

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JAN. 9, 1950

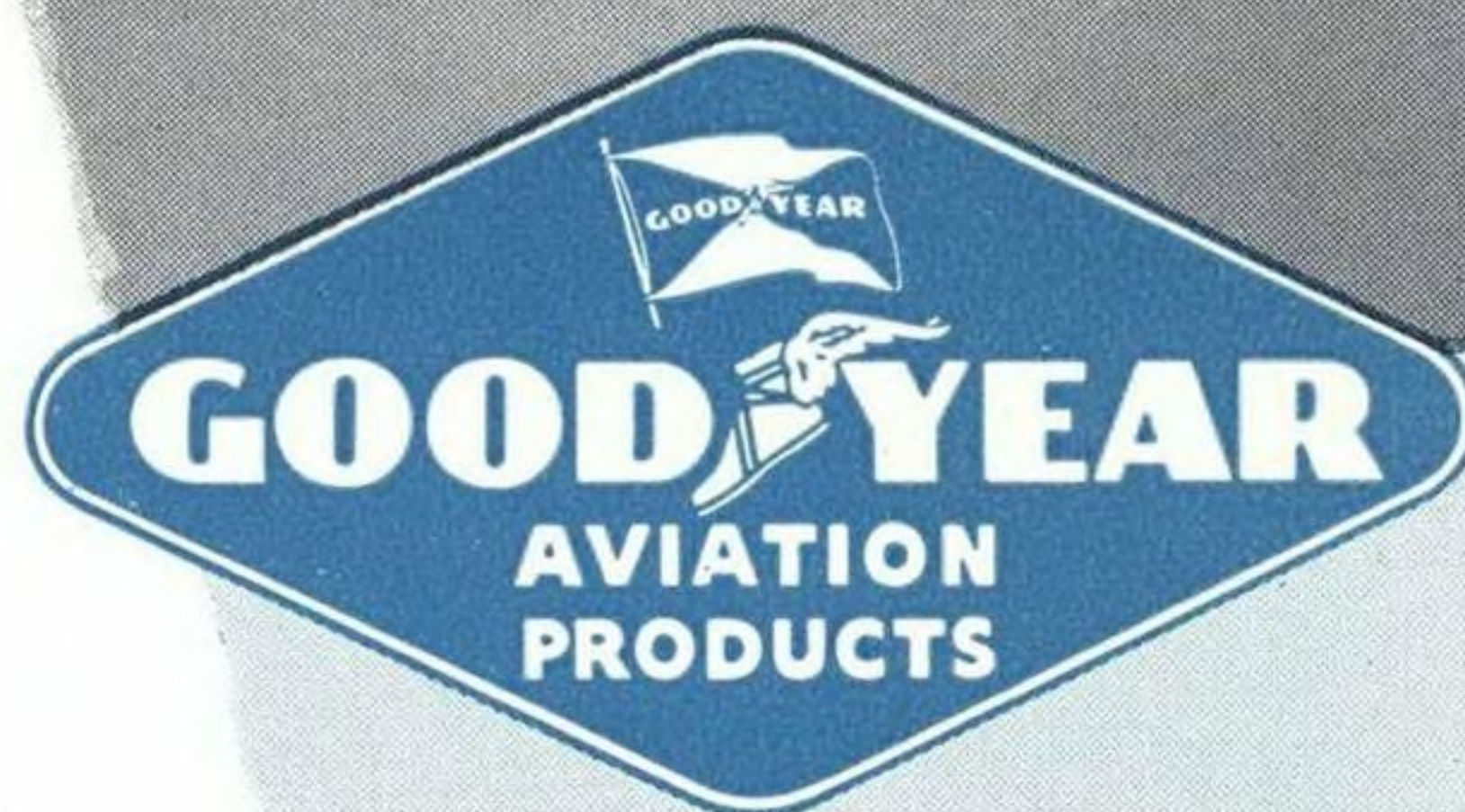


Capital is first major U.S. airline to use Cross-Wind Landing Wheels

SOON to go into service, Capital Airlines' new fleet of Super DC-3's will be equipped with Goodyear Cross-Wind Landing Wheels—the first U.S. airline to adopt this modern landing gear in cooperation with the CAA policy to increase the acceptance rate of airports. With this new

gear Capital Super DC-3's will be able to take off and land in cross winds of high velocity. Aviation Products Division, Goodyear, Akron 16, Ohio.

More aircraft land on Goodyear tires, tubes, wheels and brakes than on any other kind.



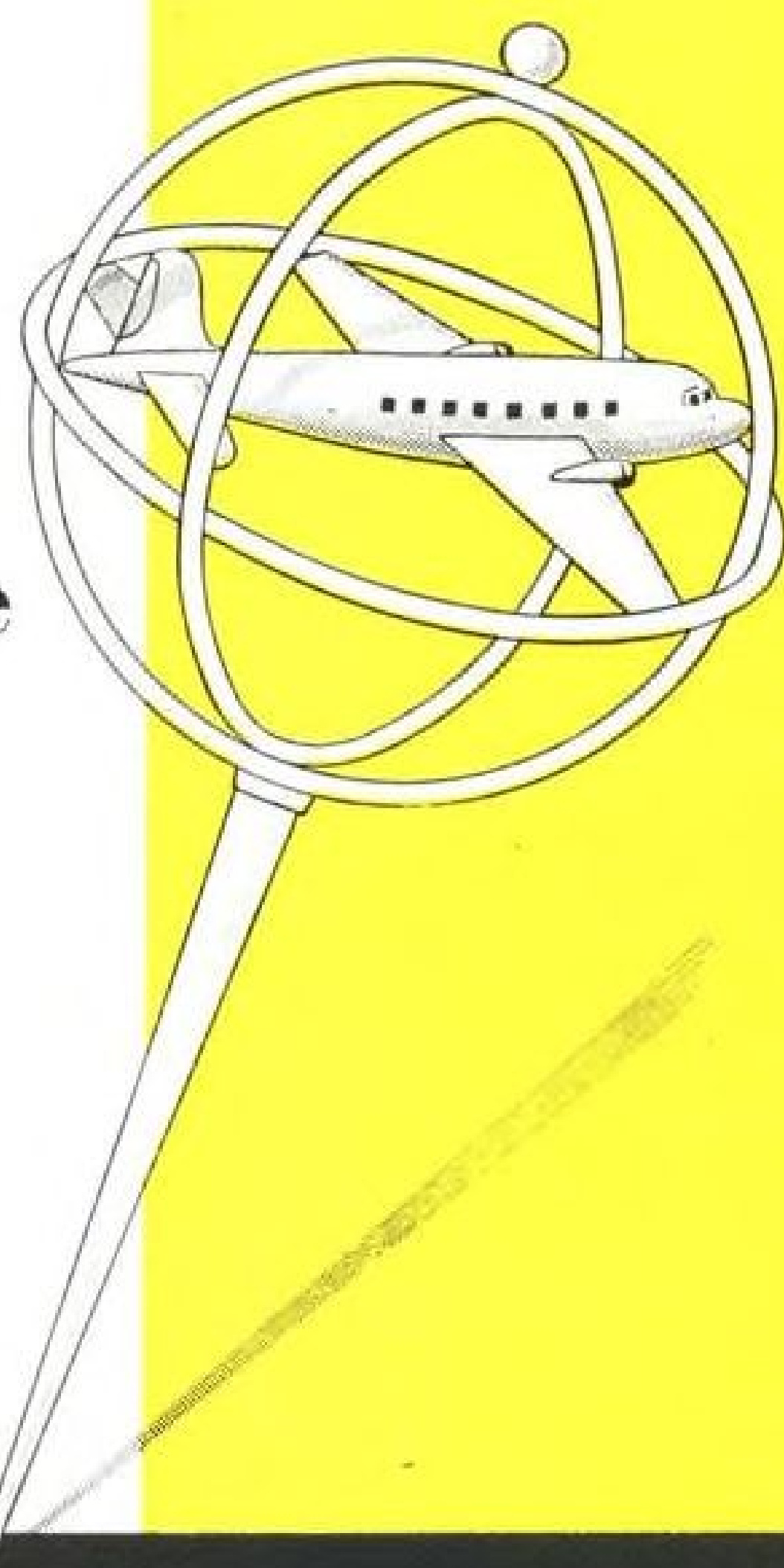


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trols, Standard on Many Types
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The bare facts about ball bearings

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ments of higher speeds,
heavier loads and con-
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of moving parts.

And... most important
of all, New Departure,
world's greatest ball
bearing maker, meets
your particular problems
with a vast fund of ex-
perience and original
thinking.



Cut-away view of
New Departure
Ball Bearing

Nothing Rolls Like a Ball
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1

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2

Under heavy compression it deforms slightly and then resumes its original form. Made of the toughest, most resilient steel known to man, the New Departure steel ball is of uniform structure throughout.

3

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4

This is how a ball resists thrust (axial loads) as well as radial loads — like a bicycle on a banked track.

5

Put two rows of balls together, and you can support thrust and radial loads from any direction. They may be in one single bearing or in two separate bearings.

6

Unlike other types of rolling elements, the ball need not be forced to travel in the proper direction. Function of separator is merely to keep balls spaced. Contact is at poles (point of slowest rotation — least friction.)

7

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8

Newest new departure by New Departure: Lubrication in new sealed bearings may be revitalized by injecting with hollow needle on pressure oiler — without removal of seals or need for nipples, grease passages, plugs.



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Aviation Week

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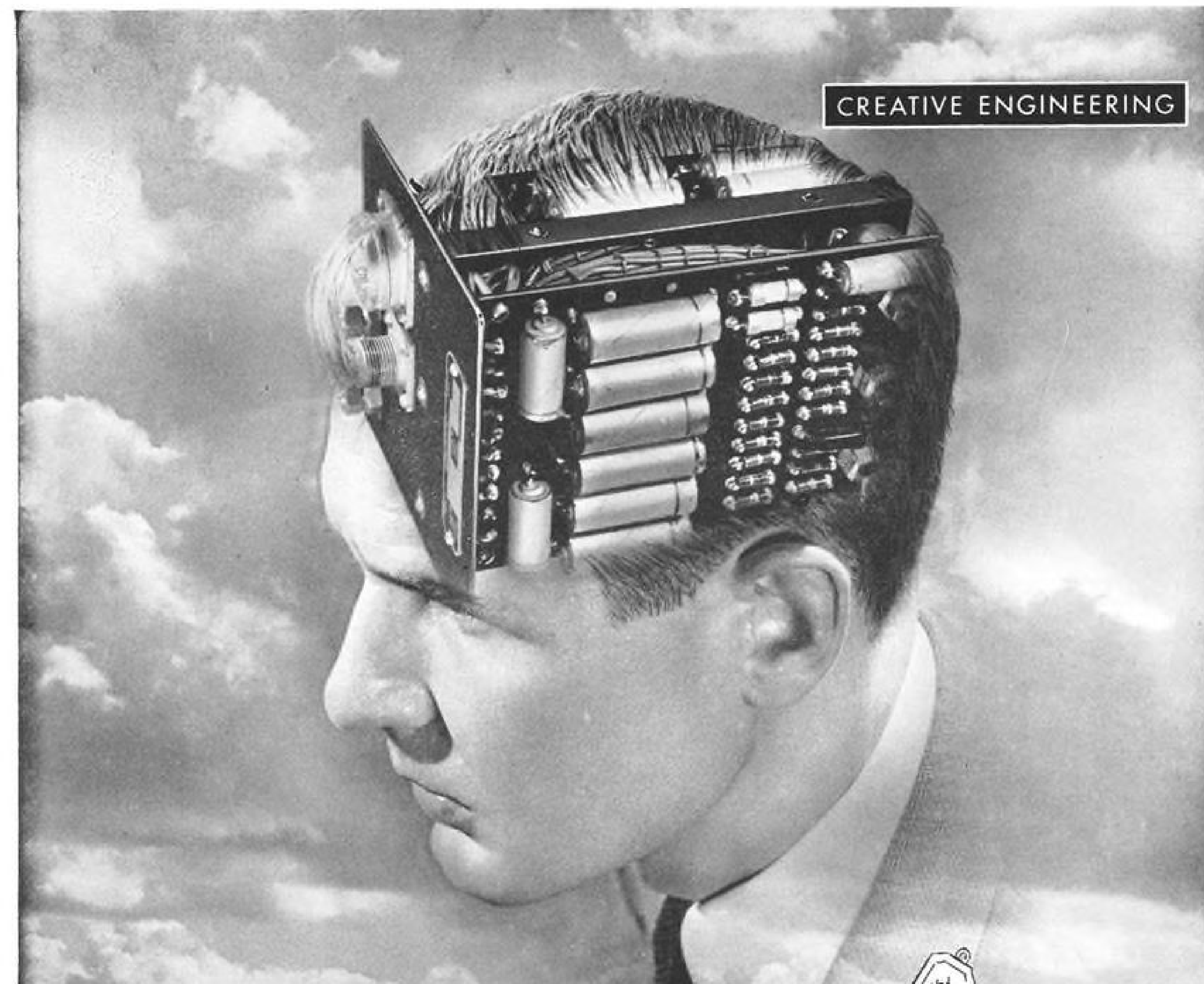
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AVIATION WEEK, January 9, 1950



CREATIVE ENGINEERING

Weather Brain



A new electronic answer to extreme temperature control problems. Designed by AiResearch, this device anticipates temperature changes—moves to correct them before they occur!

Useful in maintaining aircraft cabin and engine temperatures at a pre-selected level, the "Weather Brain" can be adapted for use wherever extremely close temperature regulation is required.

About the size of a human brain, the electronic regulator receives signals from highly sensitive "pin head" temperature anticipators... transforms them into command signals to electrically actuated by-pass valves which control the mixture of hot and cold air. Thus, even if a plane is diving at supersonic speed from the blue cold of 40,000 feet to 100-degree heat at sea

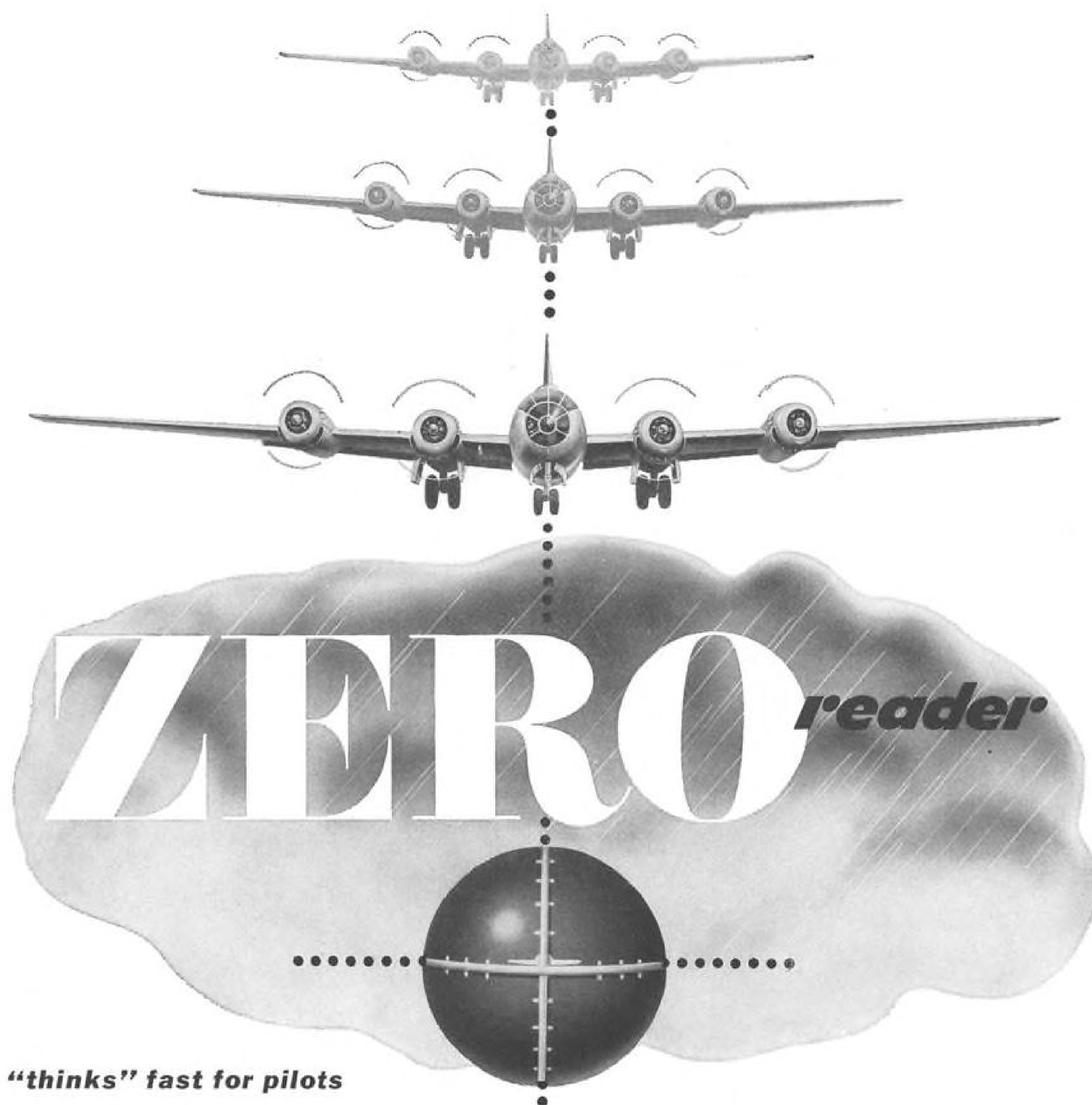
level, its cabin "weather" can be maintained precisely at the temperature the pilot selects.

The "Weather Brain" is another example of the ability of AiResearch to design and manufacture specialized equipment for hard-to-do jobs. It indicates why nearly every type of high-altitude and jet aircraft produced in the U.S. carries AiResearch equipment.

Whatever your field—AiResearch engineers—designers and manufacturers of rotors operating in excess of 100,000 rpm—invite your toughest problems involving high speed wheels. Specialized experience is also available in creating compact turbines and compressors; actuators with high speed rotors; air, gas and liquid heat exchangers; air pressure, temperature and other automatic controls.



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AiResearch Manufacturing Company
Los Angeles 45, California



"thinks" fast for pilots

Sperry's new simplified gyroscopic indicator—the ZERO READER*—is a *fast thinking calculator*. It continuously pieces together attitude, altitude, heading and radio path information and relieves the pilot of complex mental calculations on approaches and landings...simplifies en route flying procedures, leaving more time to devote to other problems vital to the success of his flight plan.

• Sperry introduced the Gyro-Horizon, Directional Gyro, Gyrosyn Compass and Gyropilot. Now Sperry

introduces the ZERO READER which is the only manual system approaching the performance of stabilized automatic flight control, another progressive step toward the development of all-weather operations.

• Developed by Sperry with the

cooperation and encouragement of All-Weather Flying Division, USAF and the Air Transport Association, the ZERO READER is an example of Sperry's never-ending search for new and better ways to improve flying techniques.

*TRADEMARK—PAT. PENDING

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NEWS SIDELIGHTS

Supersonic Footnote

Even before the USAF official denial of the Los Angeles Times story that the Bell X-1 supersonic research plane had achieved a maximum speed of 1989 mph., aeronautical engineers had been looking somewhat quizzically at the quoted figure.

That particular combination of digits is the multiplication product of Mach 3.0 times 662 mph. (the speed of sound above 35,000 ft. under standard NACA atmosphere conditions).

It would be singularly unusual for the X-1 to have exactly standard atmosphere conditions including a temperature of minus 67 deg. Normally, temperature at 35,000 ft. is much colder, with the effect of reducing the speed of sound at that altitude to a value below 662 mph. (AVIATION WEEK, Aug. 22, 1949).

It would be quite rare also for an aircraft to attain exactly three times the speed of sound, since supersonic speed up until now has been obtained by piloted aircraft in bursts of rapid acceleration rather than in steady level flight with fairly constant increments of additional speed.

Officially released data for the X-1 quotes a design Mach number of 1.5 at 60,000 ft. Under standard atmospheric conditions this would be just under 1000 mph. This figure is generally accepted, if so far unconfirmed officially, as the plane's actual maximum performance. A design top speed for the Bell X-1A, an improved version using turbine-driven fuel pumps, has been officially quoted as 1700 mph. at 80,000 ft. USAF has disclosed that the X-1A has not yet been flown. But with either version of the X-1 the speed of 1989 mph. appears substantially impossible.

Bell is currently producing four X-1A research planes and is continuing work on the long-delayed X-2 research plane which has a design capability of well over Mach 3.0. Both types are scheduled for completion this year.

JATO for Transports

Proposed CAA manual for transport aircraft flight requirements, is meeting with industry engineering opposition in regard to its references to jet-assisted takeoff units. The transport manufacturers object to the idea of carrying two or three reserve sets of JATO, arguing that the factors that would create the need for reserves might also destroy the reserves, so that no matter how many units were carried there would be no re-

Credits for X-1

Proposal that the Institute of the Aeronautical Sciences sponsor a project to establish an authentic history of "important events such as progress leading to man's first supersonic flight," has been made by Robert M. Stanley, former Bell Aircraft Corp. vice-president and chief engineer, now head of his own company, Stanley Aviation Corp., Buffalo. Stanley's proposal followed a statement attributed to Bell Aircraft that supersonic X-1 research plane was designed by Robert J. Woods, now Bell's chief engineer. Stanley said the statement was "an injustice to the team that designed the airplane."

Stanley cited Benson Hamlin, Bell project engineer, as the X-1 designer "if I had to name a single person." Men who "made it a practical reality" include R. J. Sandstrom, now Bell executive chief engineer; Stanley W. Smith, Bell project engineer; Richard H. Frost, former Bell engineer, now with Stanley's company, "and a hundred other people," Stanley said. Woods and the Bell company made no comment on the Stanley statement.

serves. Problem is rather of establishing the reliability of JATO units under expected airline operating conditions, the manufacturers contend. It is recommended that the amount of JATO used on a transport be unrestricted within limits of controllability, and that if the all-engine takeoff terrain clearance is marginal as a result of using JATO for one-engine-out performance requirement, that the rockets be used for all takeoffs. The proposed manual states that "it now appears that some of these units are sufficiently reliable to be used in determining performance and performance requirements." Manual would require two additional reserve sets of rocket units, in addition to sets for use, if the duration of a single set of JATO is less than 1½ min., or one reserve set if the duration is more than 1½ min.

Helicopter Towing

New details on the procedure of helicopter towing as practiced experimentally by USAF at Wright Field, in-

dicate that is a somewhat different procedure from the towing of gliders. The helicopter takes off under its own power, and hooks on in midair to the cable dangling from the fixed-wing tow plane, instead of being "picked up" or launched in a tow. After the helicopter and tow plane make connections the helicopter gradually reduces its power until it finally cuts its engine completely, while the forward momentum from the towplane keeps the rotors going in auto-rotation. Object of the tow is to extend the copter's range.

