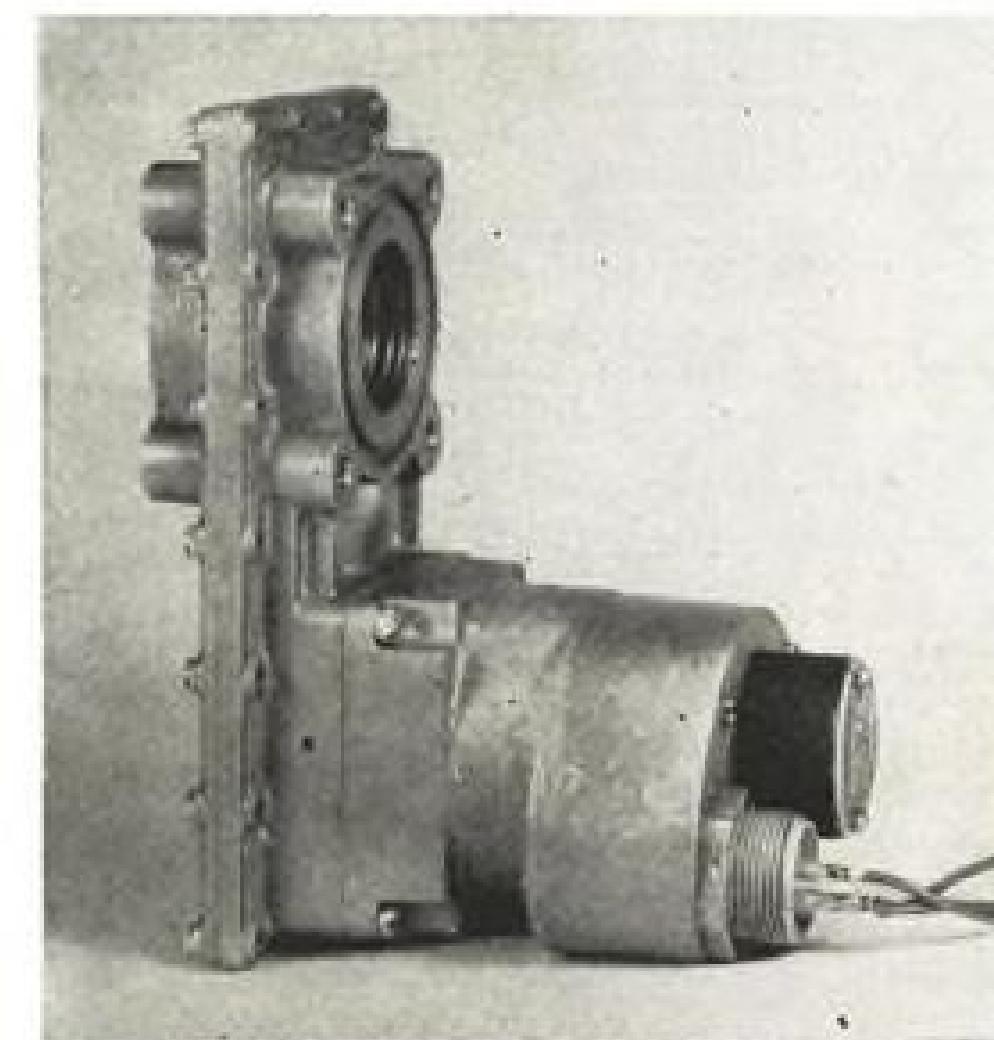
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small effect on strength of riveted sections when it is used as a spacer, claims the firm. It withstands weatherometer and 240-hr. salt spray tests; it conforms to odd shapes, and backing is stable in acids, alkalis, salt solutions, water, alcohols and most hydrocarbons. It grips immediately on contact. Tape is available in 1/4- to 30-in. widths in 36-yard rolls.

Minnesota Mining and Mfg. Co., 900 Fauquier St., St. Paul 6.



### Fuel, Oil Valve

A new fuel and oil shutoff valve, designed to meet latest military aircraft specifications, has been developed by engineers of the Standard-Thomson Corp.

The valve, an electrically operated unit, is slated to be used in planes produced by a number of leading aircraft manufacturers. Orders for it now total more than \$1 million, the company reports.

Among those on the purchasing list are Boeing Airplane Co., Northrop Aircraft Inc., and Lockheed Aircraft Corp.

The Standard-Thomson Corp., 216 S. Main St., Dayton.

### Fuel Purging Valve

New series of fuel purging valves with built-in heating elements and over-heat thermostats to meet low temperature conditions has been announced by Pacific Airmotive Corp.

These new check valves, of the snaffle type, permit air flow in both directions, but outflow from tank is determined by preset restricted setting. Inflow is nearly unrestricted, to satisfy conditions of vacuum relief.

Now in production are two sizes. The 1 1/2-in. valve is for flows from 1 to 6 lb. per min. The 3-in. valve is for 2 to 12 lb. per min.

Data and assistance on purging problems may be had by writing manufacturer.

Pacific Airmotive Corp., Manufacturing division, Burbank, Calif.

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## SHAFAER CONCAVEX

## AIRCRAFT BEARINGS

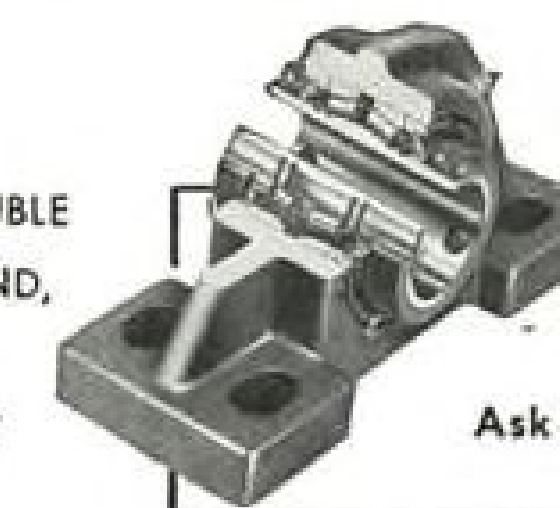
Pressures, shocks and forces on vital control bearings have increased many times over World War II high performance aircraft. Yet, Shafer bearings adequately meet these new demands with no increase in size . . . no increase in weight . . . with reserve strength to spare.