Airline Subsidy

Airlines will be the target of charges of "government oversubsidization" from two new congressional quarters this session: The Senate Interstate and Foreign Commerce Subcommittee on Communications, headed by Sen. Ernest McFarland (D. Ariz.) and the Subcommittee on Domestic Land Transportation, headed by Sen. Francis Myers (D., Pa.). McFarland has long been publicly sympathetic to Western Union Telegraph Company's claim that air-mail, with cheap rates made possible by government subsidization, has cut deeply into telegraph business and is an important cause for Western Union's current critical financial situation. The Myers subcommittee will give railroad interests a new sounding board for voicing their contention that mail pay subsidization makes it possible for airlines to offer uneconomically low passenger fares and capture traffic which should logically go to railroads. The groundwork for both investigations has been laid by professional staff members, and open hearings will be launched by both subcommittees in a few weeks.

Committee Change

Sen. Owen Brewster (R., Me.), former chairman of the Joint Congressional Aviation Policy Board, steps up to become No. 2 Republican in the Senate Interstate and Foreign Commerce Committee, as a result of the death of Sen. Clyde Reed (R., Kans.). On the GOP side, he is ranked only by Sen. Charles Tobey (R., N. H.). In the rather doubtful event of Republicans gaining control, Brewster would probably take over the Commerce Committee chairmanship, because Tobey is in line for the Banking and Currency Committee chairmanship. Republicans must win seven more seats, and hold the seats they now have in order to capture Senate control next November.

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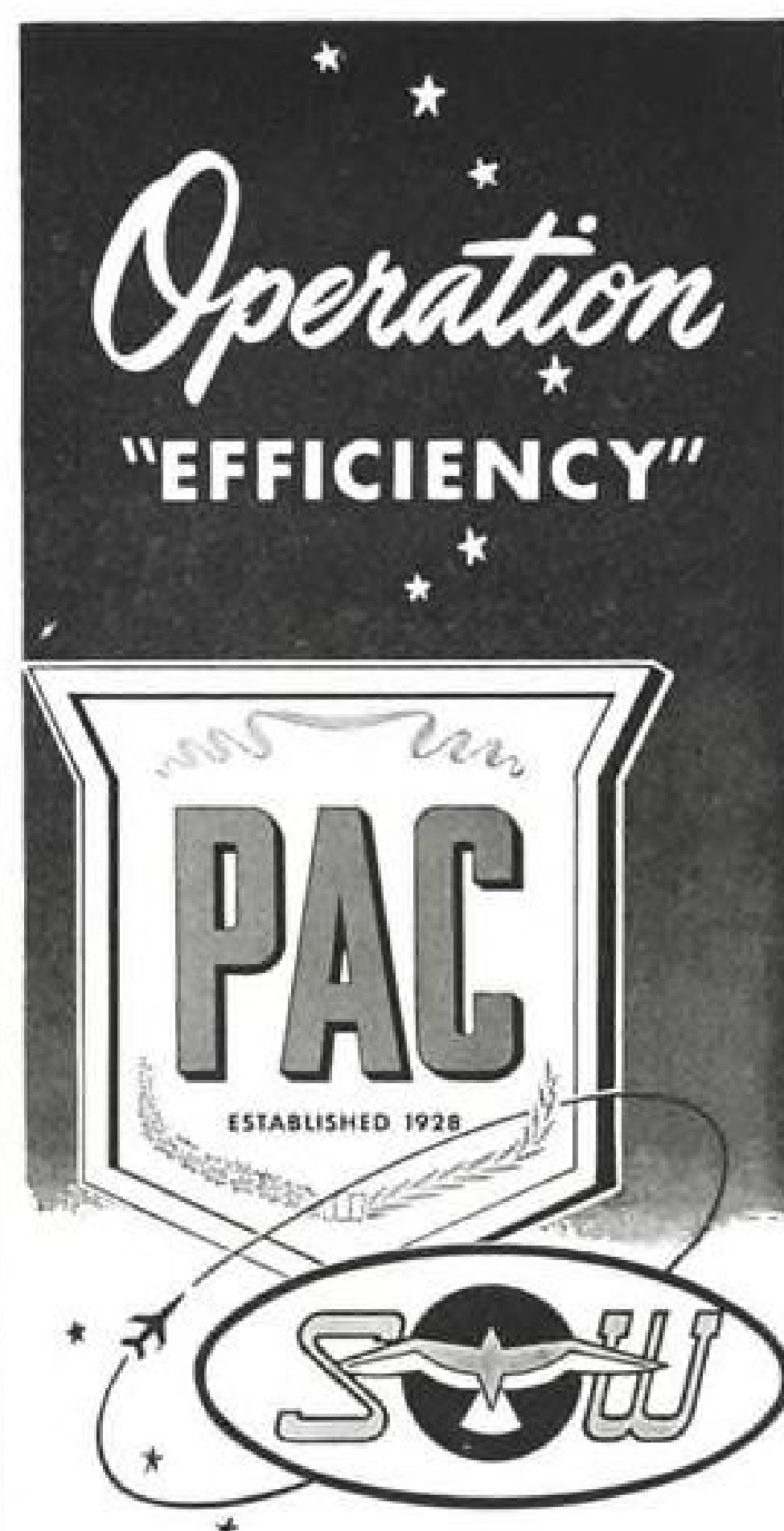
LAVELLE AIRCRAFT CORPORATION
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AVIATION CALENDAR

- Jan. 9-13—Annual meeting and engineering display, Society of Automotive Engineers, Hotel Book-Cadillac, Detroit.
- Jan. 10-27—Fourth annual Air Transportation Institute, conducted by American University in cooperation with CAA and ATA, Washington, D. C.
- Jan. 11-12—Air Force-Navy-industry meeting on aircraft installation radio interference limits, Washington.
- Jan. 13-15—All American Air Maneuvers, Miami.
- Jan. 16-17—Miami-Havana Air Cruise for private planes, conducted by Florida Air Pilots' Assn.
- Jan. 16-19—Plant Maintenance Show, sponsored by American Society of Mechanical Engineers and the Society for the Advancement of Management, Cleveland Auditorium, Cleveland.
- Jan. 17—38th annual dinner of the Traffic Club of Philadelphia, Benjamin Franklin Hotel, Philadelphia.
- Jan. 17-19—University of Illinois second annual Custom Spray Operators school, Urbana, Ill.
- Jan. 23—IAS annual Honors Night dinner, Hotel Astor, New York, N. Y.
- Jan. 23-26—IAS 18th annual meeting, technical sessions, Hotel Astor, New York, N. Y.
- Jan. 24—Ninth session, ICAO Council, Montreal.
- Feb. 18-26—National Sportsmen's Show, Grand Central Palace, New York, N. Y.
- Feb. 27-Mar. 3—Spring meeting, American Society for Testing Materials, Hotel William Penn, Pittsburgh.
- Mar. 6-9—47th annual meeting, American Road Builders' Assn., Netherlands Plaza Hotel, Cincinnati.
- Mar. 24—Fifth annual flight propulsion meeting, sponsored by the Institute of the Aeronautical Sciences, Carter Hotel, Cleveland.
- Mar. 28-31—National Plastics Exposition, sponsored by Society of the Plastics Industry, Navy Pier, Chicago.
- Apr. 4-6—Engineering and Maintenance conference, Air Transport Assn., Hotel Continental, Kansas City.
- Apr. 4-8—National Production Exposition, sponsored by the Chicago Technical Societies Council, Stevens Hotel, Chicago.
- Apr. 16-20—Annual business meeting, American Assn. of Airport Executives, Neil House Hotel, Columbus, Ohio.
- Apr. 17-19—1950 aeronautic meeting, Society of Automotive Engineers, Hotel Statler, New York City.
- May 5-6—Midwestern conference on fluid dynamics and the national meeting of the American Physical Society, fluid dynamics division, University of Illinois, Urbana.
- June 26-30—53rd annual meeting, American Society for Testing Materials, ninth exhibit of testing apparatus and related equipment, Chalfonte-Haddon Hall, Atlantic City, N. J.

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"OPERATION EFFICIENCY"



NEWS DIGEST

DOMESTIC

Eastern Air Lines has filed a \$500,000 damage suit against Capt. Erick Rios Bridoux in Washington, D. C., District Court, charging the Bolivian pilot was responsible for the collision with an EAL DC-4 near Washington National Airport, Nov. 1. The suit covers only the destruction of the DC-4 and does not mention liability for the plane's 55 occupants who were killed.

Jacquelin Cochran established a new world speed record for propeller-driven aircraft, flying an F-51 around a 500 km. course at a speed of 444 mph. Flight was under controlled conditions set by the Federation Aeronautique Internationale, with judges and timers appointed by the National Aeronautic Assn.

Gerrit Van Daam, aviation inventor, claimed to have devised first machine gun-propeller synchronization, died in Buffalo after a six-months illness. He was 56. Van Daam also invented an airplane wing de-icer, a propeller spinner de-icer and nonfrosting glass.

Personal aircraft shipments by nine companies totaled 141 in November, according to Personal Aircraft Council of the Aircraft Industries Assn. Shipments included 104 four-place and 37 one- and two-place aircraft, with total value of \$705,000. Previous month's shipments of 208 aircraft were valued at \$962,000. Total for 11 months of 1949 was 3255 personal aircraft shipped, at a value of \$13,802,000.

A federal judge has signed a stipulation between Pan American Airways and Trans World Airline prohibiting PAA from transporting passengers between Rome and the United States pending a ruling by the Civil Aeronautics Board (AVIATION WEEK, Jan. 1). Stipulation also says PAA will not "directly or indirectly, solicit passengers or cargo for such service or advertise such service to the public."

A \$1.05-an-hour minimum wage for government contracts in the aircraft industry has been recommended to Wage-Hour Administrator William R. McComb by his wage determination staff and is likely to be the figure finally chosen. Administrator's decision is being delayed pending determination of the exact limits comprising the aircraft industry. If certain "fringe" branches of the industry are excluded as planned, the hourly minimum may go still higher.

Northwest Airlines has taken deliv-

ery of tenth and final Stratocruiser. Pan American Airways also took delivery of the last of its Stratocruiser order of 20 and is assigning the craft to its Pacific-Alaska division.

Pan American Airways Corp was absorbed by Pan American Airways, Inc., and the name of the latter changed to Pan American World Airways, Inc., in a simplification of PAA's corporate setup.

FINANCIAL

Canadian Car & Foundry Co., for fiscal year ended Sept. 30, reported net profit, after taxes and other provisions, of \$1,395,663. Aircraft division has additional orders for modification of North American Harvard trainers and other work for the RCAF and is actively engaged in furthering sales of the Norseman utility aircraft.

INTERNATIONAL

Pilot error was reported as the probable cause of the KLM Royal Dutch Airlines crash July 12 near Bombay, which killed the crew of 11 and 34 passengers, including 13 U. S. newspapermen. Report was issued by an investigation committee of the Indian government. Five probable indirect causes were also indicated: Traffic control should have held the plane over the field until weather cleared or diverted it to another airport; crew was unfamiliar with topography; KLM lacked specific weather minima since it did not use the airfield regularly; pilot possibly was unaware of height of the hills near the airfield; and pilot failed to set controls to permit an adequate rate of climb. Sabotage was ruled out as a possible cause.

Argentine air communications were virtually severed by a strike last week of all foreign carrier ground personnel. Pan American has terminating flights in Montevideo, and Panagra was using Santiago, although other airlines still attempted to land at Buenos Aires. Workers were demanding an average 50 percent increase in wages.

Yugoslavia will be permitted to purchase American commercial aircraft engines and civil aviation equipment but will not be allowed purchases of any military-type aircraft engines. Export licenses reportedly have been issued for DC-3 type engines, tires, radios, hydraulic devices and spares. Approval came after recent signing of a civil aviation agreement between Yugoslavia and the U. S.

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All A.R.C. Airborne equipment is Type Certificated by CAA. It is designed for reliability and performance—not to meet a price. Installations for both single and multi-engined planes are made only by authorized service agencies. Write for further details or name of your nearest A.R.C. representative.



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PLANE FAX

Quick picture of PALO ALTO AIRPORT Calif.

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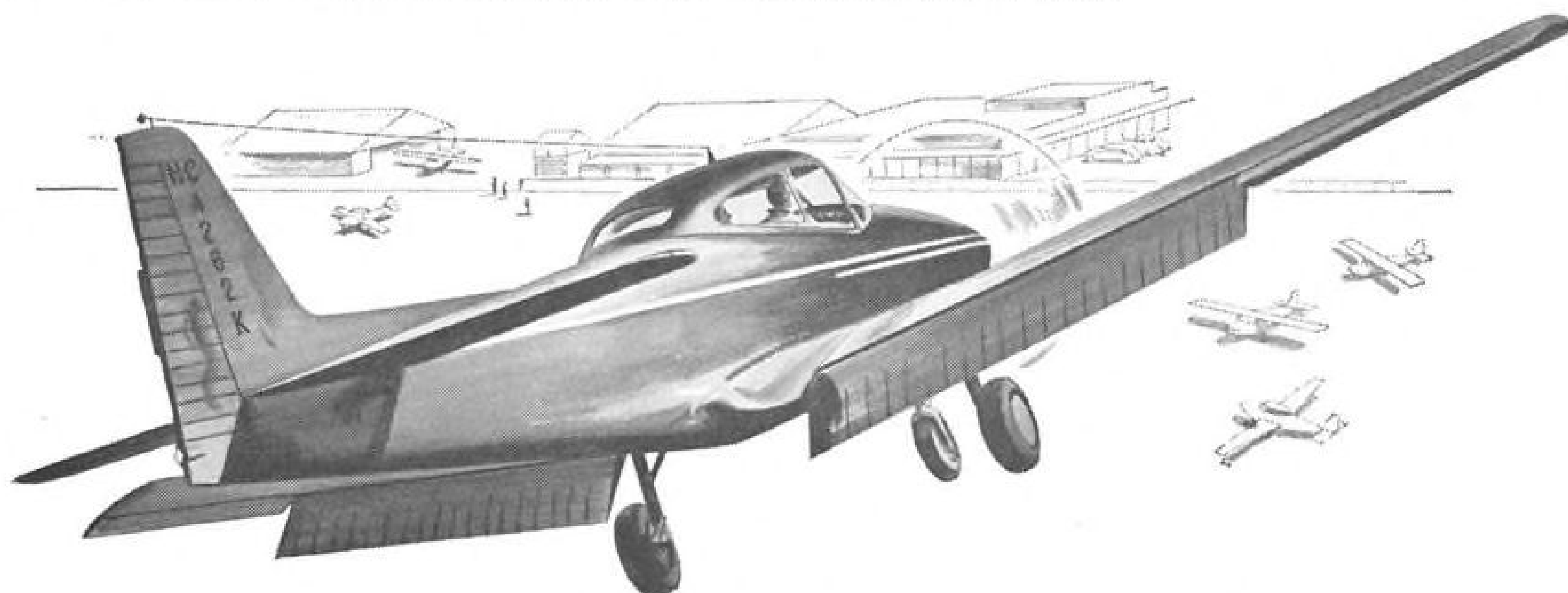
How airport owners help pilots keep costs down



Jack Nystrom, Superintendent of Maintenance of Palo Alto Airport, has started all planes at his field on RPM Aviation Oil "because it keeps engines running cleaner and freer, and cuts costs by reducing wear on vital parts. We use 'RPM' in our 16 Navions based at the field and in 115 ad-

ditional Navions that fly into the field for service and repair work. "One Continental E-185 was inspected after 1100 hours. The amount of engine wear was negligible, and the rings and valves were in excellent condition. The internal parts required only a washing off with a solvent.

"We feel that RPM Aviation Oil has done us a great service. And we will be only too glad to have you inspect any of our airplane engines when we tear them down so that you can see for yourselves what a really good oil can do."



Tips of the Month

"Let's get rid of 'pilot error'"

"These rules are fundamental—but easy to forget. They make flying safer—and more fun.

1. Keep the plane clean—inside and out.
2. Watch the load factor—don't overload.
3. Follow the preventive maintenance schedule.
4. Don't hedge-hop.
You may do it only once!"

Jack Nystrom, Supt. of Maintenance, Palo Alto Airport

Pilots now request new Chevron 80/87 Gasoline—enjoy more power, smoother take-offs

"Everybody at the field has been asking for the new Chevron 80/87 Gasoline," writes Mr. Nystrom, "and we've had very good comments from all the pilots—many of whom had been using other brand fuels. We've found that it ends take-off knocking and pre-ignition, and gives us more power than the old 80 octane gasoline. It's a particularly good deal for the pilots who had been using 91/98 gasoline—because Chevron 80/87 costs less and saves them money."



WHO'S WHERE

Changes

► Sales Appointments—Gilfillan Bros., Inc., has appointed Frank B. Tipton sales representative in the Southern California area for their aircraft parts division. . . . Edward P. Ryan has been named to the newly created post of district sales manager by National Airlines, for the New Bern and Wilmington, N. C., and Norfolk, Va., area. He was formerly NAL sales manager in Norfolk. . . . J. M. Klapp has been appointed superintendent of government sales for United Air Lines, with responsibility for developing business from government agencies on a nationwide basis.

Minneapolis-Honeywell Regulator Co. named Fred Kaiser, Midwest regional manager since 1942, field sales manager. Clarence L. Peterson becomes Midwest manager. Gavin S. Younkin is now Pacific regional manager and Ronald Cushing has become branch manager of the San Francisco office. . . . E. A. Trask, formerly head of John A. Roebling's Sons Co.'s San Francisco office, is now manager of sales for the company's Chicago corporation. G. C. Bukowsky replaces Trask in the California corporation.

► New Job—James Hebden has been named assistant divisional comptroller for Allison division of General Motors, succeeding James Crooks. Hebden was formerly with the Buick-Oldsmobile-Pontiac division.

Rear Admiral Walter S. Macaulay, USN (Ret.), has been appointed assistant executive engineer in the Knolls Atomic Power Laboratory of General Electric Co. . . . American Oil Co. named J. J. Leu, vp-services and operations and Marc I. Schwartz, vp-sales.

Elections and Honors

► New Directors—Ansul Chemical Co. elected these new members of its board of directors: Leonard C. McKesson, vp-sales; Arthur C. Pope, vp-manufacturing; Stanley R. Holmquist, treasurer; and A. J. Whitford, president of the First National Bank of Marinette, Wis.

► New Officer—Arthur S. Versfelt has been elected treasurer-controller of Aircraft Engine & Parts Corp. He was formerly with Haskins & Sells and Price Waterhouse & Co.

► Honored—John L. Collyer, president of the B. F. Goodrich Co., has been made a chevalier of the Legion of Honor by the French Republic. . . . Harold J. Roig, recently retired president of Pan American-Grace Airways, and a member of its board, was honored for 20 years of service to the airline. Roig was presented with an album of photographs, representing some of the highlights in the company's early development.

INDUSTRY OBSERVER

► Remainder of War Assets Administration's surplus aircraft components, of original value of \$200 million will be cleaned out by its successor agency, General Services Administration, by Jan. 30, in a series of sales following abolition of WAA at year's end.

► If regional technical CAA supervision continues under the new proposed optional plan to give manufacturers of personal aircraft responsibility for certification of their planes, manufacturers see little advantage, but if the supervision can be centralized in Washington, thereby eliminating considerable regional red tape, several of the manufacturers are expected to go for the new plan.

► Battelle Memorial Institute, Columbus, Ohio, is now a key basic research establishment for the USAF, as the recent award of six new USAF research contracts to the institute indicates.

► Boeing Airplane Co. at Wichita has modified the controls of the XL-15 scout liaison plane increasing rudder travel and adding tabs for increased aileron control, in order to get quicker response to controls at slow speeds. Meanwhile YL-15s are undergoing an evaluation by Army Field Forces at Ft. Bragg, N. C.

► Inquiries regarding CAA certification for the new junior-size jet engine developed at Boeing-Seattle in turbojet (Model 500) and shaft power (Model 502) versions, indicate that the Seattle manufacturer may seek commercial approval for the engine soon. Model 500 develops 180 lb. thrust, while Model 502 develops 160 shaft hp. with a 200 hp. emergency rating.

► USAF has nudged Kaiser-Frazer Corp. out of Adrian, Mich., plant which the auto manufacturer was using for storage purposes, in order to use the plant for the big German aluminum extrusion presses which are expected to result in some new airframe manufacturing techniques. Air Materiel Command will operate the presses and allot time to airframe makers on an experimental basis. Presses have arrived in Adrian from Germany and are being assembled.

► Airworthiness technical sub-committee of the Air Coordinating Committee is recommending that no international airworthiness standards be prescribed either for transport jet aircraft or for helicopters until more operational experience is available, and that member states of ICAO shall be asked to exchange views on problems involving these aircraft in preparation for standards at a later time.

► An ICAO questionnaire on the establishment of various international categories of transport planes is expected to get a reply from the U. S. delegation that establishment of other categories than "A," the highest standard of performance safety, is impracticable until more is learned about effects of takeoff ability, crash ability, stay-up ability and weather, on the overall level of safety. This is in line with recommendation of the U. S. aircraft industry to Air Coordinating Committee (AVIATION WEEK, Nov. 14, 1949).

► Revision of radio interference limits for aircraft installation at a meeting of armed service and aircraft industry representatives in Washington, Jan. 11, is expected to result in improved procedures and reduction of inspection and testing costs. Meeting is an outgrowth of industry, Navy and Research & Development Board panel studies on interference.

► Bendix Scintilla magneto division has started production of an improved series of four and six cylinder high tension aircraft magnetos, using higher quality materials, and designed for improved performance, improved radio shielding, and improved serviceability, aimed principally at advanced engine and aircraft design in the lightplane field. Designations in the new series include: S4LN, S4RN, S6LN and S6RN. A dash number 50 is added for magnetos without impulse coupling; a dash number 51 is used with each designation if impulse coupling is supplied.

► An AIA survey of aircraft industry engineers indicates a general preference for the SAE-AST-ASM tensile-hardness conversion table used by other industries, over a table currently listed in federal specification QQ-M-151 based on Air Materiel Command test data compiled some time ago. Since the survey was made at AMC's request it appears likely that the SAE conversion table may eventually be adopted to replace the AMC table.

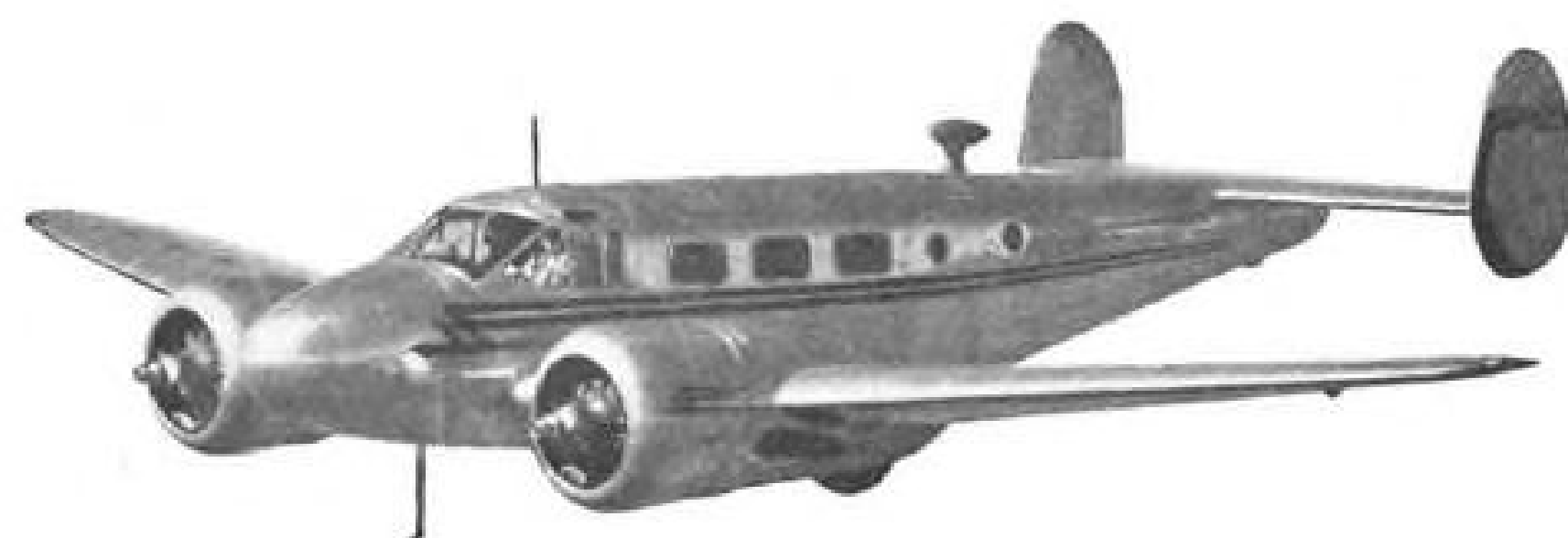


Beechcraft A35

The Beechcraft Bonanza cruises at 170 mph, carries four people in its comfortable cabin. Range is 750 miles; top speed, 184 mph. It combines safety, ruggedness, comfort, economy, speed and performance — is equipped for day, night, and instrument flight.

Beechcraft 18

The twin-engine Beechcraft Executive Transport is relied upon all over the world for fast, dependable performance. This 200-mph plane carries 7 to 9 passengers in luxurious comfort — can be operated readily out of small fields.



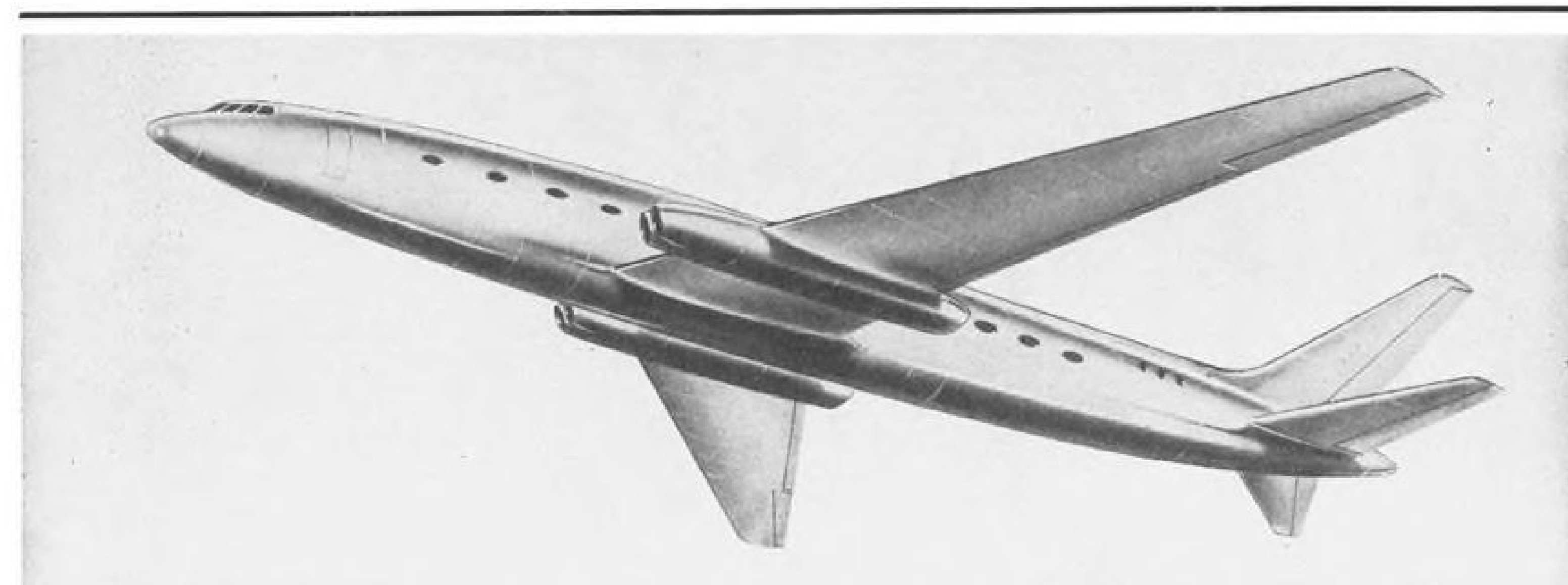
They outsold all others in their respective classes during 1949

Beechcraft

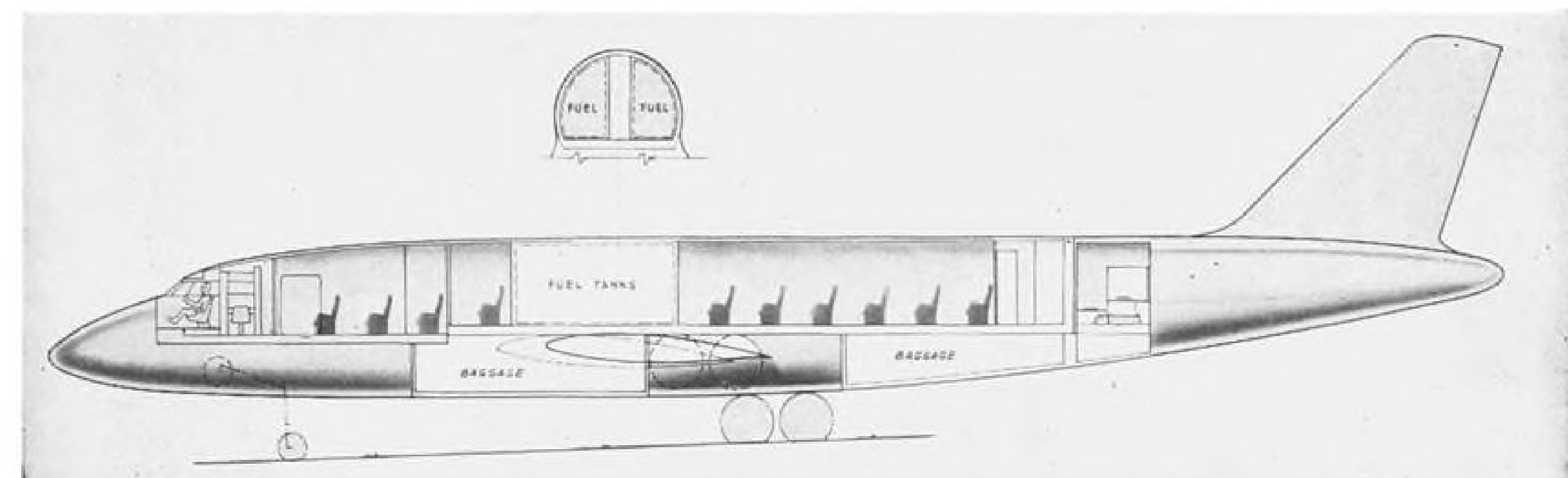
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In the U. S. — ALABAMA—Southern Airways Company, Birmingham . . . ARKANSAS—Little Rock Aircraft Sales, Little Rock . . . CALIFORNIA—Pacific Aircraft Sales Company, Burbank & Oakland . . . COLORADO—Midwestern Aircraft Company, Colorado Springs, Intermountain Aviation, Inc., Denver . . . DELAWARE—Atlantic Aviation Service, Wilmington . . . FLORIDA—Airplane Sales Division, Butler Company, Tampa . . . GEORGIA—Southern Airways Company, Atlanta . . . ILLINOIS—Airplane Sales Division, Butler Company, Chicago . . . INDIANA—Roscoe Turner Aeronautical Corporation, Indianapolis . . . IOWA—Hunter Flying Service, Cedar Rapids . . . KANSAS—Topeka Aircraft Sales and Service, Topeka; Harte Flying Service, Wichita . . . KENTUCKY—Owensboro Aviation, Owensboro . . . LOUISIANA—J. D. Reed Company, Inc., New Orleans . . . MASSACHUSETTS—Atlantic Aviation Corporation, Bedford . . . MICHIGAN—Francis Aviation, Lansing . . . MINNESOTA—Gopher Aviation, Inc., Rochester . . . MISSOURI—Fabick Aircraft Company, St. Louis . . . NEBRASKA—Prairie Airways, Inc., Lincoln & Omaha . . . NEW JERSEY—Atlantic Aviation Corporation, Teterboro . . . NEW MEXICO—Cutter-Carr Flying Service, Inc., Albuquerque . . . NEW YORK—Page Airways, Inc., Rochester . . . NORTH CAROLINA—Hawthorne Flying Service, Greensboro . . . OHIO—Ohio Aviation Company, Vandalia . . . OKLAHOMA—Aircraftmen, Inc., Oklahoma City; Tulsa Distributors, Inc., Tulsa . . . OREGON—Flightcraft, Inc., Portland . . . PENNSYLVANIA—Wings, Inc., Ambler . . . SOUTH CAROLINA—Hawthorne Flying Service, Charleston & Columbia . . . TENNESSEE—Cook's Aero Service, Alcoa; Capitol Airways, Inc., Nashville . . . TEXAS—Tradewind Airport Corporation, Amarillo; J. D. Reed Company, Inc., Dallas & Houston; G. E. Penn, Longview; Alamo Aviation, Inc., San Antonio . . . UTAH—Altair, Inc., Salt Lake City . . . WISCONSIN—Anderson Air Activities, Milwaukee . . . WYOMING—Casper Air Service, Casper.

. . . and Abroad — ANGOLA—SOREL, Luanda . . . ARGENTINA—Will L. Smith, S.A., Buenos Aires . . . BELGIUM—Intair, Ltd., Antwerp . . . BRAZIL—Companhia Carnasciali Industria e Comercio, Rio de Janeiro . . . CANADA—World Wide Aviation Agencies & Sales, Inc., St. Johns, Quebec . . . CHILE—Bunster y Bezanilla, Ltda., Santiago . . . CHINA—Wah Chang Trading Corporation, Shanghai . . . CUBA—Dr. Gustavo S. de Bustemante, Havana . . . EGYPT—Misrair, S.A.E., Cairo . . . FRANCE—Victor Helfenberger, S.A. Somatex, Paris . . . INDIA—Indamer Co., Ltd., Bombay . . . IRAN—Habib Sabat, Teheran . . . MEXICO—Jorge Pasquel, Mexico, D.F. . . . MOROCCO—Aircor, Tanger . . . NETHERLANDS—Technische Handelsmaatschappij, Hollanda N.V., The Hague . . . PARAGUAY—Nicolas Bo, Asuncion . . . PERU—Inter-Continental Trade Co., S.A., Lima . . . PUERTO RICO—West Indies Airways, San Juan . . . SIAM—Siamese Airways Company, Ltd., Bangkok . . . SOUTH AFRICA—Aviation Corporation of Africa (Pty) Ltd., Johannesburg . . . SWITZERLAND—Groupement Suisse de Representation Aeronautique, Neuchatel . . . TURKEY—Kantioti Turkish Company, Ltd., Istanbul . . . URUGUAY—Pike and Co., Ltd., Montevideo.



LOCKHEED jet transport proposals, of which this is one, show influence of military fighter design on planform, but . . .



INTERIOR ARRANGEMENT contains notable departures from present planes, particularly in use of fuselage fuel tanks.

Lockheed's Proposals for Jet Transports

Company has several design studies, but
also firm ideas on problems to be licked.

Burbank—Lockheed Aircraft Corp. is the dark horse in the turbojet transport sweepstakes. Although nothing tangible has yet emerged from the sprawling Burbank plant, competitors all regard Lockheed as the outfit to beat in the scramble for the jet transport market.

Like many other West Coast engineers, the Lockheed technicians have a drawerful of jet transport design proposals (see sketches above) but the Lockheed management has a drawerful of "ifs" it wants answered before taking a multi-million dollar plunge into the jet transport business.

►Gross on Financing—On the thorny

problem of financing, Lockheed President Robert E. Gross believes there are several more attractive methods than seeking special legislation to provide a government subsidy for jet transport prototype development. Best method from the manufacturer's viewpoint, Gross told AVIATION WEEK, would be for the airlines to pool their equipment requirements and then standardize on what they considered the best design proposal submitted by the manufacturers. Even a relatively small quantity of firm airline orders would spur manufacturers to build a jet prototype, Gross believes.

Next best method would be for the

U. S. Air Force to sponsor a jet transport competition and finance the building of a prototype that would be commercially satisfactory and also meet military requirements.

►Airline Health Problem—The financial health of the airlines, Gross points out, is a critical factor in the transport market. He believes that unless the Civil Aeronautics Board allows the airlines to accumulate some financial fat on their bones during the good years they will never be able to finance their equipment needs without additional government aid.

Another big "if" in the jet transport picture, according to Gross, is the operational assumptions on which all data on the economics of jet transports are now based. As an example, jet fuel is now much cheaper than high octane aviation gas, but if the demand for jet fuel



GROSS: U. S. airlines need fat.



SCHWARTZ: Foreign lines need dollars.



JOHNSON: Designers need CAA views.

Jet Transport Specifications

(Comparison of proposed Lockheed design with the de Havilland Comet)

	Lockheed	Comet
Gross wt.....	150,000 lb.	105,000 lb.
Passengers	40 to 50	36 to 48
Cruising altitude.....	37,500 ft.	40,000 ft.
Cruising speed.....	530 mph.	490 mph.
Range	3500 mi.	2140 mi.
	(Against 60 mph. head wind plus 45 min. re- serve)	(Against 50 mph. head wind plus 200 mi. re- serve)

surpasses high octane consumption the price situation will probably be reversed.

Gross indicated that a USAF proposal to operate North American B-45 multi-jet bombers on a test cargo run would be a step in the direction of providing accurate data to replace the assumptions now used. He also advised Americans to follow closely the progress of the de Havilland Comet and make use of its experience and operating data as much as possible.

Gross also feels that turbojet engines have not yet reached a state of sufficient reliability for commercial transport use. He believes that airframe people must wait for much more reliable jet powerplants before they can venture into commercial projects.

Location of the best market for jet transports is a problem that all West Coast sales departments are trying to solve. Lockheed's sales manager Len Schwartz believes that even dollar-short foreign airlines will scrape up the necessary dollars to buy American jet transports that offer the ability to tap the hard currency areas. Schwartz thinks the prime market requirement will be for a trans-Atlantic jet transport that will enable foreign airlines to earn American travel dollars.

► **Johnson on Problems**—Lockheed designer Clarence L. (Kelly) Johnson thinks the technical problems involved in jet transport building are smaller than those that confronted the aircraft industry when it produced the first Boeing 247 and Douglas DC-2.

Johnson points out that the military high-speed-flight research program that has already produced a crop of supersonic turbojet powered fighters has also produced a store of basic design data for high-speed jet transport design.

► **Stacking Problem**—"As a matter of fact if you took the planform of a good jet transport design and superimposed it on the planform for the Lockheed XF-90 penetration fighter, there would be little significant difference," Johnson informed AVIATION WEEK.

Among major problems to be solved in jet transport development, according to Johnson are:

• **Stacking.** Johnson points out that air traffic control is still being run according to 1930 vintage rules and that many improvements could be derived from military experience in fighter control and interception techniques. Some form of completely automatic approach to the landing runway will be required for jet transports to insure an accurate

approach under all types of weather conditions. The cost of this equipment should be measured against the high cost of fuel that would be consumed by jets during missed approaches and "loitering in old-fashioned traffic stacks."

• **Fuel location.** The large quantities of fuel required by a trans-Atlantic jet transport will mean that substantial quantities of fuel must be carried in the fuselage. Wing tanks are another possibility, but in Johnson's opinion they offer too great a hazard in wheels-up emergency landings. Johnson proposes to locate fuselage fuel tanks above the cabin floor level over the center section of the wing in double-cell-type tanks.

(This is the third of a series on U. S. jet transport development problems. These articles were prepared by AVIATION WEEK Editor Robert H. Wood and News Editor Robert Hotz who recently interviewed key executives and engineers of leading West Coast transport manufacturers. They were written before Mr. Hotz left AVIATION WEEK Jan 1 to join the public relations staff of United Aircraft Corp.'s Pratt & Whitney aircraft division.)

• **Landing and take-off aids.** Johnson believes that a light type of afterburner designed specifically for commercial use will be standard equipment for jet transports. Such afterburners will provide up to a 40 percent increase in engine power for intervals up to 30 minutes, he believes. To keep landing runs within the dimension of current major airports, Johnson believes designers must "dirty up" the plane with artificial devices to destroy wing lift after touchdown. Reverse JATO and the drogue chute are other possibilities.

• **Pressurization.** Jet transport cabin construction must be as pressure tight

as submarine hulls, Johnson believes. At 40,000 ft. there must not be even a remote possibility of blowing a cabin door or window on a commercial transport. He also points out that Civil Air Regulations now require outward opening doors which would be impossible for operations on a high altitude pressurized jet transport. Jet engines simplify pressurization problems since cabin air can be drawn directly from the compressors and heat provided from the tail pipes without any auxiliary superchargers or heaters—both now a subject of major annoyance.

• **Crews.** A four-man crew including two pilots, flight engineer and radio-radar operator will be required for jet transports, Johnson believes. He also thinks a thorough training program will be required for airline pilots to get rid of their present concepts and learn the proper techniques for jet transport operations.

• **Gust loads.** Jet transports must be of heavier construction to take the loads imposed by high altitude gusts entered at high speed, according to Johnson. He points out that sweep-back wings have an alleviating effect on gust loads. He cited his own experience of bouncing around in turbulence in a straight-winged TF-80 while the sweptwing XF-90 flew smoothly alongside. Johnson also believes that shock-mounted or spring-loaded seats are a possibility to aid passenger comfort in the sharp, short bumps that a jet transport would take. Another must for the jet transport will be airborne search radar capable of locating thunderstorms, according to Johnson.

Johnson also believes that the aircraft industry designers should keep the Civil Aeronautics Administration informed on their proposals and try to get firm commitments from CAA on whether it will approve or reject their suggestions before a firm goes to the

expense of building them. Johnson pointed out that CAA's position on these controversial points in jet transport design must be clearly stated before any manufacturer can afford to proceed on building a jet transport prototype.

Congress' Problems in Aviation

Fundamental military and civil issues face returning legislators, with budgets, safety and B-36 topping list.

A heavy aviation program is on the agenda of the new session of Congress as it convenes in Washington.

Up for legislative action are:

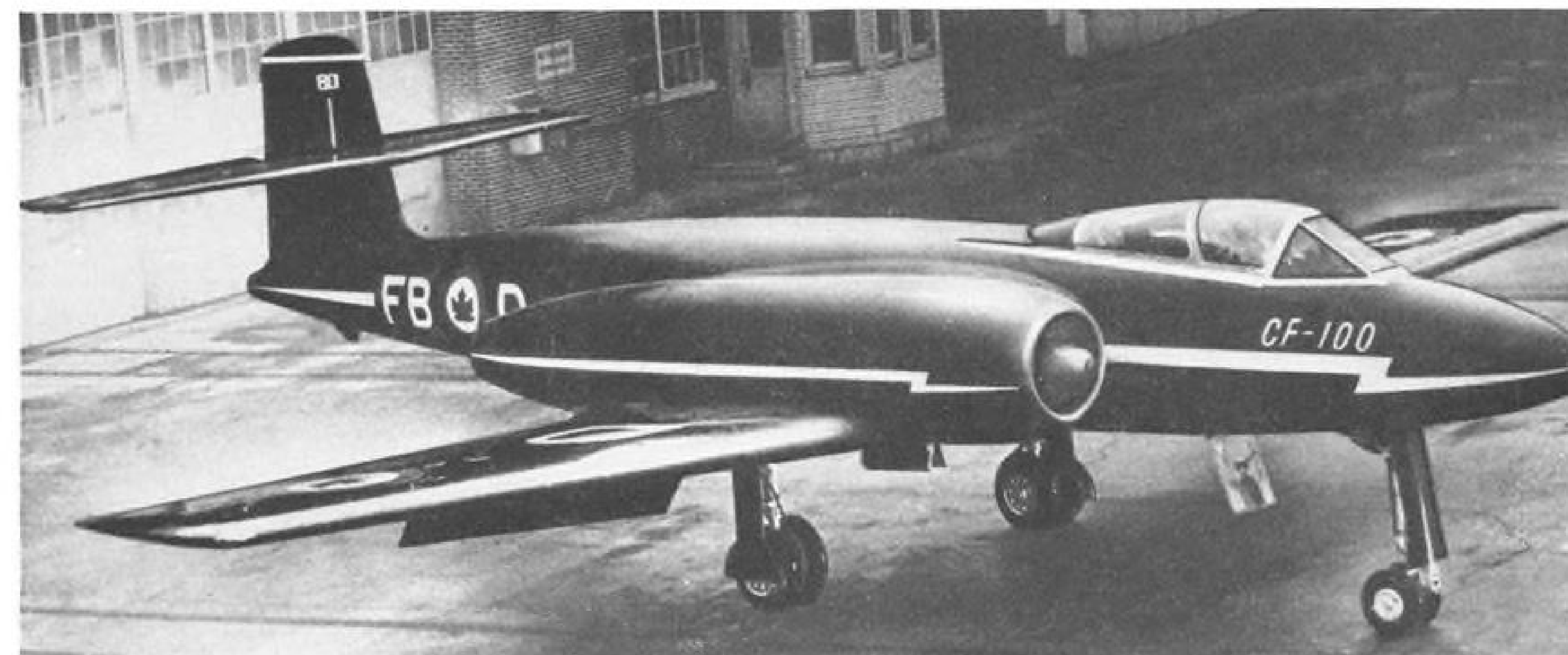
• **B-36 investigation.** The House Armed Services Committee is expected to back the Air Force decision to center today's defense on the long-range B-36 strategic bomber in a forthcoming report evaluating explosive testimony at hearings last summer airing the USAF-Navy controversy over the plane. The committee's professional staff has prepared a digest of issues for consideration at the committee's first meeting. Chairman Carl Vinson (D., Ga.) has announced the report will cover the ouster of Adm. Louis Denfeld as chief of naval operations.

• **Appropriations.** USAF is expected to get a \$4.1 billion allocation in the President's \$13.5 billion defense budget for the 1951 fiscal year. Congress voted USAF \$6 billion this year. An all-out economy drive in Congress to minimize deficit spending points to cutbacks in next year funds for Civil

Aeronautics Administration, Civil Aeronautics Board, National Advisory Committee for Aeronautics, Naval Aviation—as well as USAF.

• **Commerce Department reorganization.** The President is expected to recommend a reorganization plan shortly, to become effective in 60 days unless vetoed by Congress. Under the Hoover Commission's proposal to the President, CAA would be merged into an over-all "transportation service." CAB would keep its independent status. Secretary of Commerce Charles Sawyer, however, has urged that the department be given control over the Board, as well as Interstate Commerce Commission and the Maritime Commission, so that a uniform subsidization policy can be applied to all forms of transportation.