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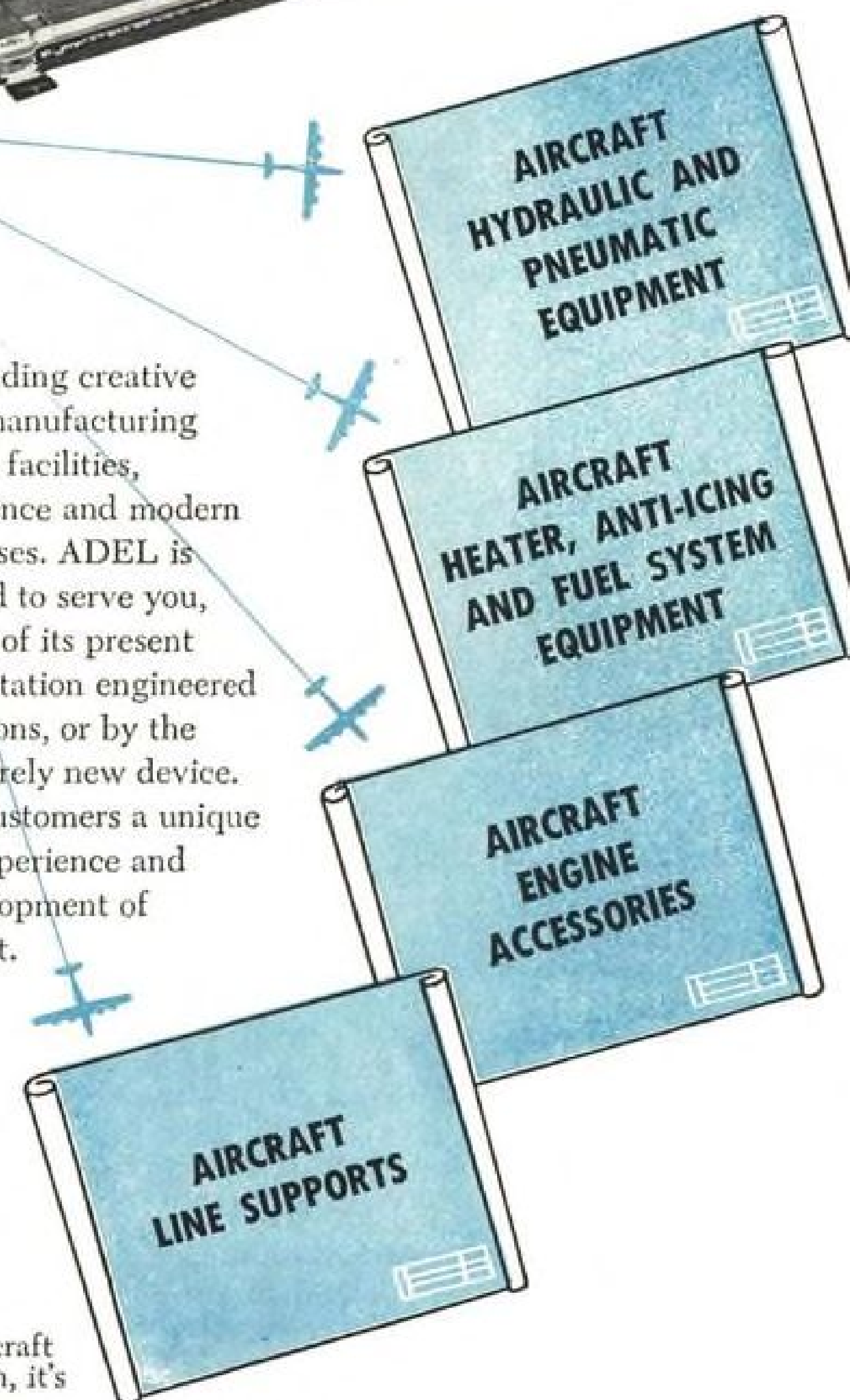
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CANADIAN REP.: RAILWAY & POWER ENGINEERING CORPORATION, LIMITED

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ice costs and spare parts requirements. In short, here is the most economical central heating unit in aviation history.

Ideal for large cargo planes, large multi-engine transports and ground heating in support of these aircraft, this new South Wind Central Heating Package affords savings never possible before in aircraft heating. Get the proof. Check the exclusive performance advantages shown below.

### Only South Wind Combines All These Advantages in Aircraft Central Heating

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2. Accommodates wide variation in ram air pressure.
3. Low pressure drop.
4. Reliable at 65 below zero F.
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To Solve Your Heating Problems write today for the experienced counsel of South Wind's trained field engineers in adapting this or any other model in the complete South Wind line of heaters for commercial, military or civilian aircraft. Model range in capacity from 20,000 to 700,000 BTU/hr. South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.



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## AIR TRANSPORT

### New York Area to Get Copter Service

•NYA initial route plan built around 3 airports.

•Direct service later; but first problem is equipment.

By F. Lee Moore

New York Airways plans to start passenger shuttle service this coming year between New York's three airports, and cargo-mail service from airports to Manhattan and the suburbs. Starting time depends mainly on how soon the company can get helicopters delivered.

New York Airways has won the long-sought prize of CAB approval to bring the nation's greatest metropolis a scheduled helicopter service. CAB, after deliberating almost a year, finally voted in favor of NYA over another avid contender for the certificate—Metropolitan Air Commuting. "It was almost a toss-up," one CAB member said. The Board gave it to NYA mainly because of its simpler financing operation.

As soon as equipment and operating experience permit—perhaps in 1953—New York Airways hopes to switch its introductory route pattern to a regular in-and-out system of scheduled passenger and cargo service between city points and the airports and suburbs.

►Copter Equipment Program—An official of NYA says the first big job is to find the largest operational helicopter type available for early delivery. NYA hopes to convince the military it would gain by freeing 10-passenger S-55s or similar types for commercial utilization experience.

NYA's original application to CAB specified a hypothetical fleet operation of six 3-passenger S-52s and three 10-passenger Bell 48s; the Bell 48 is not in production, so a likely alternative is the Sikorsky S-55—the first commercial version of which awaits final CAA certification and delivery to Los Angeles Airways.

A Sikorsky official told AVIATION WEEK his company could probably deliver a 10-passenger S-55 a year from date of firm order by NYA, assuming the military approves it.

What NYA wants most of all in the longer run is a giant helicopter of 20 to 30-passenger capacity; NYA wants such a type delivered three or four



SIKORSKY S-55, civilian version of USAF H-19 (top) is likely vehicle for copter service, if NYA can get it. Interior of Westland Sikorsky S. 55 (below) shows possible seating plan.

years from now, so it will operate routine flights for a year before the expiration of its five-year temporary certificate.

A 30-passenger copter would be efficient enough for NYA to break even on costs without subsidy, a company official estimates. There are several big copters now in development for the armed services. One or more of these will be in quantity production within three years, observers say. This type copter could carry 20 to 30 passengers depending on distance.

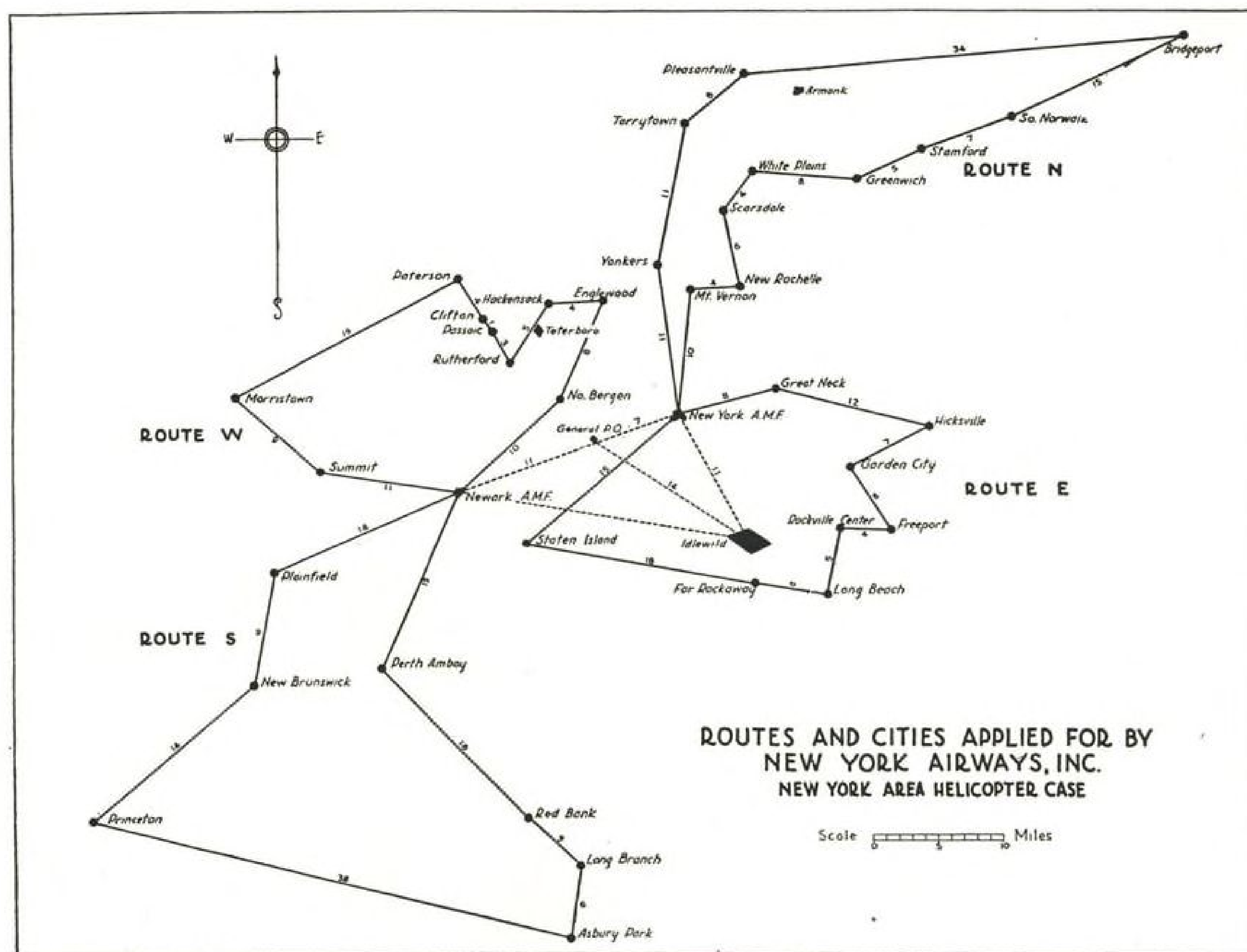
►CAB Decision—Civil Aeronautics Board voted 4-to-1 in favor of starting a New York metropolitan copter service in the interest of national defense

and welfare. New York is the third area authorized for such service by CAB; it follows Los Angeles and Chicago.

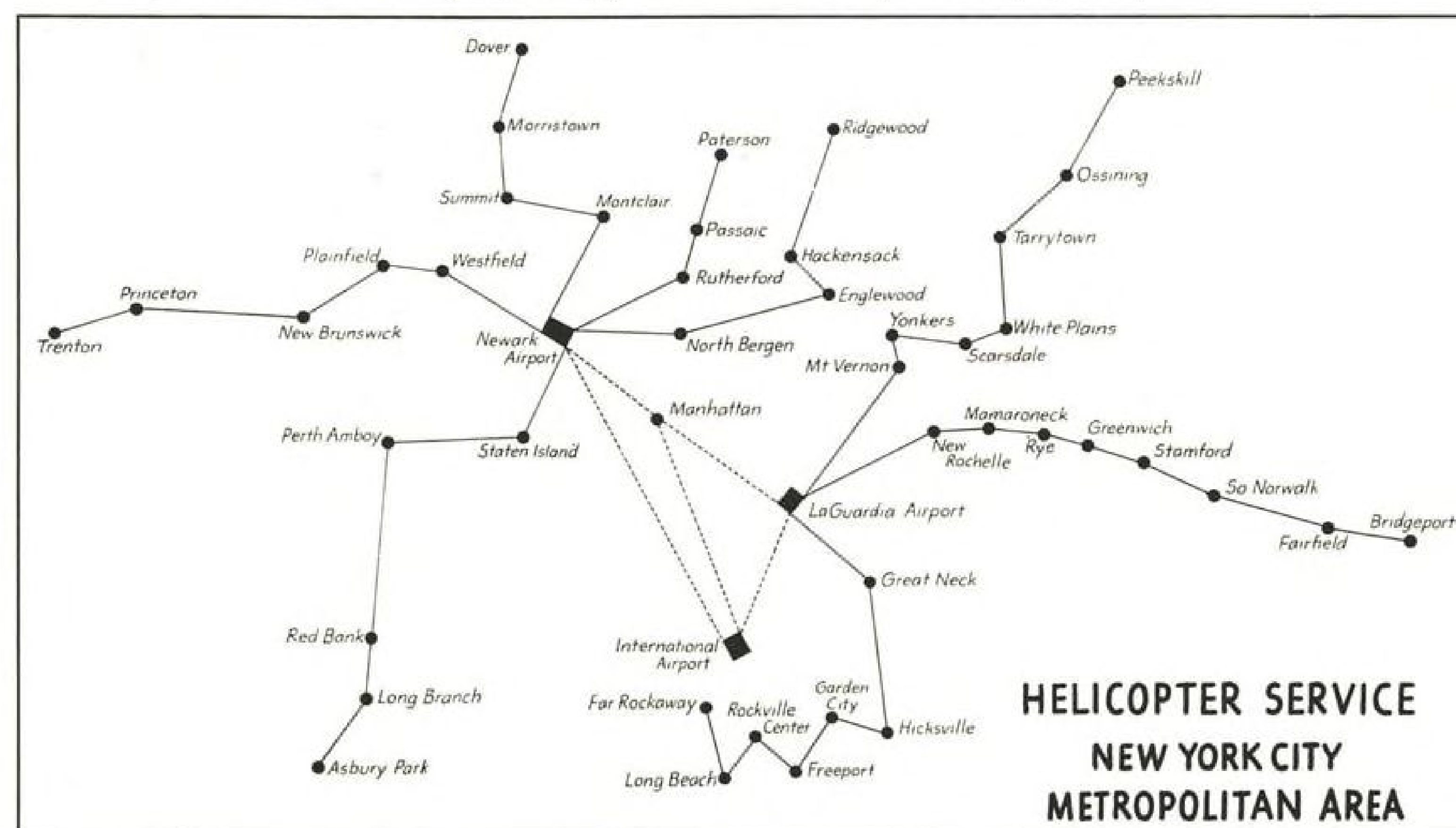
CAB Chairman Donald Nyrop dissented, mainly on grounds the other two services are enough to carry out the scheduled commercial helicopter experiment at this time on government subsidy.

First major consideration cited by the majority is the national defense: "Without exception" all elements of the Defense Department "urged activation of scheduled helicopter service in the New York metropolitan area. . . . In the light of the great number of certificate proceedings in which here-





NEW YORK COPTER SERVICE will start with mail and cargo on cloverleaf pattern to suburbs, airports and downtown Manhattan (map above). Passenger shuttle service between airports (dotted triangle) will also be included. Ultimate route pattern for passengers, mail and cargo will be radial in-and-out system, including Manhattan and inter-airport shuttle (map below).



tofore the military departments have not felt justified in taking a position, the support expressed in this proceeding is of considerable significance."

The Post Office told CAB it doesn't need N. Y. copter service for mail, but won't object if company also carries passengers.

New York Port Authority has strongly urged CAB approval of a copter service.

► **Contributes to Defense**—CAB then pointed to the will of Congress expressed in the Civil Aeronautics Act. CAB reasons: "The Congress has expressly directed the board to consider as being in the public interest the development, encouragement and promotion of air transportation, air commerce, and civil aeronautics. . . .

"The New York metropolitan area affords a particularly valuable theater in which to test thoroughly the practicability of this newest vehicle of air transportation (the copter). . . . Substantial contributions to the national defense, both civil and military as well as benefits to the commerce and postal service should be experienced well before the time larger and more efficient aircraft become available."