• **Commercial aviation.** Senate Interstate and Foreign Commerce Committee's investigation of air commerce awaits receipt of two reports. A Department of Defense report presenting the national defense requirements for



CANADIAN ALL-WEATHER FIGHTER

First photo of the Avro Canada CF-100 all-weather fighter shows the extremely long nacelles housing the twin-jet's powerful Rolls Royce Avon engines of 7500 lb. thrust each, mounted above the wingroot and close to fuselage. Horizontal tailsurfaces are mounted high on the tailfin. Small diameter double

nosewheel and double main wheels are provided. Otherwise design is relatively conventional. The two-place fighter is designed for speeds of around 675 mph. carrying night interceptor radar, and four cannon. Wing incorporates droop-snoot flap, similar to that used on Grumman F9F. The CF-100 is

making taxi tests in preparation for first flight at Malton Airport near Toronto with W. A. Waterton, crack British jet test pilot for Gloster Aircraft, at the controls. The Avro plane was first described and pictured (in sketch form) in AVIATION WEEK, Nov. 8, 1948.

commercial aviation support; and a report by Ernst & Ernst, management consultants, proposing formulas for determining "service" air mail pay. The defense study is expected to influence heavily congressional attitude toward contract carrier regulation, cargo operations, airline subsidization and government financing of commercial cargo and transport aircraft. The Ernst & Ernst study will pave the way for legislation separating "service" and subsidy payments.

• **Air crashes.** Professional staff of House Interstate and Foreign Commerce Committee is laying the groundwork for an early investigation of air crashes. It is expected to culminate in a recommendation for creation of an independent Air Safety Board, long advocated by the committee's chairman, Rep. Robert Crosser (D., Ohio).

• **Transportation tax.** Outlook for reduction or complete repeal of the 15 percent tax on transportation of persons and the 3 percent tax on cargo is excellent. The President is expected to recommend reduction, with loss of revenue off-set by increases in corporation taxes. House Minority Leader Joseph Martin (R., Mass.) will press for repeal. Legislation reducing the tax on persons to 10 percent, approved by the Senate Finance Committee, is due for early action. Sen. Warren Magnuson (D., Wash.) and Sen. Harley Kilgore (D., W. Va.) have submitted an amendment eliminating the cargo tax.

• **Plant relocation.** Controversial problem of strategic location of key defense plants and installations will be taken up by the Joint Congressional Atomic Energy Committee in its hearings on defense for atomic warfare, scheduled to open shortly. Meanwhile, a group of congressmen from West Coast and eastern industrial states have joined forces for a drive against the reported procurement program to minimize orders to their "key target" areas and disperse military business over the country. Leaders of the group are Sen. Magnuson and Rep. James Patterson (R., Conn.).

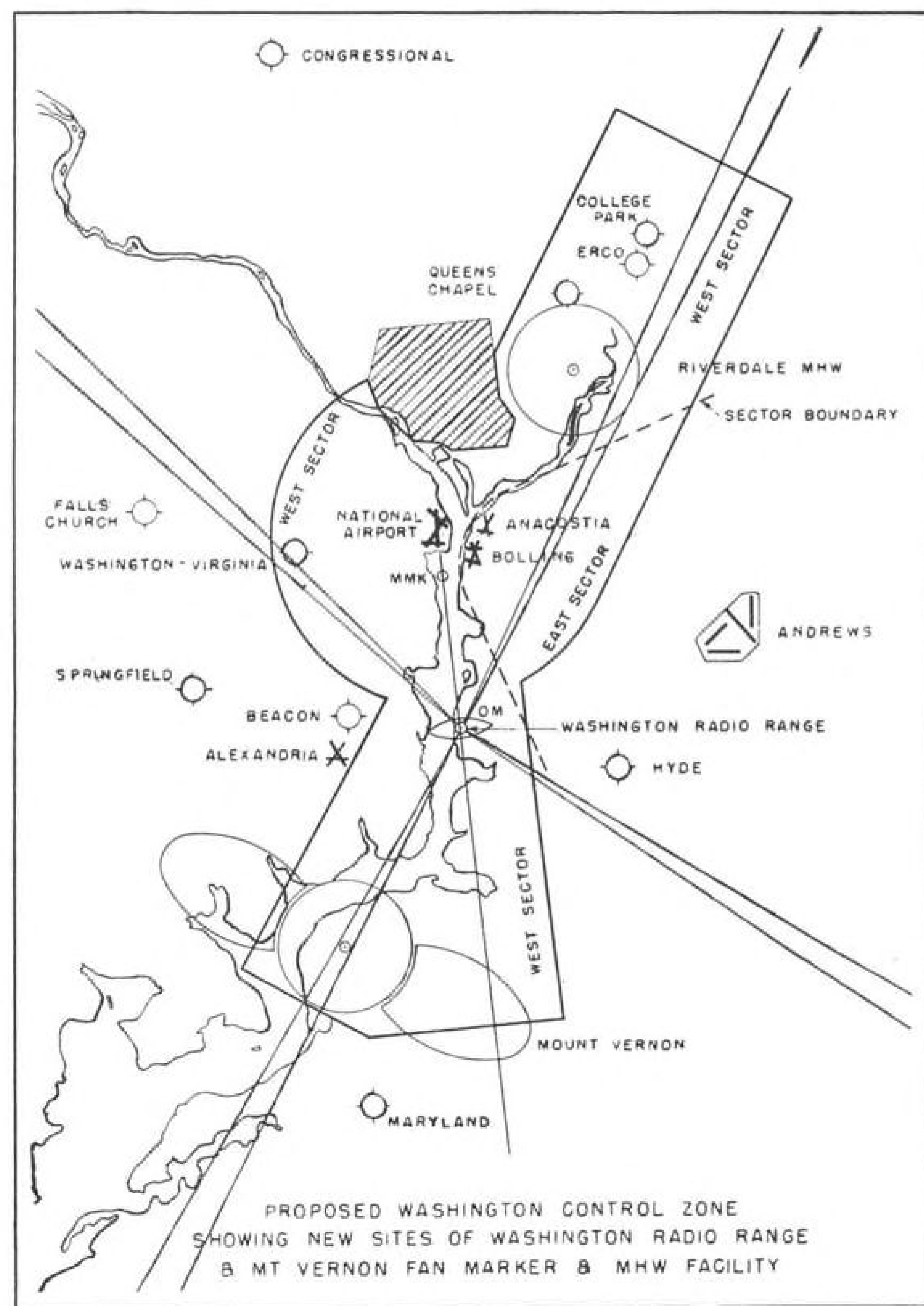
• **Monopoly investigation.** Monopoly subcommittee of the House Judiciary Committee, headed by Rep. Emanuel Celler (D., N. Y.), will continue to investigate the effect USAF procurement has had on economic concentration in the aircraft industry. The probe will be delayed until an investigation of the steel industry is completed. The subcommittee may later look into concentration of business in the airline field.

• **Investment reluctance.** Joint Committee on the Economic Report, headed by Sen. Joseph O'Mahoney (D., Wyo.), will study reasons behind public reluctance to invest in airline and aircraft stocks—as well as general public resist-

ance to risk investments. Committee seeks ways and means to overcome the reluctance and stimulate private enterprise economy.

• **Air installations.** The \$600 million national defense public works bill and legislation authorizing an air academy have top priority for early consideration. The public works bill, already passed by the Senate, provides for a

\$30 million expansion at Muroc Air Force Base, a \$25 million expansion at Limestone, (Me.) AFB, a \$10 million expansion at the Inyokern, Calif., Naval Ordnance Test Station, and other air installation expansions. The academy bill is entangled in a fight over its location. USAF's selection, Randolph Field, Tex., is expected to win out over other suggested sites.



New Plan for Washington Traffic

CAA's plan, which is aimed at adding more restrictions to traffic in the zone, meets strong opposition from AOPA.

By Alexander McSurely

A four-point plan to extend the Washington air traffic control zone and put additional restrictions on traffic operating in the zone is being circulated

by CAA Federal Airways acting Director Joseph Blatt. This is aimed at preventing collisions such as that between an Eastern Airlines DC-4 and a Bolivian pilot in a P-38.

Plan evoked sharp immediate criti-

cism from Aircraft Owners and Pilots Assn., which made the claim that existing regulations "thoroughly cover any Washington area traffic problem" if pilots will abide by them and if they are promptly and thoroughly enforced.

Here is what the plan would do:

- Extend the existing Washington control zone to 15 mi. northeast of Washington National Airport.
- Divide the control zone into east and west sectors to aid in segregating operations between Washington National Airport, Anacostia NAS, and Bolling AFB.
- Require functioning two-way radio for planes operating in the zone and require air traffic control clearances before operating in the zone.

(Exception: Aircraft operating to and from and in the traffic pattern of airports in the west sector other than Washington National are not required to comply if there is one mile visibility, if the plane does not fly more than 700 ft. above the ground, and if the plane is either in the traffic pattern or taking the shortest route across the zone to or from the airport. Military aircraft in the east sector may operate in and out of Anacostia and Bolling fields without traffic clearance from Washington National tower if operations in east sector are at or below 1500 ft., and weather is 2000 ft. ceiling or higher with 3 miles or more visibility, and military tower has given traffic clearance, and military tower is in coordination with Washington tower to prevent conflict in using runways.)

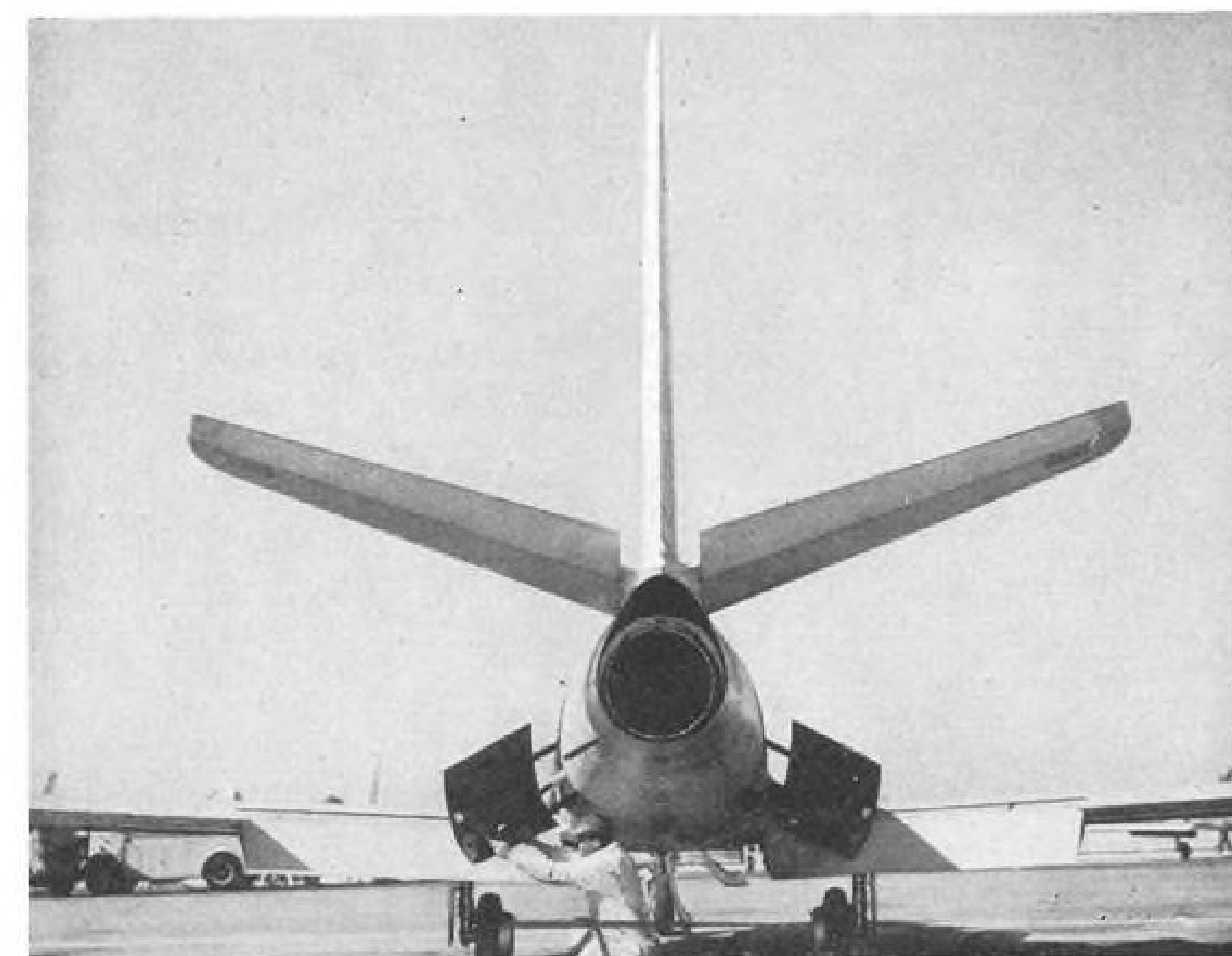
- Provide pilots operating in area with "essential traffic information."

AOPA's criticism of the plan, voiced by J. B. Hartranft, Jr., general manager, attack it as unnecessary and complex, and as actually increasing hazards in the area.

"How can such a plan be effective when in the preparatory meetings which preceded announcement, in which AOPA participated, even some of the country's most skilled airline and military flyers were frequently confused?" AOPA asked.

"Three airports (Erco Field, Queen's Chapel and College Park) are arbitrarily included in the new (extended portion) control zone, thereby raising the legal weather minimums to a point where the average non-airline civil pilot would no longer be able to use those fields legally in present safe minimum weather. Just by trying to land under those conditions, a pilot would automatically be in violation, a situation different from any anywhere else in the U. S. That confusion would automatically endanger another pilot flying on instruments relying on the new regulations to protect him."

Requirement that pilots fly no higher than 700 ft. above the ground in the



NEW F-86A DETAIL PHOTOS

Pictures at North American Aviation's flight line on Los Angeles Airport show interesting details of F-86A Sabre jet fighters ready for delivery to the USAF. Dive brakes open from the sides of the high-speed fighter's fuselage, when pushed by hydraulic arms against the slipstream, to

enable the fighter to make a steeper dive or to make a quick landing. Trained crews can change the F-86A's turbojet powerplant (GE J-47) in one hour, thanks to the construction which joins front and rear fuselage together just aft of wing, with only four bolts.

control zone (see exception above), was branded "a rather startling bit of official whimsy to which AOPA must object strenuously." It was pointed out that there are a number of radio towers in the Washington area "a good deal higher than 700 ft."

AOPA appealed for better enforcement of existing regulations against reckless pilots, instead of more restrictive regulations for the great majority of pilots. The association pointed out that the low-frequency radio transmitters widely used by the majority of personal planes "do not have range necessary for safe operation at the dis-

tance arbitrarily set for the northeast and southwest legs of the proposed zone." It concluded with a general observation that improved visibility in all aircraft would make for greater traffic safety.

(The AOPA blast on the CAA proposal is significant in that the Association is the strongest and the most outspoken spokesman for private flying interests, as a consumer group with some 30,000 members. With the decline of National Aeronautic Assn. AOPA is expected to inherit the assignment as U. S. representative of the Federation Aeronautique Internationale soon.)

Provisions of the proposal for segregating military aircraft from the Navy and Air Force bases, generally would require them to operate to the east and civil aircraft to the west of the Potomac and Anacostia Rivers when in the immediate vicinity of the National Airport. Only exception would be a few "VIP" military aircraft specifically authorized to use National Airport. The requirement however would not prevent "properly equipped" military aircraft from making instrument approach to the Bolling and Anacostia bases through the west sector.

Jurisdiction over airspace within the control zone up to 5000 ft. would be assigned to the Washington tower, with 4500 ft. as the top altitude to be assigned to an aircraft.

Washington Air Route Center would have jurisdiction over airspace above 5000 ft., with the lowest altitude for it to use in aircraft assignments at the 5000 ft. level. Planes entering the zone at 5000 ft. or above, are subject to clearance from the center.

Airplanes cleared into the traffic pattern would be operated at not lower than 1200 ft. until receiving landing sequence instructions. Clearance into pattern would specify right or left pattern and pattern altitude, traffic information about other aircraft.

Original date set for industry comments on the CAA proposal was Dec. 26, but CAA recognized the inadequacy of the time limit and has extended it without setting a definite limit, as of

the present. The AOPA comment, one of the first to get in, was dated Dec. 23, and barely got under the original limit.

Turboprop Seen Best for Long Range

A. E. Russell, chief designer, Bristol Aeroplane Co., presented strong evidence that the best field of application of the turboprop engines lies in long-range aircraft, in which it can prove even more economical than the current reciprocating engine, in his presentation of the 13th Wright Brothers lecture. The historic session is sponsored by the Institute of the Aeronautical Sciences and held each Dec. 17 in Washington, D. C.

Russell, designer of the huge Bristol Brabazon I, in the second model of which turboprop power plants are to be installed, gave a comprehensive review of turboprop characteristics and an analysis of design features that determine the performance and efficiency of turboprop-powered aircraft. Principal accent of his paper was on structural analysis of transport aircraft powered by this high-powered, low-vibration engine. Russell believes that the combination of small size, simplicity, reduced maintenance, low vibration and light weight of the turboprop engine greatly simplifies the problem of engine mounting and aircraft structural design.

The meeting was directed by William Littlewood, vice-president-engineering, American Airlines, and featured prepared comments on the lecture by R. M. Hazen, Allison; N. J. Hoff, Polytechnic Institute of Brooklyn; Ray D. Kelly, United Air Lines and Abe Silverstein, NACA Cleveland Laboratory.

Glenn Martin Sells Chemicals Division

Sale by Glenn L. Martin Co. last week of its chemicals division to U.S. Rubber Co. at a price reported in excess of \$6.5 million put the Baltimore airplane manufacturer exclusively in the aviation business, and improved its liquid capital position decidedly.

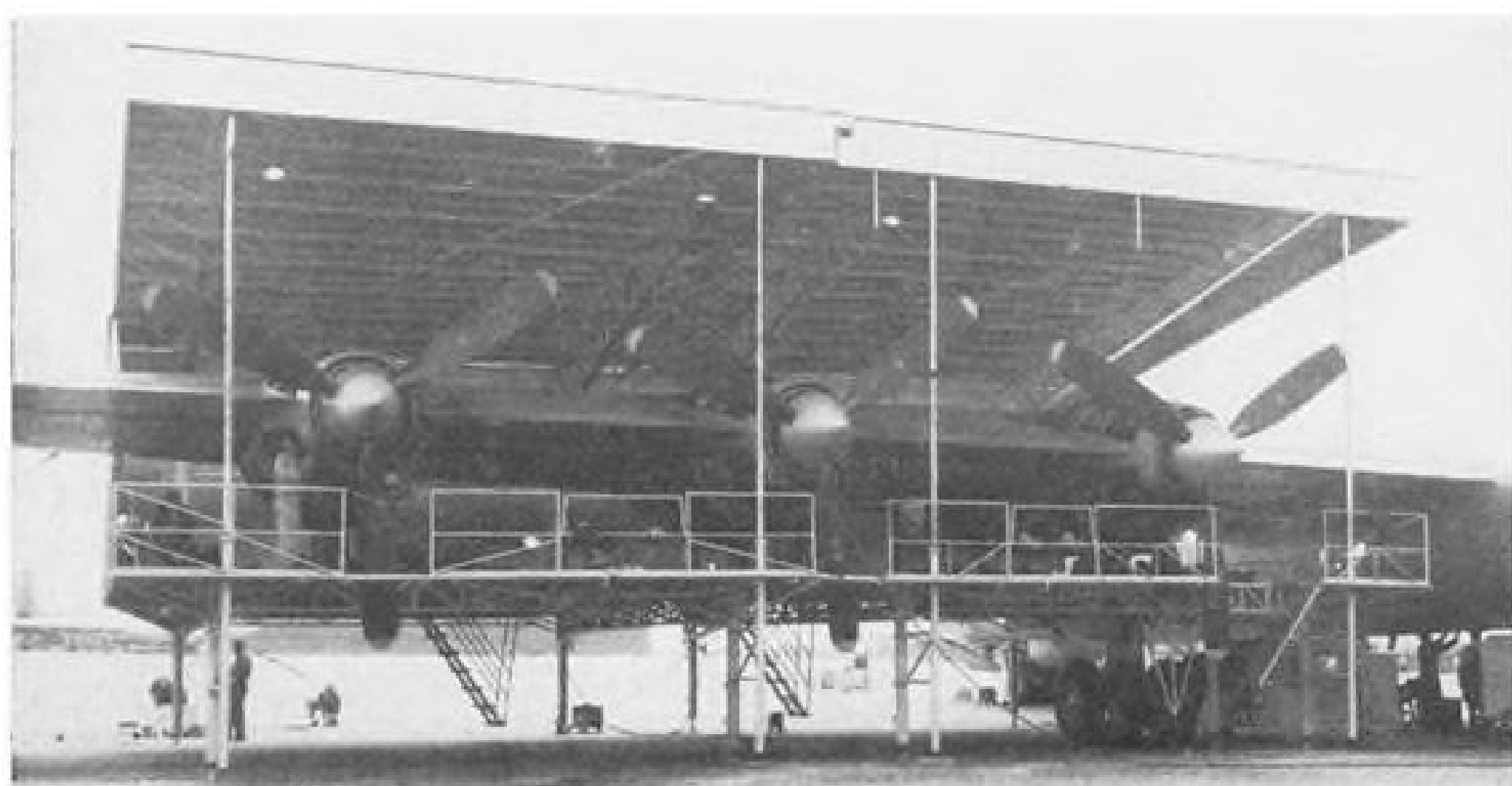
In the transaction U.S. Rubber acquired the Marvinol vinyl resin plant at Painesville, Ohio; laboratory equipment in Baltimore; patents, and the trade name Marvinol, and other assets of the chemical division. The Painesville plant, third largest vinyl plant in the U. S., and one of the most modern of its type, will continue to produce Marvinol vinyl resin for sale to plastic products manufacturers, as a part of U. S. Rubber's Naugatuck chemicals division.

Sale completed a Martin project to divest itself of all non-aviation interests and concentrate its efforts in development and manufacture of airframes, special weapons and closely related products.



B-36 ALL-WEATHER DOCKS

Three of these four-section all-weather service docks for B-36 bombers have been completed at the Ft. Worth Convair plant with more being constructed. Docks extend 60 ft. on each side of B-36 wing, allowing workmen to work on engines and wing, regardless of outside weather conditions. Docks are piped and wired for electricity and compressed air, and have built-in floodlights, and mobile heating units. Convair is also planning permanent ramp docks, into which B-36s can be moved. Mechanics will be able to remove a B-36 from a permanent dock in 15 minutes, and will be able to remove a mobile dock from a B-36 in 30 minutes.