CAB majority summarized its conclusion: "While it can be expected that substantial contributions by the federal government will be required in the form of mail payments, we believe that its expenditure is more than justified by the opportunity which will be afforded for development and experimentation in the operation of the helicopter."

CAB then chose between New York Airways and Metropolitan Air Commuting, Inc.

► **Better Financing**—NYA's financing plan was favored because it is simpler and relies on private stock subscriptions instead of public offering. Says the CAB majority: "The experience which the local service feederline carriers have had in obtaining capital to inaugurate their temporary operations has demonstrated the difficulty of raising large sums of money through a public offering of stock. . . ."

The Board largely discounts future importance claimed for MAC's greater operational experience. "While the pioneering of MAC's predecessor companies must be recognized, most of the operating personnel who obtained experience in such efforts are no longer with the applicant company."

► **Operations**—Here's the probable order of events that will bring New York its copter service:

- Certification of NYA by CAB on evidence of completion of necessary financing.
- Equipping and hiring by NYA, followed by test flying.
- CAA operation certification of NYA

for specified routes with specified equipment.

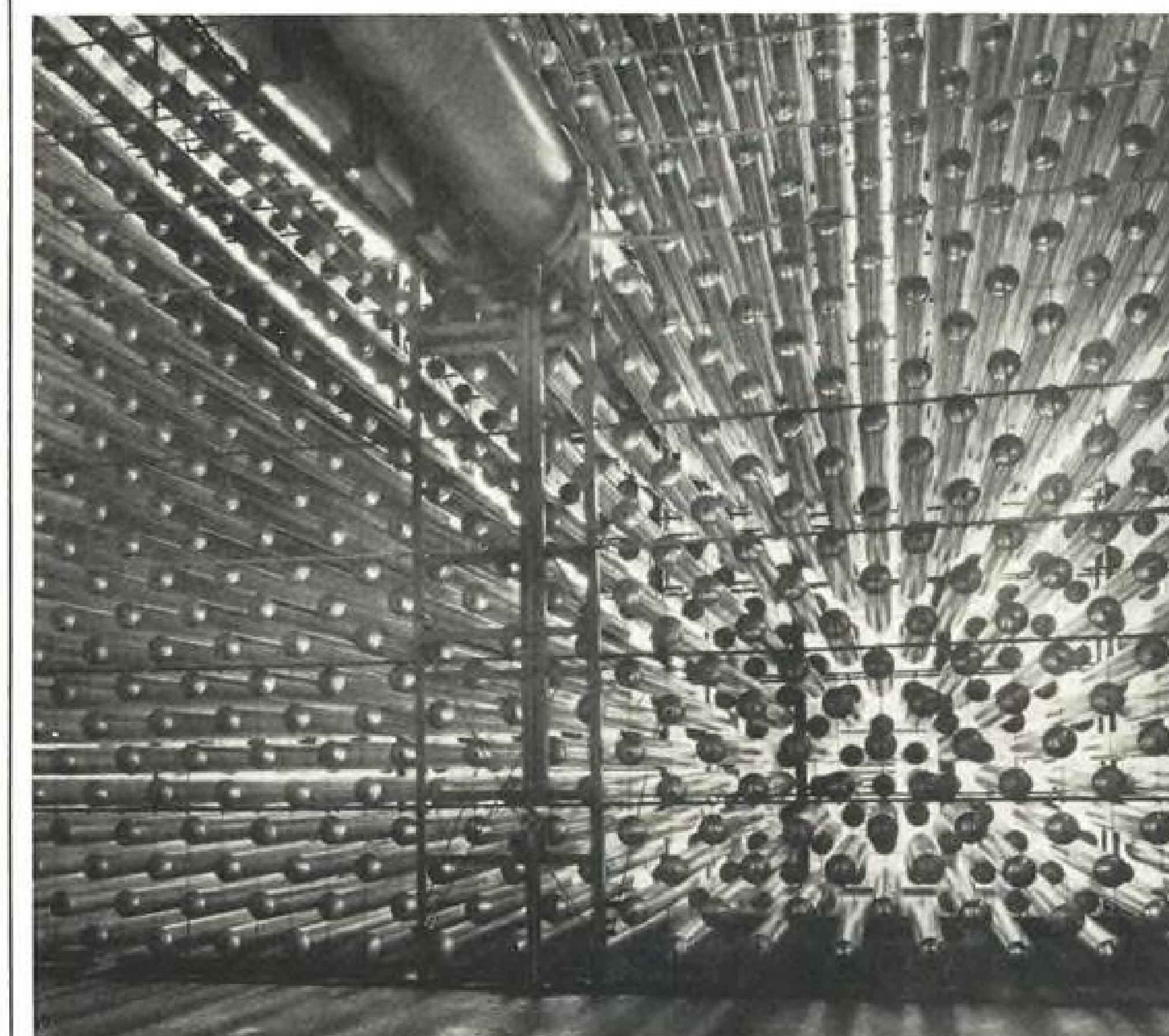
• **First route pattern** for a minimum of one year will be a cloverleaf suburban system—the cheapest route setup for mail and cargo service. At the center of the cloverleaf will be the three-airport shuttle (LaGuardia, Idlewild and Newark), which will probably be certificated initially for passenger service as well as cargo. And there will be the mail and cargo service on the run from airport to downtown Manhattan post office.

• **Ultimate route pattern** with suburban passenger service will be a radial

in-and-out system, like the arterial commuting pattern of highways and railroads of any city. This replaces the cloverleaf pattern, as passengers won't favor riding in a circle to get where they want to go.

This ultimate route pattern for passenger service will come after NYA has at least a year's operating experience and has copters of 10-passenger capacity or more and has operating certification on the suburban route.

Downtown passenger shuttle service promises to be the highest-density and best-paying service, the company believes. Several heliport locations are



## NEW TYPE CYLINDERS ABSORB TEST NOISE

• **PY-DEE Sound Absorbers** are created to effectively reduce noise from jet and reciprocating engine test units. Each lightweight corrosion-resistant tube is hung independently with no contact between and is capable of withstanding high wind velocities. Closed aluminum ends are provided with studs for suspension. This system affords flexibility in spacing even after installa-

tion. Changes in attenuation characteristics may be obtained by re-spacing units.

Twenty thousand PY-DEE units have been delivered to Army and Navy installations and aircraft engine manufacturing plants. Increased manpower efficiency and a resultant decrease in noise fatigue are the result.

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AIRCRAFT ENGINE TEST EQUIPMENT

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When trouble comes, the pilot pulls a trigger; the rest happens automatically. Ejection seat and pilot are shot clear of the plane; the small drogue chute attached to the seat stabilizes and slows down the speed of the seat and pilot. The pilot then releases himself from the seat, pulls the ripcord which opens his parachute, and descends safely to earth.



**PIONEER PARACHUTE COMPANY, INC.**

MANCHESTER, CONNECTICUT, U. S. A.

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**PARACHUTES MAKE THE DIFFERENCE!**

available in non-built-up parts of the city.

As for service to solid-city areas and high rooftops, safety officials may require twin-engine reliability. Timing of production plans for twin-engine copters is as yet not announced. But presumably they'll be in large-scale production before the last year of NYA's temporary certificate for five years.

NYA hopes to get some early-production models of twin-engine copters and break them in for use on cargo service.

► **Will It Pay?**—NYA believes it can compete directly with taxi and limousine on time and price. NYA also believes it will compete with other forms of surface transport over routes which offer non-direct surface transport.

"If we can get 20-30-passenger copters flying within less than four years, we'll be breaking even at average passenger revenue of about 12 cents a mile—less for longer flights, more for short hops like airport to downtown," according to a comment from an NYA official.

NYA figures the service will cost about 6 to 8 cents an available seat mile; average revenue of 11 to 12 cents a passenger would cover that, assuming average load factors of 50 to 60%. So NYA hopes to be breaking even without subsidy by the end of its five-year certificate. Then NYA looks to profits with no subsidy when the next generation of copter improvements comes along after that.

## ALPA Says Fatigue Caused Copter Crash

An Air Line Pilots Assn. analysis of probable cause of the Los Angeles Airways fatal helicopter accident Aug. 27 Lynwood, Calif., finds that the "lower ear on the flapping hinge (of one of the rotors) had failed due to fatigue."

Metallurgical tests at Sikorsky Aircraft, manufacturer of the S-51 involved in the crash, have been undertaken to determine the fatigue life of this part, but have not yet been completed. Meanwhile, new flap hinge links have been installed on all S-51 copters.

ALPA preliminary investigation reveals: In a left turn at altitude 200-300 ft. to land at Lynwood Heliport a loud popping sound was followed by separation of the rotor head from the fuselage. The "red" blade had separated from the rotor head at the vertical hinge pin. This caused such unbalance that transmission and pylon supports were torn loose. The copter fell, landing on its left side. Pilot Carl Crew was fatally injured.

## Every Air Coach Is Making Money

	REVENUE	EXPENSE	PROFIT
American .....	\$6,522,000	\$3,815,000	\$2,707,000
Capital .....	5,142,000	4,705,000	437,000
Eastern .....	14,516,000	11,931,000	2,586,000
National .....	4,215,000	3,282,000	932,000
Northwest .....	6,613,000	5,705,000	908,000
Trans World .....	9,950,000	7,022,000	2,428,000
United .....	3,215,000	2,182,000	1,032,000

SOURCE: CAB Rates Division.  
Direct cost per mile of type equipment on whole system is applied to coach routes without adjustment; indirect costs are allocated on same ratio to whole system as direct costs. This method is not exact for comparative route study purposes, but gives a clear picture of how the coach operation is going as a whole.

## Coach Policy Sets Off Rate War

• **United's coast-to-coast \$88-\$99 fare with DC-4s is countered by TWA with \$99 in Constellations.**

• **CAB encourages reduced fares, says airlines do not have to ask permission to add additional schedules.**

CAB's revolutionary campaign urging airlines to lower present coach fares and expand coach service turned into a smashing success in its second week—despite opposition by some carriers (AVIATION WEEK Dec. 10, page 16).

United Air Lines—which has always opposed air coach—has nevertheless touched off a transcontinental rate war by its all-or-nothing decision to lower its DC-4 coach fare to meet or beat the rates of the transcontinental nonskeds. UAL plans \$88 westbound, \$99 eastbound. TWA mulled that over and decided it would meet that with a \$99 Constellation.

Meanwhile, National Airlines announced a \$43 fare New York-Miami.

► **New Era**—The CAB policy statement posts the following goals and ground rules for what could become the wildest cut-rate contest in air transport history:

• **Lower coach fares.** CAB says: "The Board will encourage proposals . . . to reduce the fares . . . below the present general minimum of 4½ cents per passenger mile. . . . The Board believes that the fare level (for services at 'inconvenient' or 'off-peak' hours) should not exceed 4 cents per passenger mile."

• **Start many more coaches.** "Carriers should promptly and substantially expand their coach service. . . ."

• **Run them any time.** CAB has lifted all restrictions on time and place for coach flights; previously most coach flights were restricted to off-peak hours.

• **Convert a fleet to coach.** CAB urges the airlines to convert a substantial portion of their 4-engine transport fleets to high-density seating.

• **First-class planes, too.** With respect to low fare off-peak services, the Board

will not require utilization of high-density aircraft, although the use of such aircraft whenever operationally feasible will be encouraged."

• **No limit.** The Board says the airlines don't even have to ask permission to put on additional coach schedules where a coach service is already established. Only time an airline must "furnish adequate justification from both a cost and traffic standpoint" is when the proposed coach is a change in fare or a new coach route.

• **Plenty for no-shows.** The Board suggests a 10% forfeiture for coach passengers who don't show up at plane time, unless they tell the airline to cancel the reservation "within a reasonable period" before plane time.

► **What Convinced the Board**—Coach profit figures shown above were the proof CAB needed. While economics and logic have pointed to coach profitability, the Board wanted proof before it went all out. Every present coach operation of every airline has shown a profit, according to profit-and-loss figuring by the CAB Rates division.

The Board reasons also that the 25% increase in seating capacity will help carry more people during the present equipment shortage.

Then the Board makes the basic policy statement: "It is apparent that the maximum development of civil aviation in the United States, as contemplated under the Civil Aeronautics Act, will not be realized until such time as air travel is placed within the economic reach of the great majority of the traveling public. High-density coach service offers a sound means. . . ."

Comments UAL President W. A.



Paterson: "Now it appears time to determine whether a scheduled airline can cut fares to 3½ cents a mile in order to satisfy those who feel that we must broaden our market with a second-class type service. We will watch the experiment closely and eventually will either abolish or expand the low-cost service, depending on economic results."

## Germans Get Allied Civil Air Proposals

(McGraw-Hill World News)

**Frankfurt on Main**—Germany will be a factor in aviation again come next spring.

Draft of the Allied contractual agreement on civil aviation in Germany was handed Germans last week. The Germans will now study it, and frame their own draft before year's end.

Complete agreement is still up for thorough discussion and haggling. A conference between Allied and German high officials will be held after receipt of German counterproposals.

► **Allied Draft**—Here are the four points in the Allied draft submitted to the German government:

- **Germans will be given the right to fly internal and external routes.** Permission to fly internal routes only would be meaningless, since profitable hauls are possible only on external and trans-Atlantic flights.

Berlin will be barred to German aviation, since air corridor is open only to occupying powers.

- **Ban on German construction of aircraft and engines** definitely will continue; all other equipment presumably can be manufactured by Germany under terms of the plan.

- **Germans will not be forced to hire crews of other nationalities.** In the beginning, they may want to hire foreign nationals as training cadres, but this is on a voluntary basis only. Basically, all German pilots and crews will be employed.

- **U. S. will sponsor Germany for membership in International Civil Aviation Organization.** Allied officials fear, though, a veto by Czechoslovakia may bar Germans from ISAO membership. But Germans will voluntarily comply with rules and regulations of ICAO.

United States officials are unwilling to say when final agreement is to be signed and German air activity will start. It is obvious, however, the Germans are most anxious to get started again. Best guess points to about Apr. 1.

► **Financial Trouble**—The Allies feel Germany will have a rude awakening financially after running their own line for awhile.

In the past, Germany got excellent service through the medium of foreign,

heavily subsidized lines, without having to pay a cent of subsidy themselves. Their own line now will call for heavy continuing aid from the German treasury.

They may be forced into a partnership with an existing foreign airline to keep going.

Another big problem will be paying for initial aircraft and engines.

► **Starting Routes**—The Allies are dubious where all this money will come from. But prestige always is a very heavy factor in Germany and the resurgence of German civil aviation in 1952 is a certainty.

In addition to internal service, initial routes probably will be from Frankfurt to Paris, London, Rome, Zurich and Scandinavian capitals. After equipment and facilities are lined up, Germans also will be anxious to return to trans-Atlantic routes.

## Airline Associations Planning Merger

An Independent Airline Association is in the planning stage, to get some unification of two separate airline organizations—Air Coach Transport Assn. (ACTA) and the Independent Military Air Transport Assn. (IMATA).