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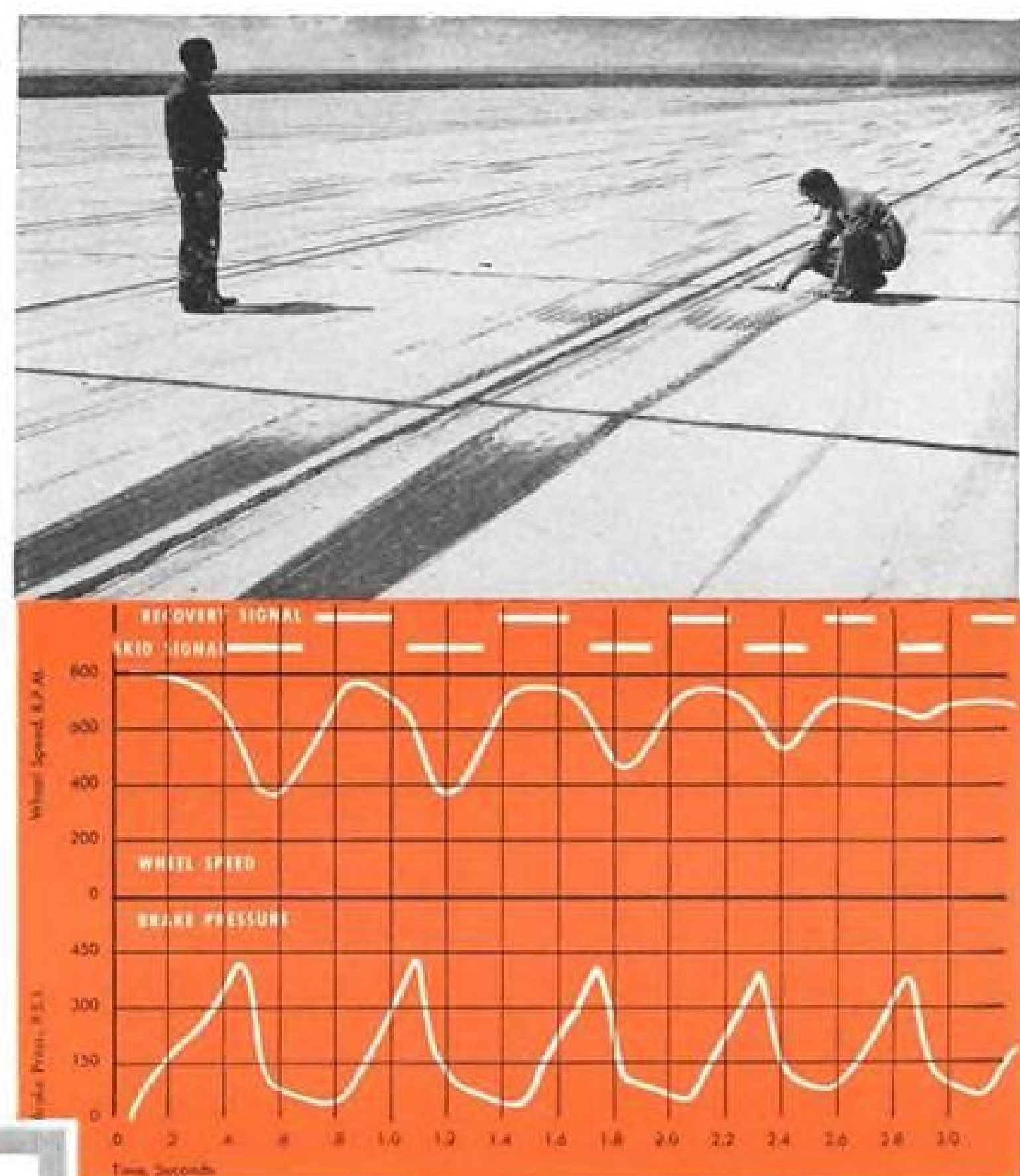
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11. Long life with reliable operation has been proved by prolonged testing of the system's components.
12. Installation of automatic control into existing pneumatic and hydraulic brake systems requires only minor changes due to the remote control features of the electrical system.
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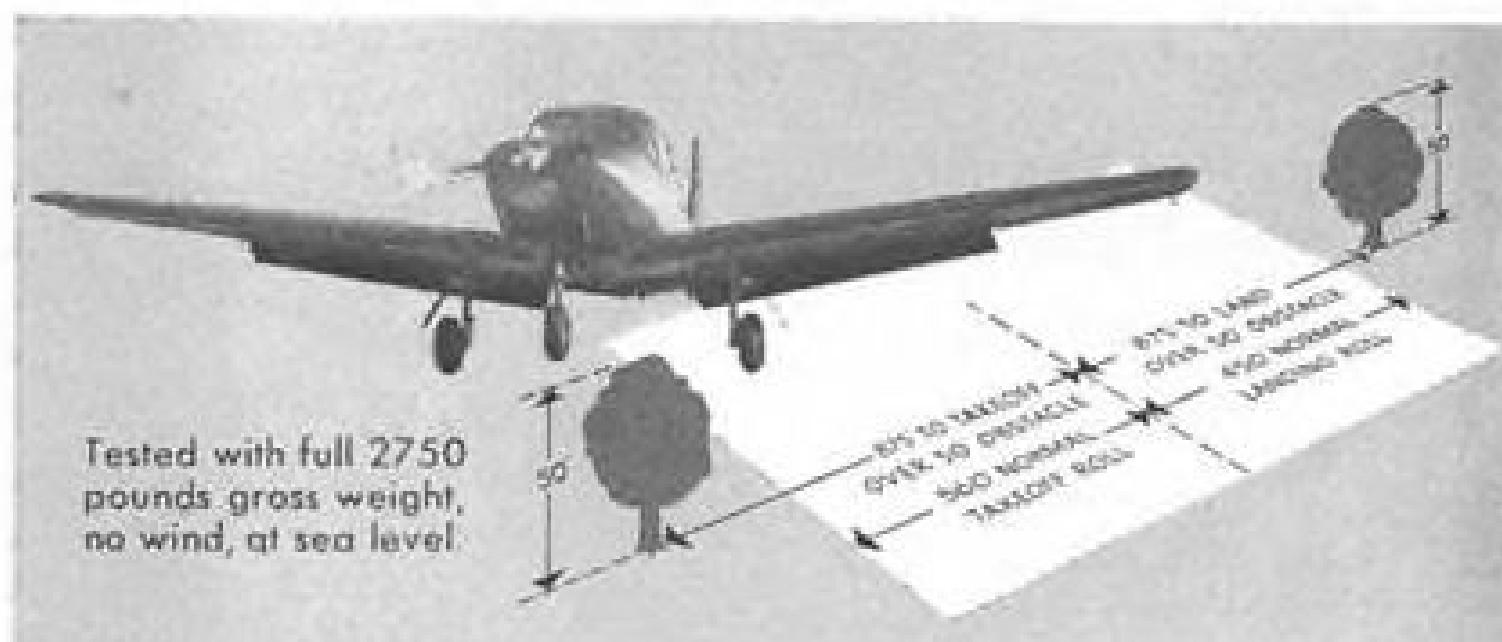


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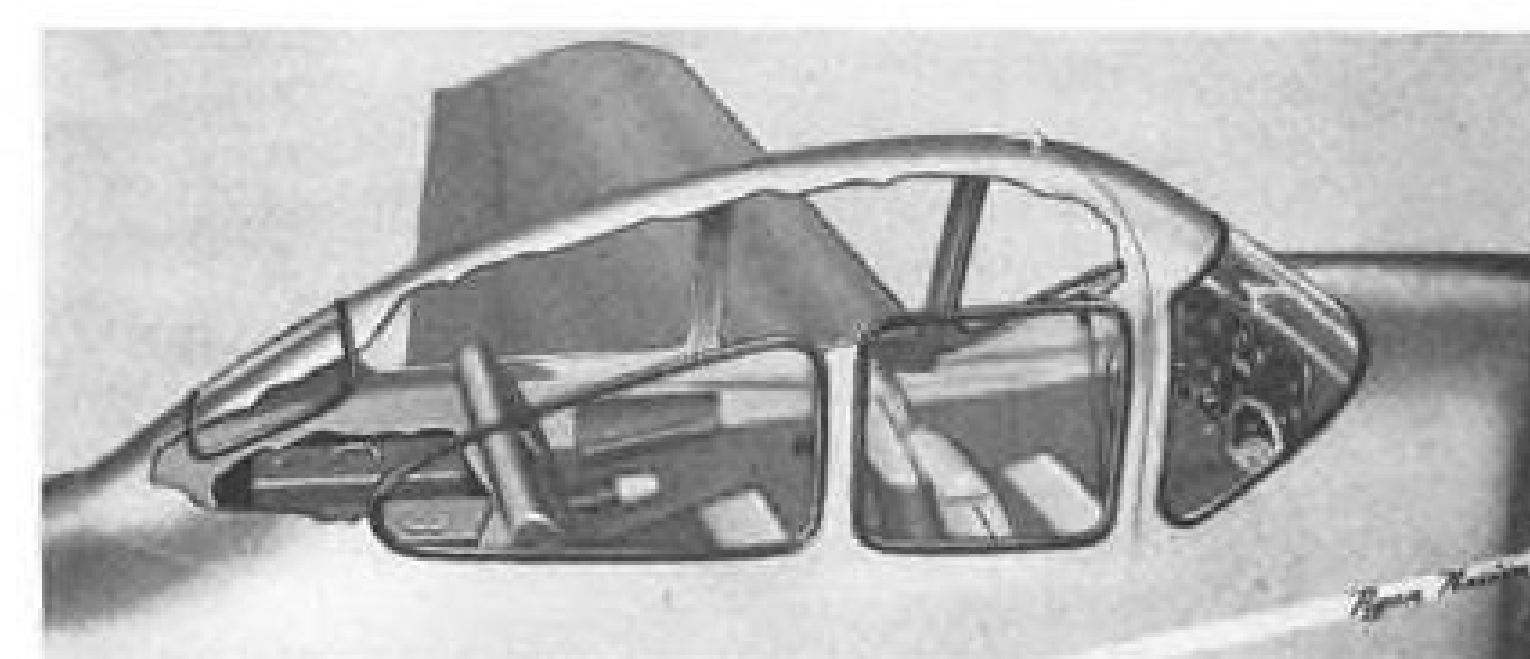
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AERONAUTICAL ENGINEERING

Rocket Power—Its Place In Aeronautics

Analysis of this high-thrust medium reveals beneficial characteristics, design parameters, application details.

By Robert McLaren

The rocket motor has been well established as a basic powerplant in the aircraft propulsion spectrum. Although its current field of application is highly limited, every indication points towards an ever-widening scope for rocket power as aircraft speed and altitude increase to extremely large values.

There already remains little doubt that very-high-performance aircraft (interceptors, etc.), all defensive and most offensive missiles of the future will be propelled by rocket power.

Application of the rocket motor for aircraft and missile propulsion necessitates several radical changes in the design approach. It cannot be considered separately as a powerplant, with the design of the vehicle proceeding independently as a consequence.

►Design Factors—Peculiar nature of rocket power demands complete integration of powerplant and vehicle design, not only with each other but with the performance desired. Operational problems of rocket power also determine design factors to a large extent, so that a maze of divergent considerations must be focused in the design stage of rocket powered aircraft.

The salient feature of short duration of rocket power permits some simplification in design. The tremendous power available also permits the designer to virtually ignore various efficiencies of primary importance in other powerplants.

Although this simplicity of the design problem may be deceiving in practice, there remains little question that once a few basic characteristics have been analytically determined, the design of the rocket powered aircraft may proceed in a straightforward manner.

This analysis will consider these basic characteristics, their effect on performance, and methods for optimum application of their advantages and limitations. We will not consider such separate fields as fuels, testing, motor design, cooling methods or application of rocket power for assisted takeoff, in-flight acceleration, etc., but only the use of rocket power as the sole powerplant of the aircraft or missile.

►Principles—The rocket is one of the general family of jet propulsion units

(turbojet, ramjet, pulsejet, etc.) which utilizes the momentum principle for operation. These units differ from one another only in the relative magnitudes of the masses and velocities involved.

All impart a low velocity to a high mass (aircraft or missile) by the ejection of a low mass (products of combustion) at high velocity. The rocket differs from other jet propulsion units only in that it carries entirely within itself the matter to be ejected, whereas the others extract the greater portion of such matter from the atmosphere.

The fact that the rocket carries its own oxygen supply accounts, in part, for two of its most widely-known characteristics—independence of the atmosphere for operation and enormously high fuel consumption. However, both of these highly-publicized features are substantially misleading upon closer inspection. As will be shown, the efficiency of a rocket is not only comparable to, but, in some cases, actually superior to other forms of aircraft propulsion, including even the reciprocating engine.

►Makeup—The rocket motor consists simply of a combustion chamber and a nozzle.

The rocket engine includes fuel and oxidizer supply lines with control valves, cooling equipment (when used), igniter unit, mounting lugs, etc.

The complete rocket powerplant includes the motor, engine, fuel and oxidizer supply tanks and associated plumbing, fuel pressurizing equipment (either high-pressure inert gas or turbine pumps), controls and instrumentation. (The solid-propellant rocket unit, which

contains all of the above equipment within a single casing, will not be considered here.)

►Motor Characteristics—Thrust of a rocket motor is created by its reaction to the ejection of exhaust products in a high-velocity jet from the nozzle. It is obvious, therefore, that the thrust increases with an increase in the jet velocity and an increase in the products of combustion (fuel consumption). This may be expressed

$$T = \frac{w_f}{g} V_j \quad (1)$$

where T is thrust, lb.; w_f , propellant mass flow, lb./sec.; g , acceleration due to gravity; and V_j , effective velocity of the exhaust jet, fps.

Inspection of Eq. (1) shows clearly that at a given thrust, the fuel consumption can be reduced directly by the use of increased jet velocity. This relationship is plotted in Fig. 1, for a typical rocket motor, which indicates that an increase in jet velocity from 4000 to 8000 fps. reduces specific fuel consumption from 0.008 to 0.004 lb./lb./sec.¹

Maximum theoretical jet velocity attainable by a rocket motor occurs when all of the fuel heat of combustion is changed into kinetic energy in the jet. This is expressed

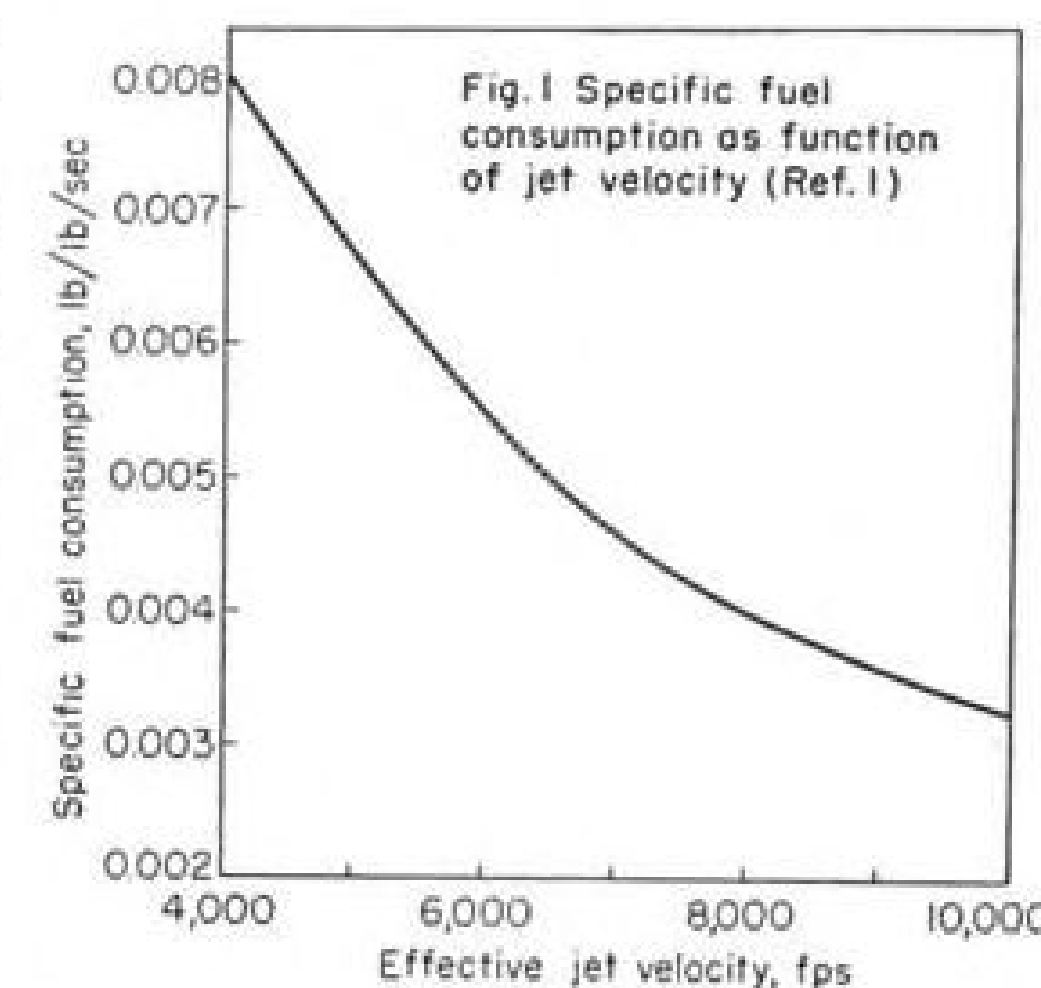
$$V_j = \sqrt{2 \eta I E_p} = 223.9 \sqrt{E_p} \quad (2)$$

in which I is Joule's equivalent, 778 ft.-lb./Btu.; E_p , thermochemical energy of the propellant, Btu./lb.

It is apparent from Eq. (2) that the maximum jet velocity is obtained by fuels having the highest heating energy value. For example, if hydrogen, with a heating value of 51,608 Btu./lb. is burned with eight parts of oxygen, the resulting propellant heat value of 5750 Btu./lb. gives an ultimate effective exhaust velocity of about 17,000 fps.² This theoretical value is reduced sharply in actual rocket motors, however, through a variety of losses.

►Efficiencies Compared—The combustion efficiency of a rocket motor is quite high, ranging between 94 and 99 percent. A loss of about 3 percent occurs in heat transferred to the walls of the motor, leaving between 91 and 96 percent of ideal heat as available energy in the jet.

Kinetic energy of the exhaust jet is from 40 to 70 percent, depending upon the unavailable thermal energy in



the jet. Loss through residual kinetic energy of exhaust gases leaves 0 to 50 percent of the ideal heat as useful energy available for propulsion.³

Generally, well-designed rocket motors can develop from 40 to 60 percent of their theoretical exhaust velocity.⁴ Therefore, the internal efficiency of a rocket motor may be taken as 50 percent, and it is of interest to compare this value with the 30 percent of the reciprocating engine and the 15 percent of the turbojet engine.

This presents the surprising fact that a rocket motor actually is half-again as efficient internally as a reciprocating engine and more than three times as efficient as a turbojet engine.

The question naturally arises: If this is so, then why is the fuel consumption of the rocket motor so many times higher than that of the reciprocating and turbojet engines? The answer lies in a consideration of the overall efficiency of aircraft engines. Expression for this efficiency is:

$$\eta = \eta_i \times \eta_p \quad (3)$$

in which η is overall efficiency; η_i , internal efficiency; η_p , propulsive efficiency.

Propulsive efficiency introduces the speed of the vehicle into the efficiency calculations, since it is the ratio of the rate of change of the vehicle kinetic energy to rate of kinetic energy expelled in the jet. For the engine-driven propeller and the turbojet engine

$$\eta_p = \frac{2v}{1+v} \quad (4)$$

in which v is velocity of vehicle/velocity of jet, or velocity ratio.

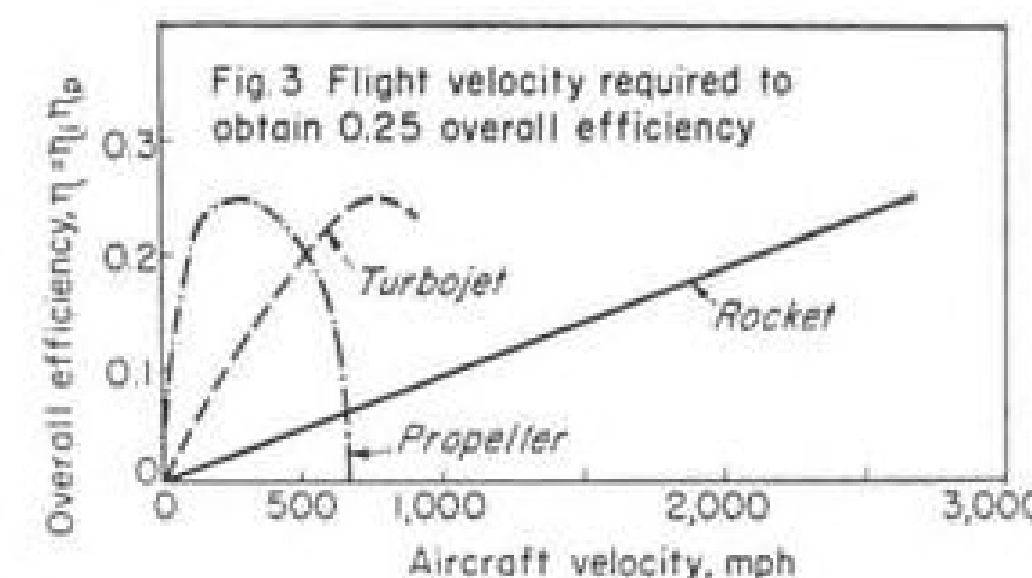
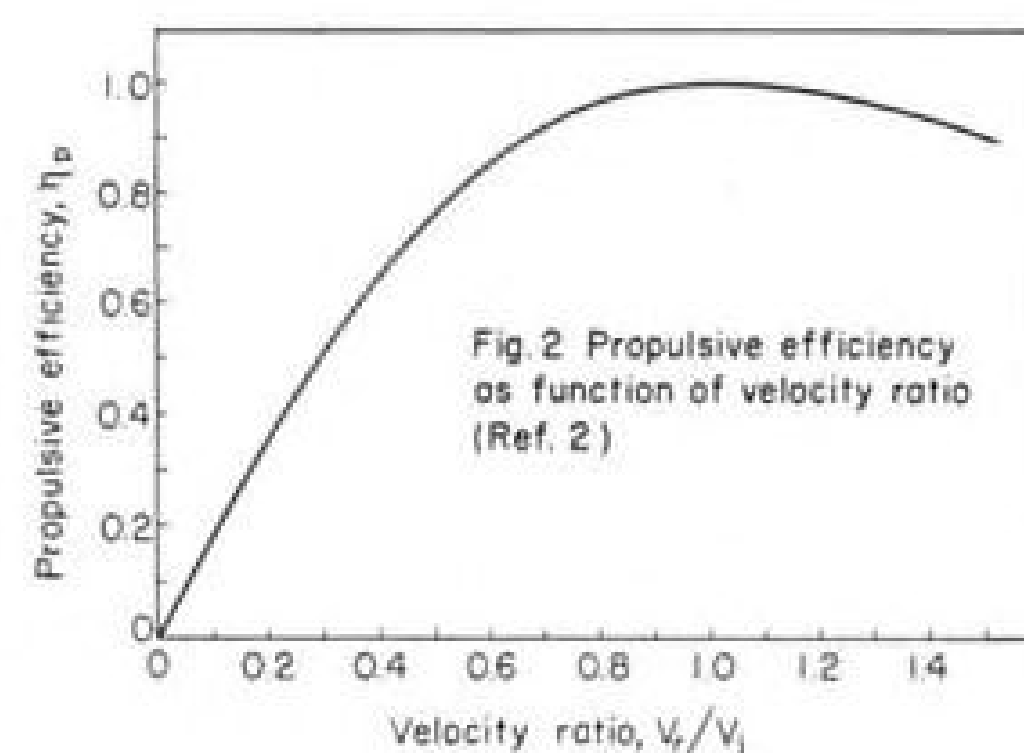
It is seen from Eq. (4) that propulsive efficiency is at a maximum (1.0) when the speed of the vehicle and the speed of the jet are the same, that is, at a velocity ratio of unity. Eq. (4) also indicates that a propeller or turbojet-driven aircraft cannot fly faster than the speed of its jet because such a situation would require a propulsive efficiency greater than unity which is, of course, impossible.