Main aim is unified representation for dealing with military on contract and furlough flights. But complete unification on other matters probably will be difficult, may take years.

IMATA membership includes cer-

tificated all-cargo operators as well as some international nonskeds; it is almost entirely devoted to military business. ACTA represents domestic nonskeds on CAB and political issues, as well as military business.

## Pioneer Negotiates For 9 Martin 2-0-2As

Pioneer Air Lines is negotiating with Martin Aircraft to buy nine Martin 2-0-2As. This would be the first local service airline to try a big modern transport on an extra-shorthaul operation.

All that's holding up the deal is the matter of price.

Pioneer, in its preliminary prospectus to the SEC, proposes to finance the deal with sale of DC-3s, a \$2,450,000 bank loan, an issue of 120,000 shares common stock at \$1 par value, and sale of bonds worth \$226,090.

Approximate negotiating price area reported for the nine 2-0-2As is over \$5 million.

## PAA To Build New Havana Terminal

Havana—A new cargo terminal which will more than double its facilities here is being planned by Pan American World Airways at Rancho Boyeros Airport.

Present facilities have been a bottleneck for cargo handling because of their small size and convenient location.



**JEEP FINDS NEW JOB**

Versatile Willys-Overland Jeep with a conveyor system speeds United Air Lines' ground handling of air cargo. U. S. Rubber "Crepe Top" 2-foot-wide belt, with 20-ft.-long working surface, is operated by a Vickers hydraulic Power Pac unit driven by the Jeep engine. The belt can carry up to 1,000

lb. as a single item or 2,500 lb. in separate items. Normal working speed is 80 fpm. The conveyor boom can be raised to 10 ft. 7 in. and lowered to 5 ft. 1 in. United eventually will have 22 of these mobile conveyor units, made by Cargo Handling Equipment Co., Van Nuys, Calif.

## SHORTLINES

► **Air Line Pilots Assn.** is running a check on "crash gates" around airports—finds many locked, which would prevent emergency equipment from reaching a trouble scene fast.

► **Air Transport Assn.** president Adm. Emory S. Land is expected to delay retirement until next June 3, date set for return of executive vice president Robert Ramspeck from chairmanship of the Civil Service Commission.

► **American Airlines** is described as the "biggest, lowest-cost operator in the domestic field" in a long feature article of the December issue of Fortune Magazine. Earnings of \$10,400,000 on revenue of \$118,700,000 are forecast for this year. Sharp-eyed foresight on its postwar equipment program is mentioned.

► **Capital Airlines Constellations** from KLM will be modified by KLM to Capital specifications. . . . Has CAB examiner recommendation to serve Chicago, Milwaukee and Twin Cities on all-cargo flights, provided Capital doesn't carry local cargo between them.

► **Chicago & Southern Air Lines** cannot serve Miami on its Caribbean flights, CAB says. CAB had denied C & S petition for reconsideration of its application to serve Miami. CAB says it gave Braniff such a right only to make more competition for Pan American, and that another carrier in the Miami-Latin America route system would be too much competition.

► **Civil Aeronautics Board** has received a petition for reconsideration of the transcontinental coach decision, in which four nonsked airlines were denied certificates for regular air coach service New York-West Coast. New material and evidence will be introduced. . . . Proposes to allow continued production of several type lightplanes without installation of flap position indicators. Present regulation requires flap indicators, but CAA asked CAB to remove the requirement for lightplanes on which the pilot can see his flap position anyway.

► **India-Afghanistan**—India's latest application to Pakistan for right to inaugurate air service to Kabul (Afghanistan) may overcome earlier Pakistan objections to Indian flights over its closed northwest frontier. Proposed route is from Ahmedabad in western India to Zahidan in Iran with refuel at Karachi and then up to Kabul—

1,000 mi. longer than direct route via Pashwar. If right is granted, one of three applicant companies will fly it: Indian National Airways, Himalayan Airways or Air-India.

► **Riddle Aviation Co.** may continue its non-certificated domestic all-cargo flights pending disposition of its application for a domestic all-cargo certificate New York-Miami, CAB says. U. S. Airlines had asked CAB to stop this operation because Riddle also operates a CAB-certificated all-cargo service between New York or Miami and Puerto Rico.

► **Southern Airways** is asking CAB for route expansion to Dothan, Ala., and

Panama City and Pensacola, Fla.

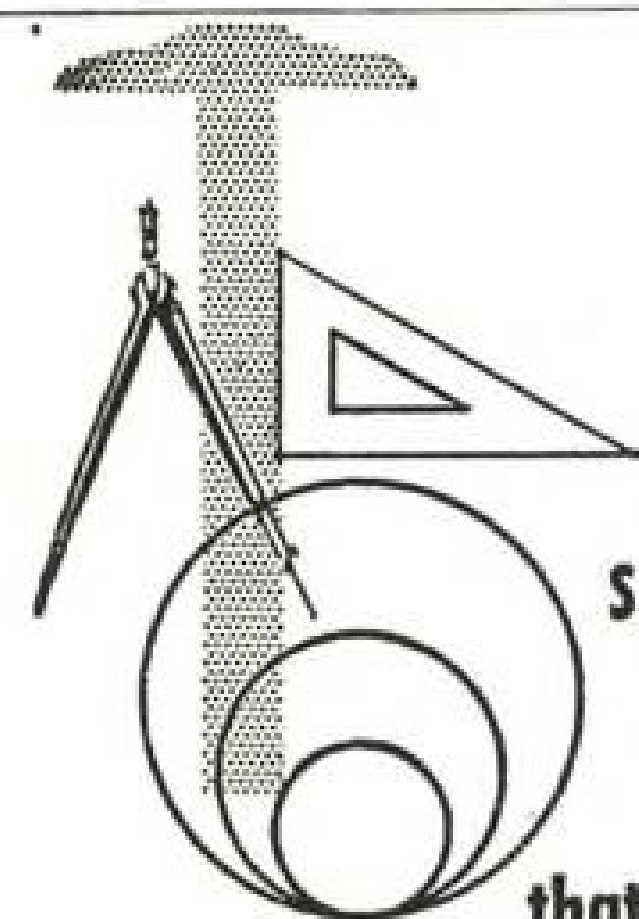
► **Southwest Airways** has signed a new pilot wage contract, effective Dec. 1, 1951, for 12 months.

► **Western Air Lines** is expanding air coach services this month. . . . Says it will accept a mail rate of 53 cents a ton mile, a compensatory (non-subsidy) rate according to CAB figuring. It would be retroactive to Oct. 1. Western predicts passenger revenue of \$12,470,000 for next year, and pre-tax operating profit before mail pay of \$1,382,000. After receiving \$638,000 mail pay at 53 cents a ton mile, and paying income taxes, Western expects net earnings of \$869,000.

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Mr. C. G. Jones, Salary Personnel Department

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P-2595, Aviation Week  
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For Sale. Lockheed Lodestar Wing Panels brand new, in original crates. Guaranteed free of rust or corrosion. \$1,500 each. F.O.B. Harrisburg, Pa. Stinson Field Aircraft, 6013 Mission Road, San Antonio, Texas.

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AVIATION WEEK, December 17, 1951



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Send a resume if you cannot apply in person







## COCKPIT VIEWPOINT

By Capt. R. C. Robson



### The Flight Before Christmas

(A Christmas poem for Air Age kiddies)

'Twas the flight before Christmas and all through the sky,  
Not a creature was stirring, 'cept the Captain and I.

The throttles were set on the quadrant with care,  
In hopes of beating Saint Nicholas there.

The passengers were nestled all snug in their seats,  
The purring of engines had lulled them to sleep.

And Captain at the wheel and I on his right,  
Had just leveled off for a long winter's flight.

When out in the sky there arose such a clatter,  
We jumped in our seats to see what was the matter.

We checked each engine quick as a flash,  
Glanced at the dials all over the dash.

The moonlight reflecting from the cloudbank below,  
Showed nothing amiss in the cold white glow.

When what to our wondering eyes should appear,  
But a miniature sleigh and eight tiny reindeer.

With a little old pilot, so lively and quick,  
We knew in a moment it must be Saint Nick.

More rapid than our ship his coursers they came,  
And he whistled and shouted and called them by name.

"Now Pratt! now Whitney! now Curtiss! and Wright!  
On Franklin! on Allison! on, on through the night!"

"To the top of the clouds, to the top of them all,  
Now, dash away, dash away, dash away all!"

And then in a twinkling on our wing we did hear,  
The prancing and pawing of each little deer.

Flying swift as the wind over a cloud,  
They passed right by us, nodded and bowed.

He was dressed in goggles and helmet and boot,  
And snow flakes were clinging to his flying suit.

A bundle of toys was strapped to his back,  
He looked like a paratrooper in his jumping pack.

His goggles how frosted, his dimples how merry,  
The wind burned his cheeks and his nose like a cherry.

He had on the earphones of his radio,  
And was flying the course, straight as a crow.

The smoke from his pipe his teeth held tight,  
Streamed out behind him into the night.

He had tightened his seat belt over his belly,  
But it shook underneath like a bowl full of jelly.

He was sure a good flyer, that jolly old elf,  
He flew better than Captain—or even myself.

With a burst of speed from his tiny sled,  
He was out in front and pulling ahead.

He was looking for a break in the dense overcast,  
For he'd stockings to fill—an all-night task.

When off to the south he saw a big hole,  
And banking to his right he started to roll.

He pushed forward his stick, to his team gave a whistle,  
And towards it they flew, like the down on a thistle.

But we heard him exclaim ere he dove out of sight,  
Merry Christmas to all and to all a good flight!

## WHAT'S NEW

### Telling the Market

Civil Air Regulations and Reference Guide for Pilots, 1951 edition. Published by Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26; \$1.50.

Revised to include CAR Part 20 and all recent CAR amendments, this volume contains the complete regulations for student, private and commercial pilot certificates as well as instrument and flight instructor ratings. The reference section gives information on the various examinations, check questions on the regulations and is illustrated to show aerial maneuvers.

Revised edition of Parker-Kalon Assembly Handbook gives essentials of P-K self-tapping screw selection, application data, recommended hole sizes and corresponding drill sizes. It is pocket-size. Ask for Booklet 480 from Parker-Kalon Corp., 200 Varick St., N. Y. 14, N. Y. . . . Latest technical information on Weatherhead aircraft flareless and AN tube fittings and flexible hose assemblies are given in profusely illustrated Supplement A-300 brochure, which also contains detailed information on assembly. Write the Weatherhead Co., Aviation division, 300 E. 131 St., Cleveland 8, Ohio.

Two new manuals—one giving comprehensive data on silicone rubber, the other providing information on the use and selection of O rings made from silicone rubber compounds—are available from the Arrowhead Rubber Co., a division of National Motor Bearing Co. Write in care of the O ring department, Downey, Calif. . . . Service manual, Modern Masking Material and Methods for Fabrication and Spray Finishing, is offered by The Kay & Ess Co., Dayton 4, Ohio.

Handsome 84-page, leatherette-covered, spiral-bound book, Better Grinding, gives valuable tips on how to set up grinding jobs, how to operate precision cylindrical grinders, how to care for these machines, with over 90 illustrations showing grinding operations. Write Landis Tool Co., Waynesboro, Pa.

### Publications Received

• Jane's All the World's Aircraft 1951-1952, edited by Leonard Bridgman, published by McGraw-Hill Book Co. Inc., 330 W. 42 St., New York 36, \$22.50.—Aircraft, civil and military, of every nation in the world.

• 200 Miles Up: The Conquest of the Upper Air, by J. Gordon Vaeth, published by The Ronald Press Co., 15 E. 26th St., New York, \$4.50.—A scientific report on atmospheric research, rocketry and ballooning.

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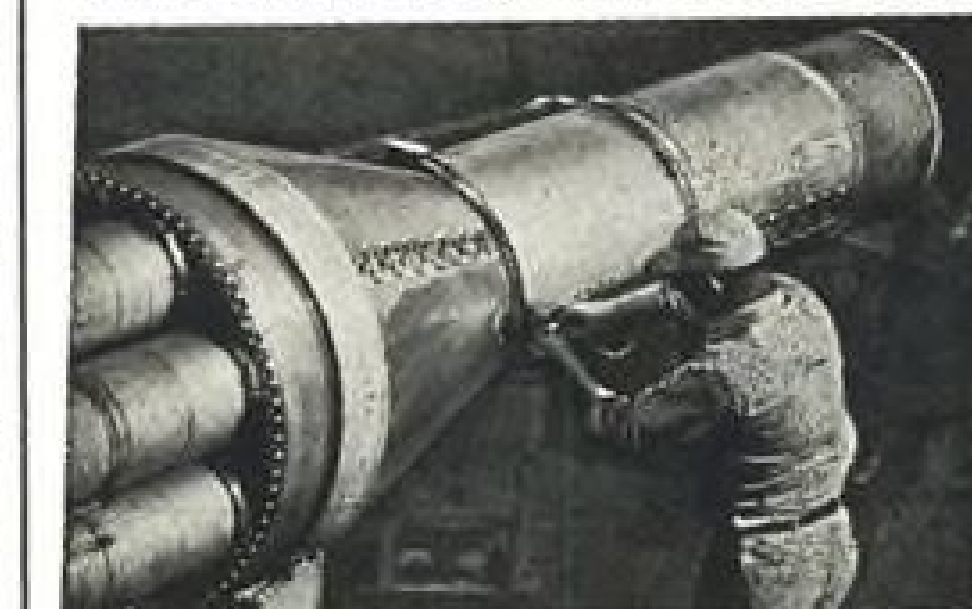


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## EDITORIAL

### Fighting Unfair Headlines

If you don't think commercial aviation still has a mighty public relations problem on its hands, take a look at our Exhibit A, the Detroit Times front page the day after Labor Day, 1951.

While commercial aviation's operations, engineering and maintenance men work around the clock every day of the week, trying to be sure that this year will always wind up a safer one than the last, the rest of us have the problem of letting the country know how safe the airlines already have become.

Certainly, we have accidents. Name somebody who doesn't. But between the railroads' advertising, and examples of "news judgment" like that shown on Exhibit A, we have a rugged mission cut out for us in forever fighting back and finding ways to get the real facts across to the public on safety. Because the facts are not as bad as railroad advertising and some big, black headlines insinuate.

Why do we take these blows sitting down? It's a problem worth unceasing thought and effort, no matter how many potential customers may be flocking to the airports at any given moment clamoring to get aboard airliners.

The big danger is that we will let ourselves slow up what should be a perpetuating public relations campaign on safety even when times are good. Because no matter how good business can get, national psychology can suddenly change overnight if we are suddenly hit by accidents that we may be able to describe only as acts of God. Every industry has these. But if public confidence has been built up assiduously and honestly during the good times, then bad times will not be as disastrous as they might be.