Propulsive efficiency for the rocket powered vehicle is given by

$$\eta_p = \frac{2v}{1+v^2} \quad (5)$$

In this equation, maximum propulsive efficiency is also obtained at a velocity ratio of unity but comparison with Eq. (4) shows clearly that the rocket powered vehicle can exceed its jet velocity, although its efficiency falls off with velocity ratios greater than unity. Fig. 2 is a plot of Eq. (5) and indicates the manner in which propulsive efficiency drops off after a velocity ratio of unity is exceeded.

To compare representative power-



plants, a plot of Eq. (3) can now be made showing the overall efficiency of the units at various flight speeds. It is necessary, of course, to make a variety of assumptions in the preparation of Fig. 3. The internal or thermal efficiencies assumed are: Engine-driven propeller: 0.3; turbojet engine: .25; and rocket engine: 0.50; and the propulsive efficiencies vary with flight speed in the familiar manner.⁵ Fig. 3 shows that when and if the flight speed of a rocket-powered aircraft or missile can be increased to a high enough value, then the rocket is as efficient a power plant as any other.

A comparison of Eqs. (1) and (5) show the essential design difficulty in the rocket. Eq. (1) indicates that a high jet velocity is necessary to obtain high thrust; Eq. (5) shows that a high velocity ratio is required for propulsive efficiency and this is obtained only by making the vehicle speed closely approach the jet speed, that is, it would be desirable to have a comparatively low jet velocity in order to bring it down to the vicinity of the vehicle speed. The design problem for a rocket-powered aircraft, then, is to combine the highest possible jet velocity with the highest possible vehicle velocity.

► **Design Parameters**—Since, from Eq. (1), the thrust of a rocket is determined by its propellant mass flow and the jet exhaust velocity, the thrust may also be expressed in terms of the pounds of fuel burned every second. Therefore,

$$w_f = \frac{Tg}{V_j}$$

and, rearranging,

$$\frac{T}{w_f} = \frac{V_j}{g} = I \quad (6)$$

The term on the left is an expression for the thrust produced for every pound

of fuel burned per second and, therefore, is given the special name I , specific impulse. Its dimensions are in seconds. This is a basic criterion in rocket design, since it is apparent that it determines directly the exhaust velocity of the rocket motor. Expressed in terms of fuel chemistry

$$I = \frac{1}{g} \sqrt{\frac{2\gamma}{\gamma-1} \frac{RT_o}{M}} \quad (7)$$

where γ is ratio of specific heats; R , universal gas constant; T_o , combustion temperature (abs.); and M , propellant molecular weight.⁶

Inspection of Eq. (7) indicates that specific impulse varies as the square root of the absolute temperature of the gases in the combustion chamber and inversely as the square root of the molecular weight of the propellant.

It follows that our first requirement, high exhaust velocity, is obtained by high combustion temperatures and low propellant molecular weight. However, the pressure within the combustion chamber increases as approximately the fifth power of the temperature, so that temperature increases place tremendous demands on combustion chamber strength.

Velocities—The problem of rocket missile velocity is complicated by a wide variety of factors but the relationship may be simplified by neglecting the variation of gravity with altitude (slight), the effect of drag (which is of consequence only at very low altitudes) and variations in flight path. Within these limitations, the equation for rocket velocity simplifies to:

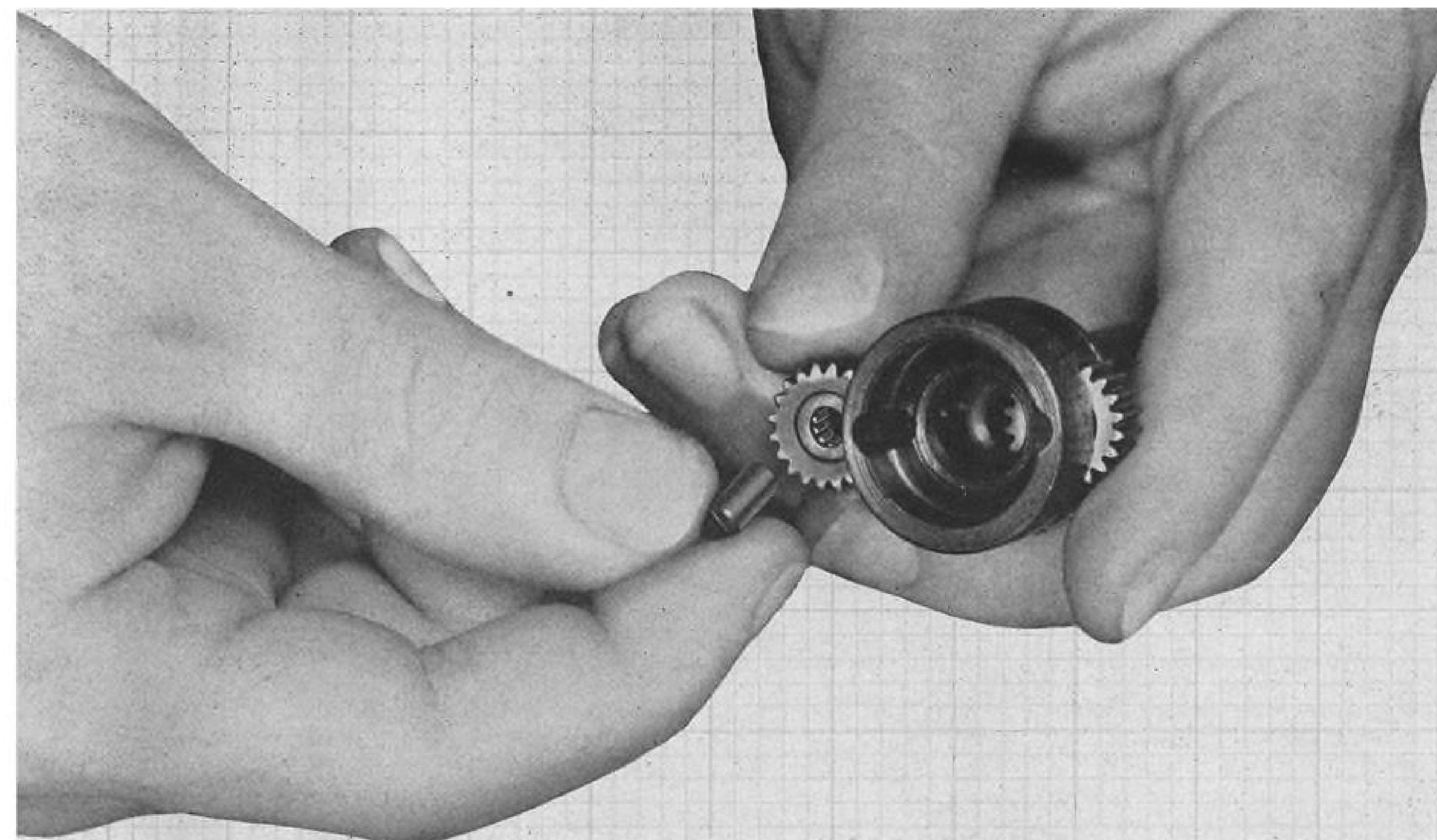
$$V_r = V_j \log_e \frac{W_o}{W_e} \quad (8)$$

where V_r is rocket velocity; V_j , jet velocity; W_o , gross weight at launching; and W_e , empty weight. The expression W_o/W_e is given the special name "mass ratio" and is a vital criterion in rocket missile performance.

To obtain maximum performance, the rocket must obtain maximum propulsive efficiency and, as shown by Eq. (5), this occurs when rocket speed equals the jet speed. Turning now to Eq. (8), it is seen that V_r can be made equal to V_j by setting W_o/W_e equal to e , or 2.71828.

Thus, the rocket obtains its maximum performance when its mass ratio is about 2.72. Eq. (8) also indicates that $V_r = 2V_j$ at a value of the mass ratio of e^2 , or about 7.4; $V_r = 3V_j$ at a mass ratio of e^3 , or about 20.1; etc. It is to be noted that this obtains regardless of the numerical values of V_r or V_j , so that variations in mass ratio offer an effective control over the problem of equating rocket and jet velocity.

With the exception of payload, which is usually a tiny fraction, differ-

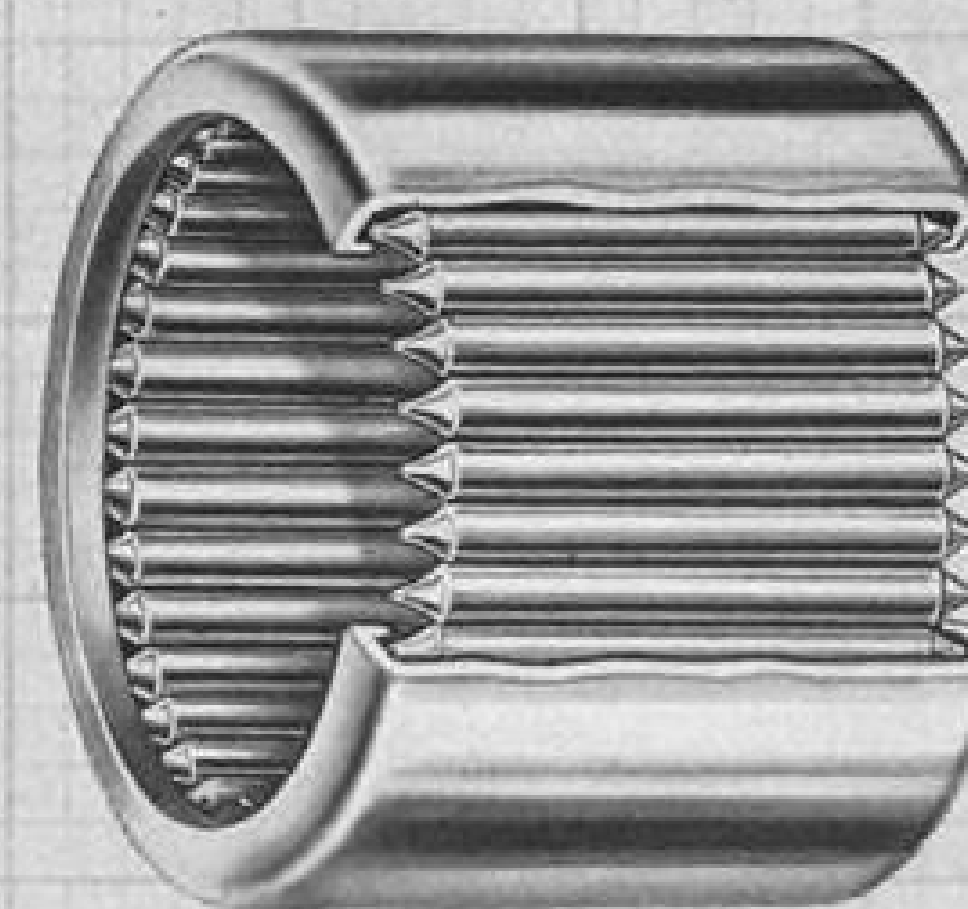


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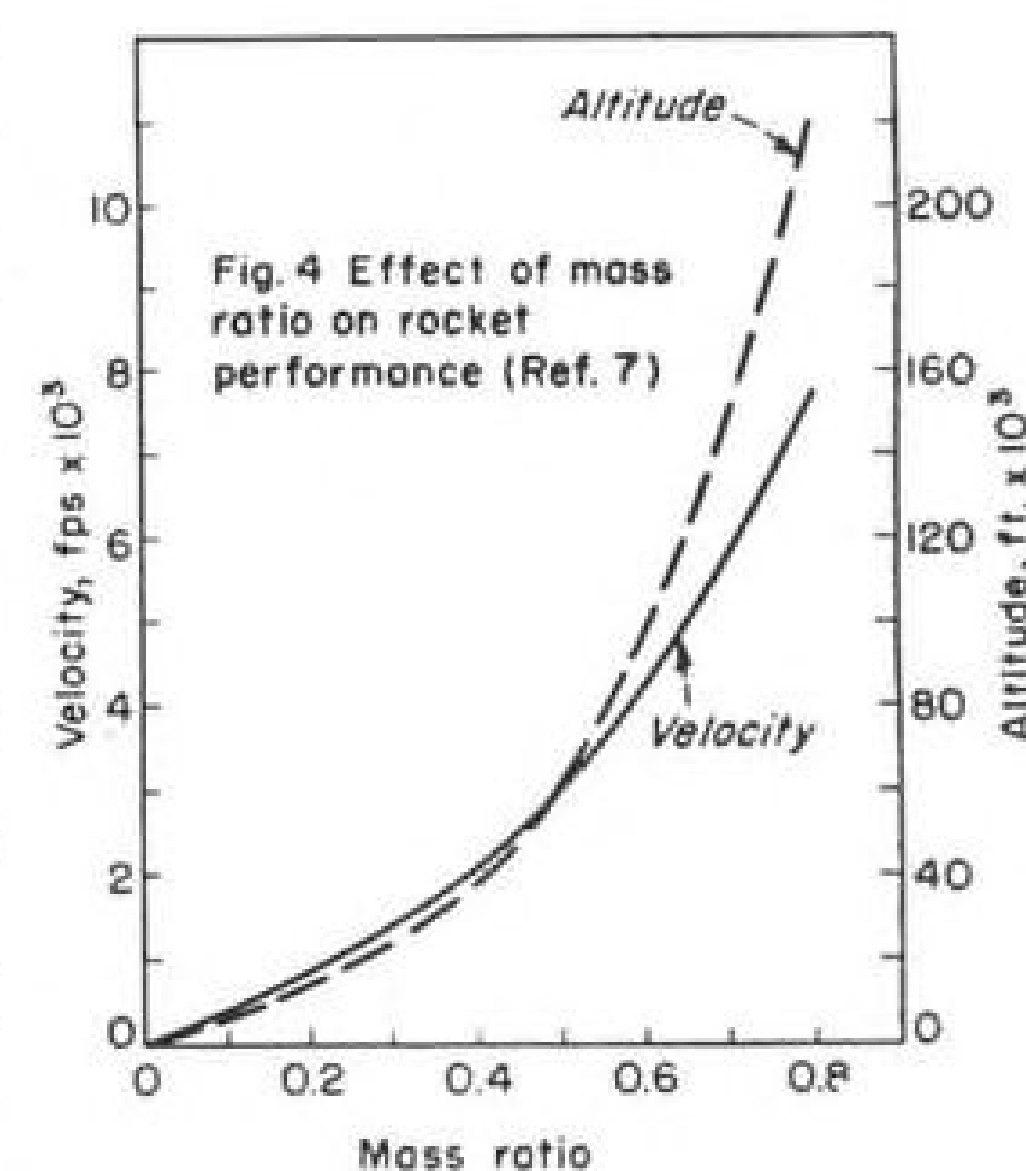
ence between the empty and gross weight of a rocket is propellant. Therefore, $W_0 = W_r + W_f$, in which W_f is fuel weight. The expression W_0/W_r therefore can be written in terms of the fuel weight as:

$$\frac{1}{1 - \frac{W_f}{W_0}}$$

For simplicity, the term W_r/W_0 is also termed the mass ratio expressed as fuel weight as percent of gross weight.

► **Mass Ratio Effect**—The profound effect of mass ratio on rocket velocity is shown in Fig. 4, also containing an altitude scale, and which is a typical form for the curve. It is seen clearly that remarkable gains in rocket performance can be obtained by reductions in structural weight in a rocket missile.

Although rocket accelerations are not high (5-6g, compared to 8-12 in aircraft design), the fact that the fuel load must be contained "loose" presents structural problems militating against light weight. The mass ratio of the V-2 was 0.69, excluding the 2150-lb. warhead. With this weight included the mass ratio was 0.76, which would indicate the present reasonable limit for practical construction.



One promising method of avoiding the limitations of rocket power outlined above is the use of the step, or multi-stage rocket. This arrangement consists of a smaller rocket mounted in the nose of the main rocket. The smaller rocket commences to fire immediately upon the end of firing of the main rocket, which drops off at this precise moment.

A recent example of this arrangement was the firing of a "Wac Corporal" rocket from the nose of a V-2 at White Sands Proving Ground, New Mexico. The Wac Corporal attained a velocity of more than 5000 mph. and an altitude of better than 250 mi., whereas the V-2 alone reaches only a little over 100 mi. and a velocity of about 3500 mph.

► **Step Benefits**—The advantages of this arrangement are obvious, since the second stage velocity is simply added to that of the first stage, resulting in exceptionally high velocities and, therefore, performance efficiency. The mass ratio of the combination consists of the fuel load of the primary step divided by the gross weight of the combination.

If it is assumed that the mass ratio of both steps are the same, then the second step will attain a velocity twice that of either stage alone. This principle is, therefore, of extreme importance in obtaining the high velocities required for long range missiles.

It was this arrangement that was to have been used by the Nazi "America Rocket," which was an A-4 (winged V-2) mounted in the nose of the "A-10" booster and intended for bombarding the American continent. Combined weight was estimated at about 85 tons, and calculations indicated that it would, indeed, have spanned the Atlantic Ocean. The project was never completed, however, because of the Nazi defeat.

Malina and Summerfield¹⁰ have shown how a rocket powered by

oxygen-hydrogen and utilizing five steps could attain escape velocity yet weigh only 8,320 lb. fully loaded. This rocket would carry a 10-lb. payload and have an initial thrust of approximately 40,000 lb.

► **Aircraft Use**—Application of rocket power to aircraft requires integration of the foregoing relationships into the more familiar design parameters.

For example, a wing loading of 100 lb./sq. ft. in a conventional aircraft, requires a takeoff speed of about 200 mph. at sea level. However, if we provide this airplane with rocket thrust equal to 0.8 of its takeoff weight, we can reach this takeoff speed in only 12 sec. and will need only 1750 ft. of runway.¹¹

An interceptor weighing only 11,000 lb., of which 7,000 lb. is propellant, could reach 40,000 ft. in just 91 sec. from takeoff and cruise at 800 mph. However, the range of this design is only 77 mi. from takeoff. This range would be increased 14.3 percent by a 20 percent increase in propellant volume.

It is in rate-of-climb that the rocket-powered interceptor displays its prominent superiority. Calculations indicate that a combat version of the famed Bell X-1 would have a rate-of-climb varying from 28,500 fpm. at sea level to 66,500 fpm. at 60,000 ft.¹² The fuel would be expended at this point but the airplane would coast to 75,000 ft.