The accompanying picture of the Detroit Times front page speaks for itself. By the time the eight-star edition went to press the next day, more Americans had been killed by automobiles than on any previous Labor Day in history.

The Times itself said, "America went wild on highways during the Labor Day holiday." The grand total of dead, up to that time, was 449 persons.

On the same front page the Times reported the crash of a stunt plane and a girl wing-walker—an accident involving two persons.

The plane crash won the top banner, eight columns wide. The record highway toll of 449 persons killed (and no telling how many hundreds of others injured), got a third-priority headline only five columns wide, and in smaller type.

A pilot and a wing-walker crashing in a stunt plane was more important (or dramatic) than America's "going

wild on highways." Or so the Detroit Times thought that day.

Aviation people, like ourselves, have been deploring this inequity of news values by the daily papers for a long time. A plane accident so often gets the scareheads, out of proportion to an accident of similar casualty extent involving other transportation media or even other non-transportation mishaps.

Obviously, some of this difference is due to news editors who believe planes are still more dramatic than trains, buses, or the common, garden variety of death-dealing automobile.

There are fewer such news editors than formerly. Especially on the better-edited newspapers and those



EXHIBIT A

which are willing to subordinate sensational writing and typographical treatment to straight and balanced reporting.

Fortunately, the Civil Aeronautics Administration soon after Labor Day took an aggressive step to try to cut the number of headlines about needless air show accidents. It announced it would henceforth allow no air shows except "when it is shown that such activities will contribute directly to the advancement of, and public confidence in aviation."

This commendable move, however, did not come in time to prevent the Detroit fiasco, or the accident at a Flagler, Colo., air carnival that cost about 20 deaths. Such air shows had been taking lives and endangering thousands more every summer, as AVIATION WEEK had been pointing out on this page for two years.

Obviously, the only way to combat these problems is to keep right on improving safety. But that is not enough. We must publicize that ever-better safety record and thus let skeptical news editors and the public itself know how unfair screaming headlines can be. We must never stop publicizing our good records.

—Robert H. Wood



## technical bulletin

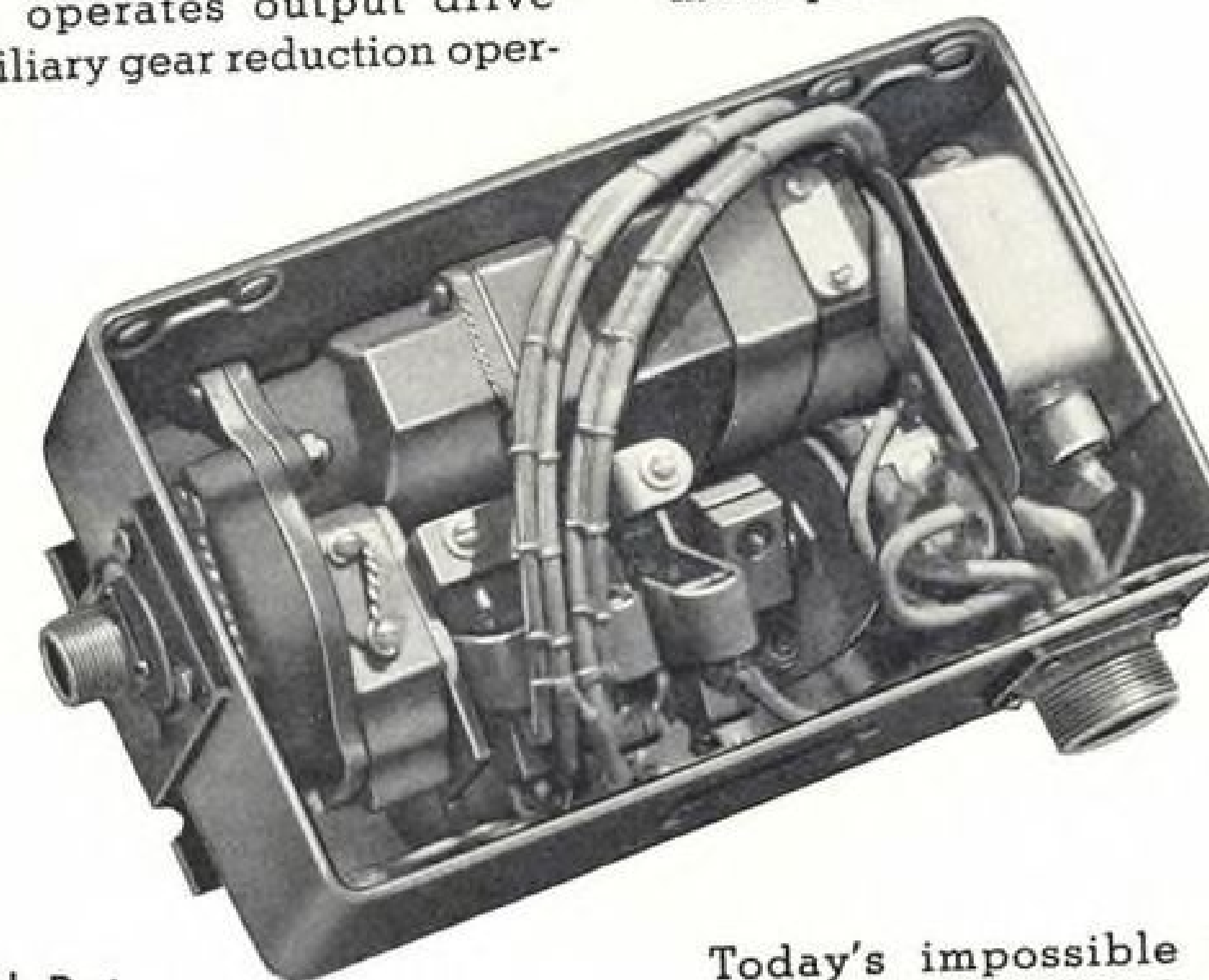
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# *Allison Turbo-Prop engines to power NEW USAF NAVIGATOR-BOMBARDIER TRAINER*



Allison T38 Turbo-Prop engines will be installed in a new version of the USAF T-29 Convair Navigator-Bombardier Trainer.

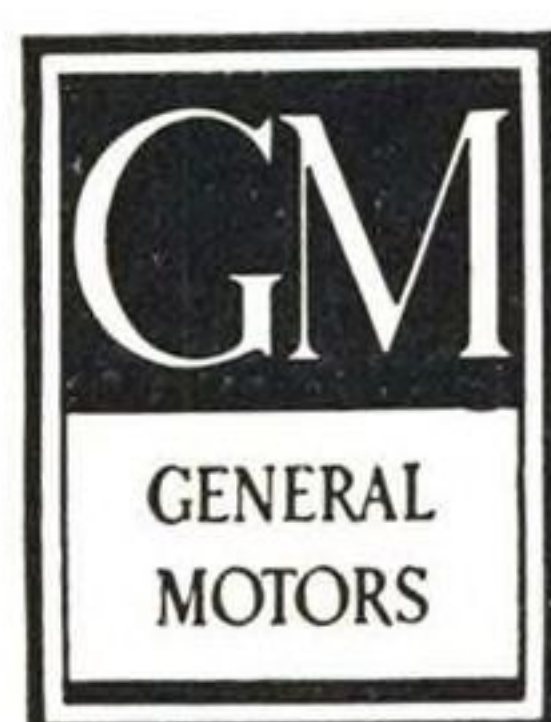
With these lighter, more powerful turbine engines, the T29C will fly faster, at higher altitude and with increased range. Thus better training will be given students under conditions more closely like the

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