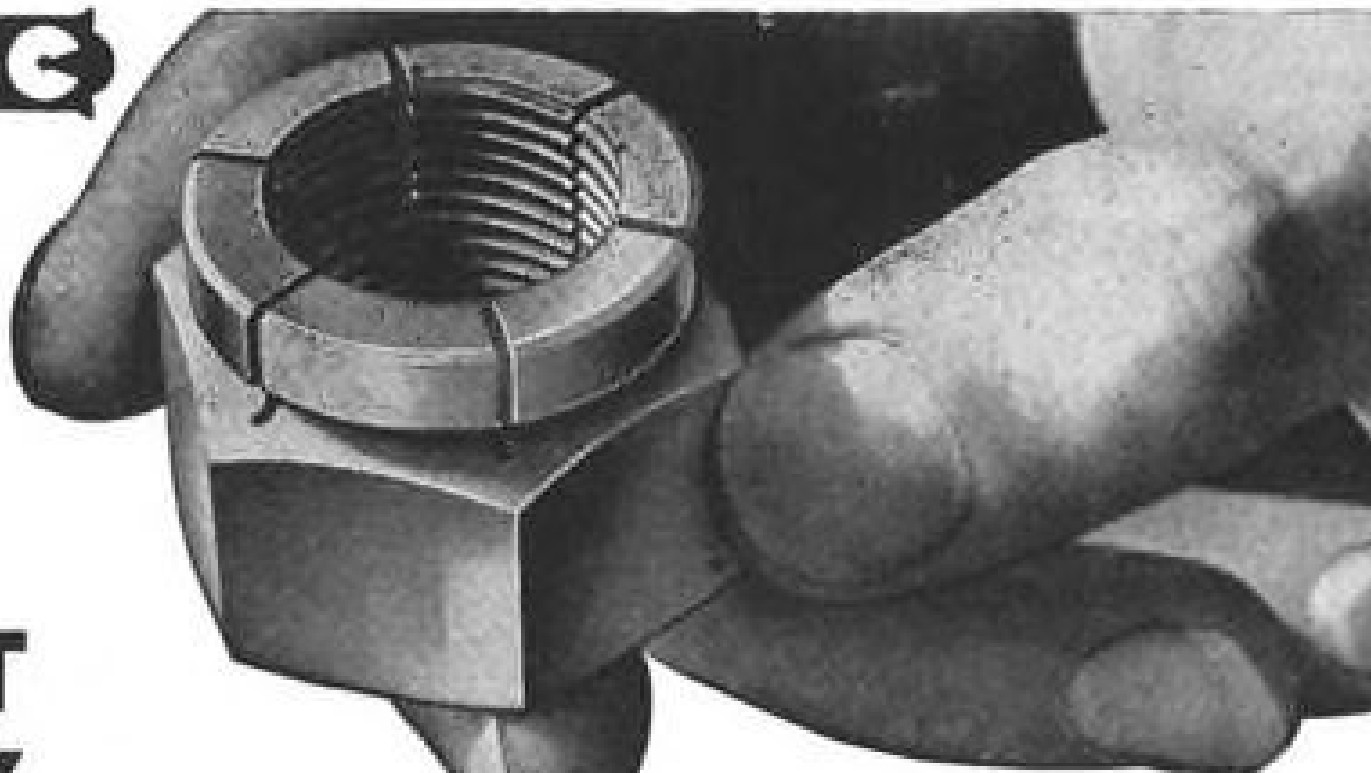
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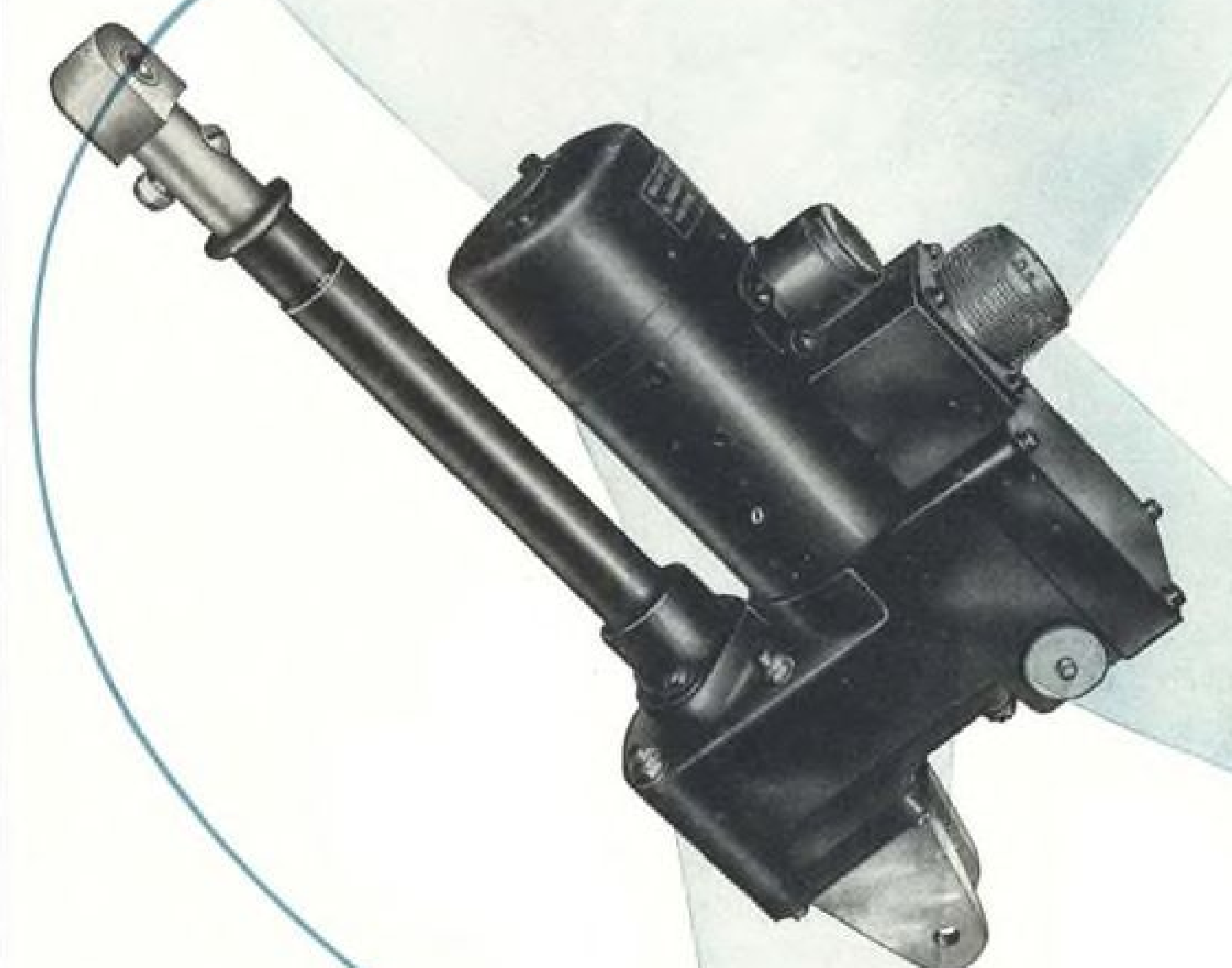
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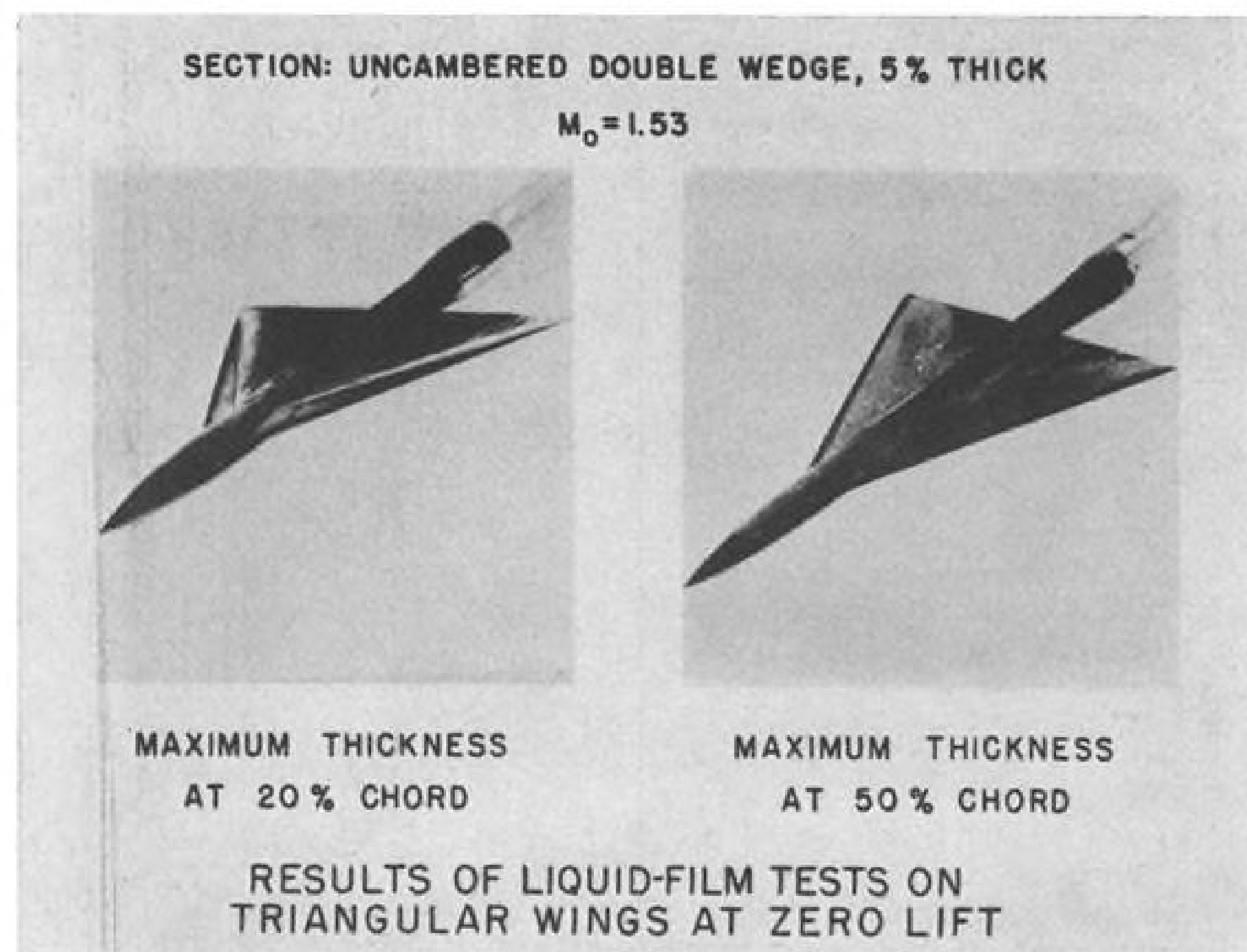
All dimensions were still within original tolerance limits. Piston rings were free in their grooves. Even cylinder walls showed negligible wear, in spite of the fact that each piston had traveled thousands of miles within its bore, separated from the latter only by the thinnest film of oil.

This freedom from excessive wear after six weeks' non-stop running suggests that for the engines, at least, the flights were more or less routine. That may explain why owners whose aircraft must pay their way—farmers, ranchers, business and industrial users, and most recently of all, local airlines—show a steadily-growing preference for planes with Continental power.



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Film Evaporation Aids Flow Study

The National Advisory Committee for Aeronautics has successfully adapted a British-developed solution to one of the most difficult wind tunnel research problems—accurate detection of boundary layer flow transition.

The new "liquid film" method originally was developed for use in subsonic wind tunnel boundary layer research by W. E. Gray of the Royal Aircraft Establishment in 1946. This method has now been adapted to supersonic flow study by researchers at the NACA Ames Aeronautical Laboratory.

The method utilizes the principle that rate of evaporation of a liquid film on the surface of a model is normally greater where the boundary layer is

turbulent than where a laminar condition exists.

In applying this principle, Ames engineers first coat the model with flat black lacquer and, immediately prior to installation in the tunnel, with a liquid mixture containing glycerin. The tunnel is then operated for a period sufficient to permit the liquid to evaporate completely in the turbulent region but remain moist over the laminar area.

Upon removal from the test section, the model is dusted with talcum powder, which adheres to the moist laminar area but not to the turbulent area, thus increasing the contrast between the two areas and permitting accurate measurement and photographing.

Turntable Speeds Compass 'Swinging'

A new method of "swinging" aircraft compasses, which utilizes a special turntable and electrical indicating unit to permit faster, more accurate production check-out of compasses, has been adopted by Fairchild Aircraft division, Hagerstown, Md.

Replacing the conventional compass rose system, the new installation, called the Wakefield compass compensator, reportedly has reduced from 6 hr. to 1½ hr. the time required to compensate magnetic and Flux-Gate compasses, ADF and other navigational equipment on the Fairchild C-119 Packets coming out of the factory.

The 6½-ft. turntable, made of aluminum-alloy I-beams and sheet metal, is set in a pit with its surface flush with the apron surface. It contains a shallow trough to accommodate the dual wheels on one strut of the C-119's main landing gear.

The rotating unit hooks up electrically with a remote indicating unit placed in the cockpit of the aircraft. When the plane has been oriented to magnetic north, the indicator reads north. From then on, exact headings are read on the indicator and the compasses compensated accordingly.

The aircraft under check-out can be rotated on the turntable under its power or with a small tractor. The new installation was developed by Wakefield Engineering Co., Coeur d'Alene, Idaho.

ment in high altitude operation. ► **Brush Wear**—The most common criticism of aircraft electrical equipment at altitude is accelerated generator brush wear. This phenomenon was in evidence as early as the mid-thirties and was a wide-spread complaint during World War II. Exact chemical explanation of this phenomenon is not yet generally agreed upon, but one interesting theory was offered by Maj. Philip Teed, Vickers-Armstrongs, at the Second International Conference between the Institute of the Aeronautical Sciences and the Royal Aeronautical Society.

He believes that the aqueous vapors at low altitude replace the cupric oxide worn off the brushes at low and medium altitudes, and brush life is thereby automatically preserved. However, at high altitudes, where the aqueous vapor content of the atmosphere may be as little as 1/1000 of the sea level value, rapid brush wear results.

That such difficulties are more the fault of the services than of the manufacturers is seen in a recent discussion of the problem by F. P. Wills.¹⁰ He points out that USAF requirements for small size and light weight in aircraft generators forces the manufacturer to use very high average brush current density. When 6 and 9kw., 30v generators first came into use, there were 221 amp./sq. in. on the 6kw. 200-amp. and 200 amp./sq. in. on the 300-amp. generators. These brush current densities are about three times the values normally used on brushes of all other types of electrical machines.

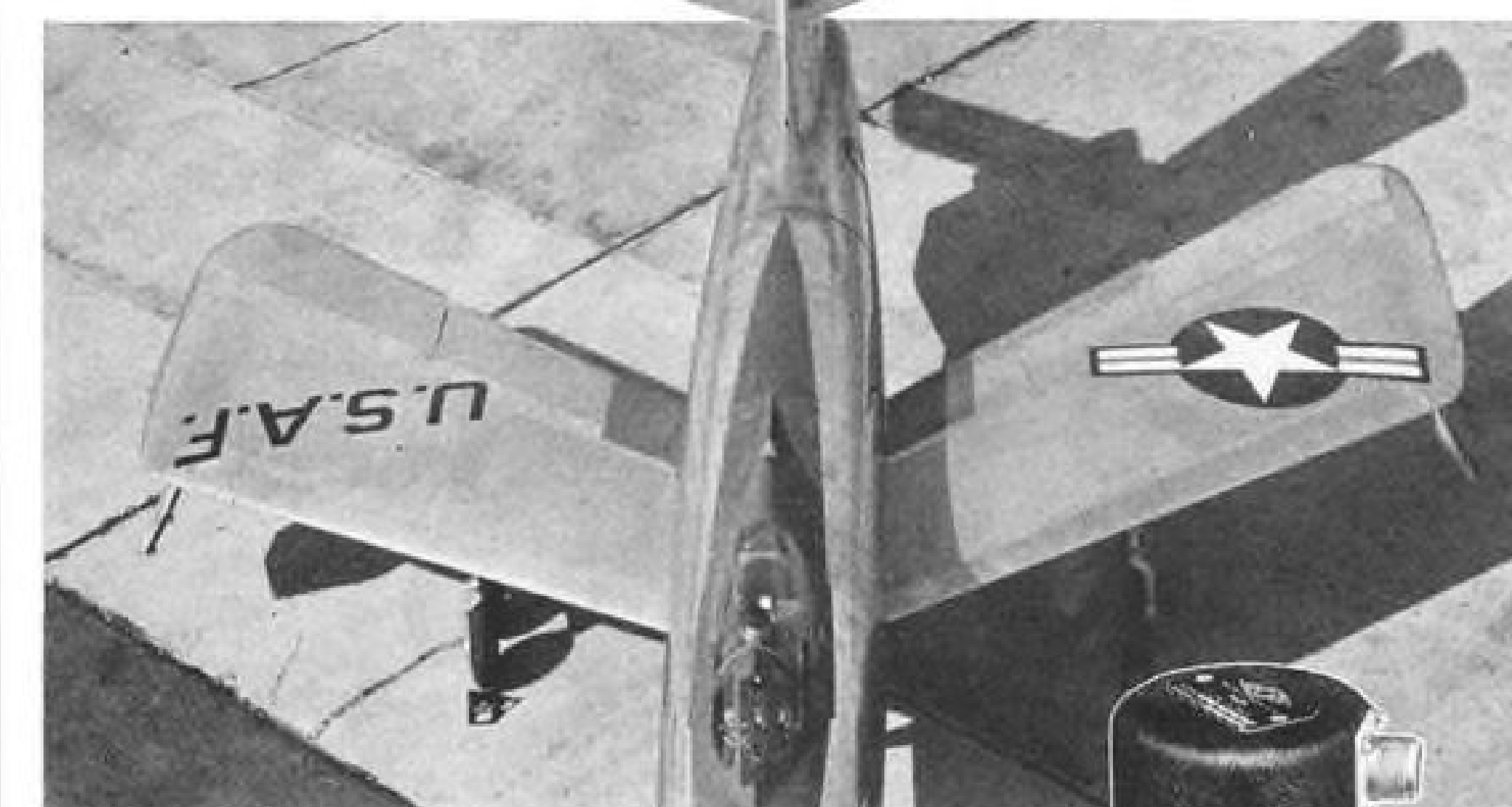
► **Wear Solutions**—Two answers to the problem have already substantially lowered brush wear at least up to the 40,000-ft. level. Principal solution has been the use of special impregnates such as metallic halides on the brushes, which improve their durability by several hundred hours (in most cases to engine overhaul time).

A secondary relieving factor is the use of higher d.c. supply voltage (120, 210v., etc.), which reduces brush current densities to about 70 amp./sq. in., with a great saving in weight of the commutator and even less brush wear than is normally obtained by special high-altitude impregnation of brushes.

► **Mechanical Factors**—Some avionic difficulties at high altitude are created by simple mechanical problems not associated with electricity. For example, the well-known problem of low-temperature lubricants is involved in many items of electrical equipment such as direction finders, radar spinners and many types of high-speed rotating machinery. Sticking of such units for want of lubricity can often create malfunctioning, overheating and fire hazard.

Low temperatures of high altitude

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Aerotec's proved record of efficient automatic controls on the thousands of F47's and F84's that have been and are in service earned its consideration when the XF91 was in the development stage.

The XF91 is one of the galaxy of Navy and Air Force fighters that advantageously employ Aerotec's policy of designing a specific control for each individual problem.

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also cause substantial contraction and expansion of metallic parts, with serious difficulties resulting in bi-metal components.

► **D.C. Use**—Many of these difficulties with d.c. operating machinery are being avoided by the use of a.c. systems.

Alternating-current generators do not require commutation, transformers and rectifiers may be used to provide a wide choice of voltage and current changes in virtually trouble-free operation, there is no compass interference, conduit and wiring are lighter because voltages are higher, etc.

However, use of a.c. avionic equipment poses the problem of development of a satisfactory constant-speed drive for the alternators to permit paralleling. Numerous such drives have been developed, but both military and commercial operators are still seeking improved versions.

Another new solution to the high altitude avionic problem is the breakerless, high-frequency, low-tension ignition system. This is light in weight, uses no breakers and is relatively unaffected by atmospheric changes.

Combination of increasing electrical load requirements and ever-increasing operating altitudes is placing greater and greater responsibility on the avionics engineer. However, his versatility must be channeled by consistent design and procurement policies that interpret research results into long-term requirements.

With the broad directions of future aircraft performance already clearly indicated and many of the major avionic problems outlined, there appears little reason to doubt that avionic performance achieved through designer-user cooperation will keep pace.

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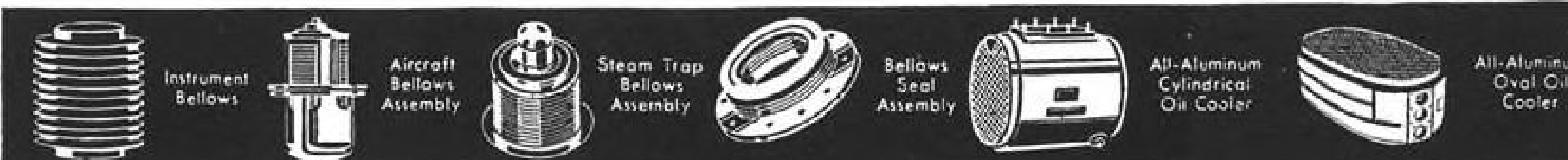
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FINANCIAL

CAB Faces Helicopter Problem

Must decide whether to authorize passenger service in New York area, when mail pay may be missing.

Helicopter proponents, encouraged by initial successes in providing scheduled mail service, are seeking even greater commercial expansion with the prospects of handling passenger operations.

Consummation of this development would be of tremendous import to all phases of commercial aviation. One of the most annoying conditions surrounding passenger air travel today is the vexatious and time-consuming delays encountered at congested airport terminals and movement to and from such terminals and the centers of large cities. A demonstrated safe helicopter operation, promises to find an ever-widening market in public acceptance.

Scheduled passenger service by helicopter is up for determination by the Civil Aeronautics Board in two separate proceedings. Los Angeles Airways, with two years of established mail operation as a backbone, applied last May for authorization to provide interurban passenger service over its routes. Of more immediate importance, however, is the proceeding involving helicopter service in the New York area, scheduled for a CAB hearing next week in New York.

► **Mail Pay Factor**—The New York case is without the blessing of the Post Office Department. This represents a vital element in influencing the course of this proceeding. It raises a serious question whether CAB will see fit to make any award and, if so, the successful applicant will be in a position to operate profitably without any mail pay.

Without active government support through mail payments, a successful commercial helicopter service appears impossible at this time. It is highly significant that the Yellow Cab Company of Cleveland, authorized by CAB in 1947 to conduct an experimental passenger helicopter operation in the Cleveland area, has not yet inaugurated any service.

No mail authorization accompanied this award. Without the promise of mail pay, it has been difficult to raise the necessary capital to launch this enterprise. The lack of suitable equipment in the past has also been a factor.

A number of years ago, a commercial operation without any mail service or

even CAB authorization, Helicopter Air Transport, Inc., tried to establish itself in the Boston area but went bankrupt. ► **Air Commuting's Experience**—It is noteworthy that one of the applicants in the pending New York area case, Air Commuting, Inc., originally received a three-year authorization from CAB to conduct a commuting service from New York City to local areas. This authorization was granted primarily on the premise that the award carried with it no mail compensation.

Confining its operations solely to passengers and property, Air Commuting, Inc., has fallen far short of attaining the profitable levels first anticipated. With its temporary certificate about to expire in 1950, Air Commuting desires to combine forces with another applicant in the New York area helicopter case in the hopes of prolonging its corporate existence through the possibility of obtaining mail authorization.

Only two helicopter mail services have been certificated by CAB. Largely experimental in nature, transportation of mail and property over three circular routes totaling 261 mi., radiating from the Los Angeles Municipal Airport to post offices in about 40 suburbs, was authorized by CAB in May, 1947. Los Angeles Airways, Inc. was awarded a three-year certificate, effective from Oct. 1, 1947, the date service started.

Following this pioneering effort, CAB was encouraged to authorize a similar service in the Chicago area. Helicopter Air Service, Inc., was awarded a five year certificate, effective July, 1949, to provide mail and property transportation by helicopter over three routes totaling some 300 mi., radiating from the Chicago Municipal Airport to 43 suburbs and over a shuttled route to the rooftop of the main post office.

► **P.O. Attitudes**—Experimental helicopter service was originally espoused by the Post Office Department as early as 1946. Enthusiastic support of this type operation was re-affirmed in the 1947 fiscal report of the Postmaster General with the following declaration: "These (helicopter) experiments demonstrated the practicability and worth of this type of mail service to supplement the speedy transportation by trunk airlines."

This strong support was re-affirmed in subsequent statements issued by Post Office officials and has been of prime importance to CAB in justifying the necessary mail payments facilitating such services.

Nevertheless, on July 13, 1948, two days before oral arguments leading to closing the case in the Chicago proceeding, the Post Office Department filed a petition to re-open the case. The reason for the Department's sudden and unexpected action in this instance remains obscure. CAB denied the Post Office petition. While the Post Office ran some truck service tests, the results were incorporated in the record but evidently CAB found such tests inconclusive as they were not seriously entertained.

This reversal of Post Office Department policy, however, has been expressed early and more conclusively in the New York area proceeding. Notice has been served that in view of the changes which had been made in surface transportation facilities in the New York area since the experimental air mail flights were conducted during January, 1947, and because helicopters could not land on the roof of the General Post Office Building in New York City, the Post Office Department did not consider helicopter air mail service necessary and would not sponsor any route in this proceeding.

► **Port Authority Approval**—This Post Office declaration represented a blow to the aspirations of the hopeful applicants seeking a certificate for mail helicopter service in the New York area. However, the Port of New York Authority has intervened in this proceeding urging certification of a helicopter passenger, mail and cargo service for the New York and New Jersey area. By shifting the emphasis to passenger operations, it is hoped to influence CAB in awarding a helicopter franchise in the New York City area, carrying with it of course, the right to mail service and the attendant compensation.

From the over-all results achieved by the certificated operations in the Los Angeles and Chicago areas, it would appear that the benefits received, both in expediting the mail and from the standpoint of the national welfare, justifies the compensation.

Los Angeles Airways is currently being paid \$1.25 per airplane-mile. While on an airplane-mile basis this rate is among the highest paid any of the certificated airlines, reduced to volume of service performed it is closer to a compensatory rate than that paid any feeder.

The coming of a successful passenger helicopter operation will accelerate the period in which mail service by this type of equipment will be placed on a truly compensatory basis.

—Selig Altschul

SALES & SERVICE

Executive Planes Replace Nonskeds

Most of Teterboro's traffic used to come from irregular carriers, but the switch is on to business aircraft.

Teterboro Air Terminal, once one of the largest air freight channels into the Eastern seaboard, is rapidly turning into the East's main stem for executive aircraft.

The New Jersey field, now part of the Port of New York Authority's four-pronged airport system, at one time was the headquarters for passenger and cargo nonskeds. Before the Civil Aeronautics Board cracked down, drastically cutting nonsked activity, Teterboro was the hub for east-west cargo flights and N. Y.-Puerto Rico and return passenger hauls.

► **Marked Change**—Then, the field was handling more than 1200 plane movements a day (in 1946 there were 151,000 takeoffs and landings); more than 40 independent carriers used the field.

Today only a small handful of nonskeds remain at Teterboro and they account for the smallest portion of the field's traffic movements. Largest number of flights are still by flying schools. Local traffic greatly increases the overall figure. But the rapidly increasing

number of flights by executive airplanes marks a definite change in Teterboro's character.

► **Traffic Analysis**—Here are some typical day-by-day traffic breakdown at Teterboro:

Dec. 1: DC-3- and C-46-type aircraft, flown by nonskeds, numbered 17. Local and training flights totaled 518. Executive plane flights reached 124.

Dec. 3: Nonskeds, 20; Local and training, 582; executive aircraft, 113.

Dec. 4: Nonskeds, 10; local and training, 734; executive aircraft, 88.

Dec. 6: Nonskeds, 14; local and training, 214; executive aircraft, 100.

► **Executive Service Center**—Mallard Air Service's new executive aircraft center (AVIATION WEEK, Dec. 5) looms as the most promising development in Teterboro's growth as the center of executive aircraft activities. The center, leased from the Port Authority for about \$25,000 according to unofficial estimates, is already getting business from corporation-owned aircraft.

The Port Authority rates for landing

and hangaring transient planes at other New York area fields is high enough and sufficiently confusing to encourage use of Teterboro. Several aircraft operators sometimes have been discouraged from using LaGuardia Field because airport attendants could not decide on the proper rates.

Part of Mallard's high rental for the 160- by 300-ft. hangar will be paid by rental of storage space. Some estimates are that Mallard can make almost \$4000 per month in this way.

BRIEFING FOR DEALERS AND DISTRIBUTORS

► **NEW PIPER**—Successor to the 1948 four-place Piper Clipper is a new four-placer with 125 hp. instead of 112, credited with considerably improved performance over the 1948 model which was the year's best seller.

► **NEW BELLANCA**—New 190 hp. Lycoming-powered version of the Bellanca Cruisair Sr. which has been flying in prototype stage for some months, is going to be a serious contender for personal plane speed honors. First production planes are beginning to come off the line now. The lower-powered Cruisair was a speedy plane for its power and the new one, it is claimed, will cruise up around 180 mph.

► **FLIGHT DEMONSTRATOR**—Example of selling through letting the equipment speak for itself, is the flight demonstrator Cessna 140 operated by Van Dusen Aircraft Supplies at the eastern Van Dusen base at Teterboro. The plane carries a two-way Motorola Avigator radio for standard airway transmission, a two-way VHF Narco omnirange receiver, two stall warning indicators, wheel pants, Goodyear wheels and tires, a McCauley Met-1-prop and is finished in Roxaprene with a Re-Glo coating to top off the finish. Each one of these is a product sold by Van Dusen. The arrangement gives the sales force a chance to show dealers and customer how each works in service.

► **WHEEL SKIS**—Combination wheel-skis made by Federal Aircraft Works, Minneapolis, are now available for the following light planes: Piper J3-C, PA-11, PA-12, PA-16, PA-17; Cessna 120, 140, 170, 190, 195; Stinson 108 (Voyager); Aeronca 15 (Sedan) and Luscombe Model 11 (Sedan). Other models will be available later. Wheel-skis are available with or without a hydraulic actuation arrangement which raises or lowers the ski on the gear to make selective ski or wheel landings.

—Alexander McSurely



WHITE MIDGET SPORTPLANE

W. E. White of San Diego, Calif., poses next to tiny 400-lb. personal plane he designed and built in his spare time. Craft is 14 ft. long, has 20-ft. span, and is powered by a two-cylinder motorcycle engine. The plane is said to have carried a 165-lb. man, and to have a cruising speed of over 55 mph., and an 1800-ft. ceiling. Construction is mainly of spruce and fabric. When his

service as a Navy aviation mechanic at North Island is completed, White hopes to produce the plane in kit form; in the meantime he plans to sell blueprints and specifications to those who want to build their own. White says that the cost of materials would run between \$150-\$200, without engine. CAA approval has yet to be obtained on the tiny new single placer.

AUTO-LITE

● The quality of Auto-Lite Aircraft Wire and Cable is the result of 37 years of experience, research and advanced laboratory tests. Again and again these products have proven their dependability . . . where dependability is a "must." The specifying of Auto-Lite Wire and Cable is fast becoming standard practice among leading aircraft manufacturers. Here is ample proof of the Auto-Lite statement that "Money cannot buy better wire and cable."

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LOW TENSION

Aircraft cable with copper conductor
Specification AN-JC-48a

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Specification ANC-161

Shielded aircraft cable
Specification ANC-168

HIGH TENSION

Aircraft ignition cable with stainless steel conductor and neoprene sheath
Specification ANC-130a, 5mm, 7mm and 9mm sizes

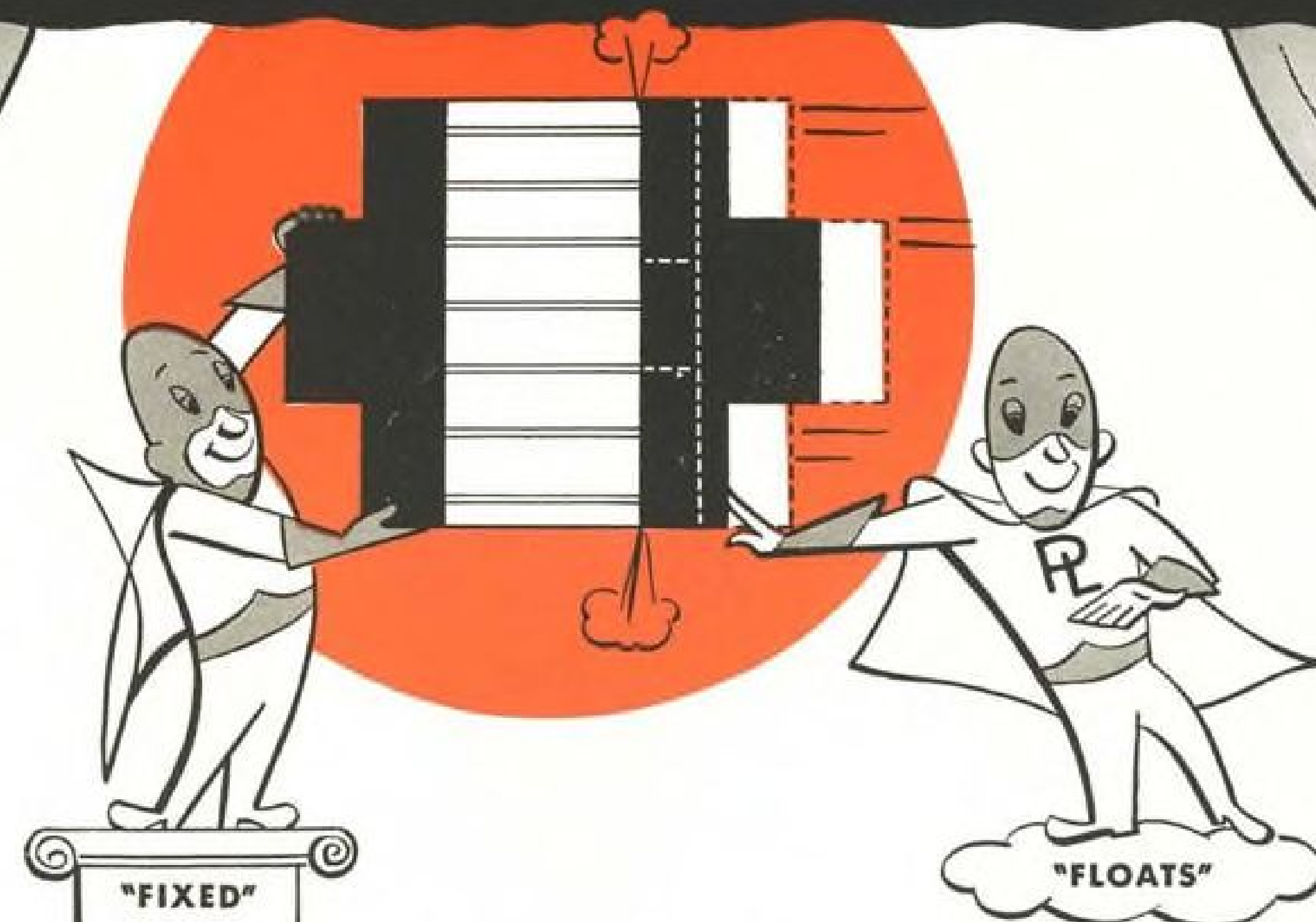
Aircraft ignition cable—Auto-Lite Steelductor—with stainless steel conductor and braid and lacquer finish
Specification AN-JC-56

Aircraft ignition cable with copper conductor and braid and lacquer finish
Specification AMS-3390 and AMS-3392

Aircraft ignition cable with copper conductor and neoprene sheath to commercial specification

Aircraft ignition cable with copper conductor and braid and lacquer finish to commercial specification

MEET THE "PL"* TWINS



...The Greatest Little Act in Hydraulics

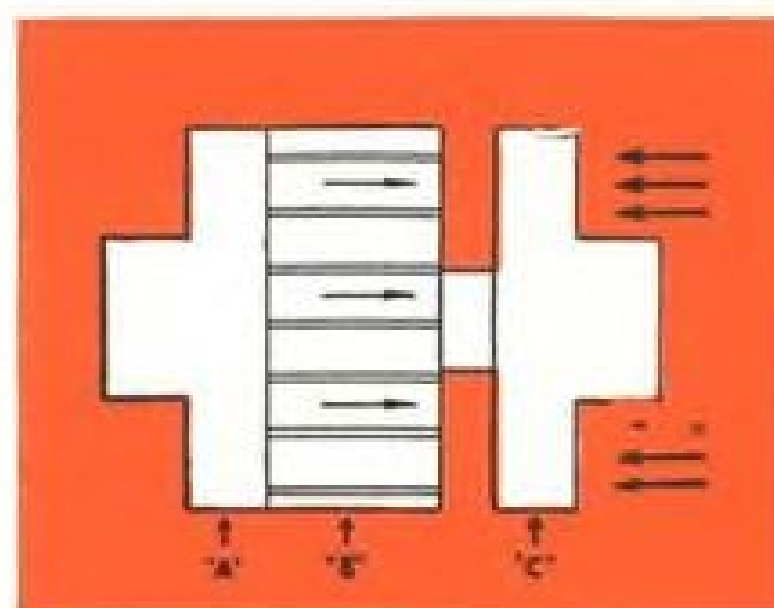
Yes, sir, "Fixed" and "Floats" are the famous "PL"* twins, Pesco's exclusive hydraulic pump act that provides volumetric efficiencies up to 97% . . . torque efficiencies up to 90% . . . and assures these efficiencies over a longer service life.

"Fixed" is an old-timer at this kind of an act. But it's "Floats" that really wows 'em.

He's the one that *automatically* holds end clearance to a thin film of oil, making possible maximum torque and operating efficiencies under all operating conditions. Together, "Fixed" and "Floats" make possible Pesco's patented "Pressure Loading" principle of construction for gear-type hydraulic pumps. Here's their act:

*"PRESSURE LOADING"... How it works

The schematic illustration at right shows the three principal parts of a gear-type hydraulic pump. They are the bearings ("A" played by "Fixed" and "C" played by "Floats") and the gear ("B"). Bearing "A" is fixed. Bearing "C" floats. By means of the "Pressure Loading" principle, pressure from the discharge of the pump is transmitted through a "Pressure Loading" passage and is exerted against the rear of the "floating" bearing. This force is counter-balanced by pressure developed within the gear cavity so that the thrust of the bearing against the gears is just enough to accomplish its purpose.

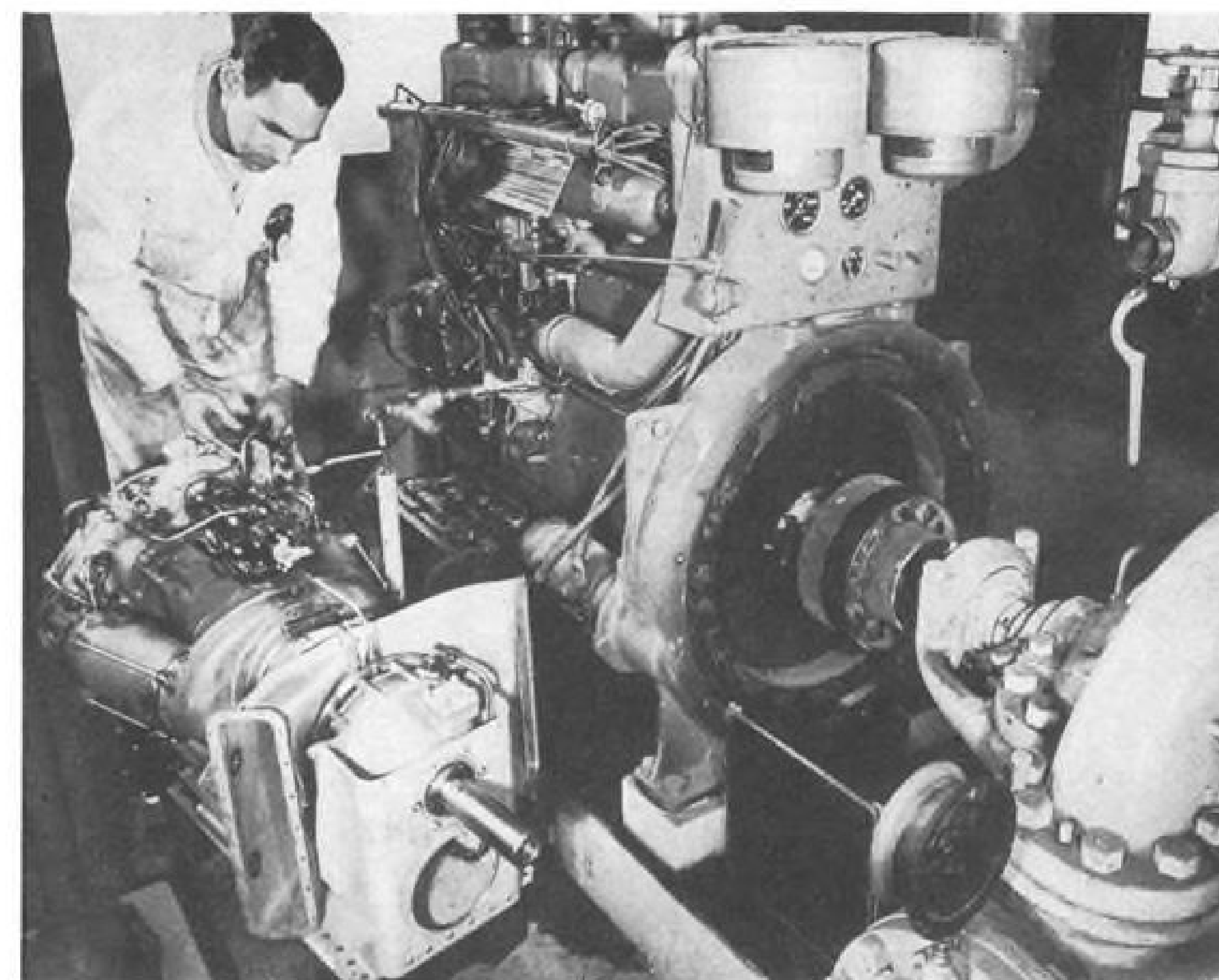


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PRODUCTION



COMPACT BOEING TURBINE (left) next to conventional engine of about same power. . .



CAN FIT INTO SMALL CABINET when dismantled, thus easing storage and transport.

Boeing Jet Set For Market Tests

Company hopes to enter non-aircraft field with new small turbine adaptable to variety of industrial tasks.

The Boeing Airplane Co.'s long hunt for a non-aircraft item to diversify its production may have ended with a gas turbine whose experimental existence the company disclosed in 1947 and about which it has just revealed additional information.

Edward C. Wells, vice president of engineering, says that the Boeing Model 502 turbine is, "so far as Boeing knows, the most advanced small gas turbine for general application in the United States."

► **Industrial Use**—The Boeing 502 is

ready now to prove its adaptability to actual industrial jobs, Wells says. Boeing expects, during the next two years, to manufacture enough turbines to permit thorough service testing in a variety of industrial and vehicular applications, with large-scale production presumably to follow. It has announced no production figures, but observers understand some 15 or 16 turbines already have been built or are scheduled for construction.

Boeing believes the gas turbine is a "natural" for the field of industrial standby equipment. Weighing only 185 lb., with a continuous output rating of 160 hp. and an emergency rating of 200 hp., the turbine can be conveniently mounted in a small space for operation of standby pumps, generators and compressors. It is only 38 in. long as compared to 53.2 in. for a diesel engine of the same horsepower, 23 in. wide as compared to 29 for a diesel, 18.5 in. high as compared to 45.2. Its 9.4 cu.ft. volume of installation envelope compares with 40.5 cu.ft. for a 2850-lb. diesel. Its 1 lb. per hp. compares to 6 lb. per hp. in most automotive engines.

The gas turbine has only one-sixth as many parts as an average piston engine of equal horsepower, the largest weighing no more than 25 lb. In a recent demonstration, one man completely disassembled and assembled one of the turbines in six hours, using tools weighing a total of 14 lb.

► **Aircraft Uses**—In the aircraft field, the Boeing 502 holds promise of three distinct applications. It will provide a dependable, quick-starting ground power unit, long needed for servicing large aircraft. It will serve as an excellent source of auxiliary power aboard the planes themselves, being powerful enough to carry a tremendous work load, yet light enough to present no weight problem. It also has promise as the powerplant for light planes and helicopters.

The Boeing Model 500 which is the 502 without the gear box, shaft and turbine wheel, makes an efficient space heater which might have an aircraft application as a fog dispeller.

Another of the turbine's most interesting outlooks is in the marine field, where research shows it readily adaptable for powering small craft; cabin cruisers, speed boats, launches and light barges.

► **Design Details**—The Model 500 is an 111-lb. turbojet with 180 lb. of thrust. Source of power is the same in both models, but the 500 produces jet power, measured in pounds of thrust, while the 502 puts out shaft power, measured in conventional horsepower.

The turbine has two major sections: the gas producer, mainly a single-stage centrifugal compressor, two can-

type burners and an axial-flow turbine wheel; and the power output section, where the jet's thrust is transformed into shaft power without a mechanical connection.

Gases travel from the first-stage turbine wheel, turning at 36,000 rpm., through a nozzle box and are expanded through the second-stage wheel driving the output shaft. This wheel is vanned, turns of 22,500 rpm. and drives through a 9:1 reduction gear, stepping the rpm. down to 2500.

With no mechanical link between the two sections, the gas-producer speed can be controlled independently of the output-shaft speed, resulting in an engine with an infinitely variable transmission. An extremely high torque can be developed on the output shaft by stalling the shaft while running the first stage at its rated speed. Working power of the turbine is not tied to the narrow speed range of its compressor efficiency.

► **Operation**—Starter power requirements remain nearly constant, even in sub-zero weather. Boeing expects that, at 65 deg. below zero, the turbine can be started, warmed up and the throttle opened to full power in one minute.

The 502 will be cooled by normal circulation of air for nearly all applications, says Wells.

Fuel consumption, higher than that of comparable piston engines, particularly at idling speed, is a problem, Boeing engineers admit. Diesel fuel, kerosene and low- or high-octane gasoline

obtain about the same results. Boeing engineers expect to perfect the turbine's operation on low-grade industrial fuel oils, down to and including "bunker C."

A considerable portion of the turbine's first-stage power goes into driving the compressor, although much of this compressor power is regained in the energy of the gases and extracted in the turbine wheel. Boeing is directing part of its research toward improving the efficiency of the compressor to the point where it will require less power.

► **Research Continues**—Other research is directed toward improving the efficiency of the burner, by raising the combustion temperature to fully utilize the heat developed, losing as little as possible through the exhaust. Boeing engineers are reducing the maximum and increasing the minimum temperature of burning in the combustion chambers to a point at which the average is most consistent and most efficient.

Boeing has solved the problem of noise from the compressor by developing a lightweight filter made of aluminum and Fiberglas but still has work to do on reduction of exhaust gas and gear noise.

Critical alloys have been required to withstand the high temperatures required for turbine operation. Cobalt and columbium are among the alloys which, because of their scarcity, Boeing is attempting to replace with other metals.

of \$9206.59; Leach Relay Co., Los Angeles, Calif., on a bid of \$571.50; Potter & Brumfield Mfg. Co., Princeton, Ind., on a bid of \$290; Arrow-Hart & Hegeman Elec. Co., Hartford, Conn., on a bid of \$1596.70; Cutler-Hammer, Inc., Cincinnati, Ohio, on a bid of \$467.38; American Phenolic Corp., Chicago, Ill., on a bid of \$9.72; General Electric Supply Corp., Dayton, Ohio, on a bid of \$7786.28, and Standard Electric Products Co., Dayton, Ohio, on a bid of \$14,577.75.

For intervalometer, type B-9 (50-297): Akeley Camera & Instrument Corp., Jamaica, N. Y., on a bid of \$50,165.

AF Invitations to Bid

Bids openings are 20-30 days after approximate issue dates shown in the following bid proposals. Bid sets containing specifications for items to be procured will be sent to qualified applicants who state bid invitation number.

One bid set will be available for examination without obligation by prospective bidders, after bid publication date, at each of the seven AMC procurement field offices. This will enable firms to see specifications before writing or telegraphing for their own bid sets.

Procurement field office locations: Boston Army Base, Boston 10, Mass.; Government Aircraft Plant No. 4, Ft. Worth 1, Tex.; 39 S. LaSalle St., Chicago 3; Wright-Patterson AFB, Dayton, Ohio; West Warren and Longo Aves., Detroit 32; 155 W. Washington Blvd., Los Angeles; 67 Broad St., N. Y. 4.

INVITATIONS

Antenna Loading Coil, 1-7 items, bid invitation No. 50-552, issue date Dec. 28, delivery first article 90 days, remaining 30 days after approval of first article at rate of 50 units each per month.

Grinder, 1-6 items, bid invitation No. 50-531, issue date Dec. 27, delivery 30 days.

Guide assembly, 1-2 items, bid invitation No. 50-597, issue date Jan. 3, 1950, delivery 90 days.

Pin, 1-4 items, bid invitation No. 50-558, issue date Dec. 28, delivery 90 days.

Navy Awards

The Navy has announced the following contract for aviation items:

Gruman Aircraft Engineering Corp., Bethpage, N. Y., parts necessary to convert government (Navy)-owned models JRF-4/5 airplanes to overhauled airplanes of the configuration of "N" classification in accordance with the contractor's "specification for overhaul of JRF airplane," 20, \$560,310. (Due to typographical error, this cost previously listed as \$56,310.)

Navy Bid Invitations

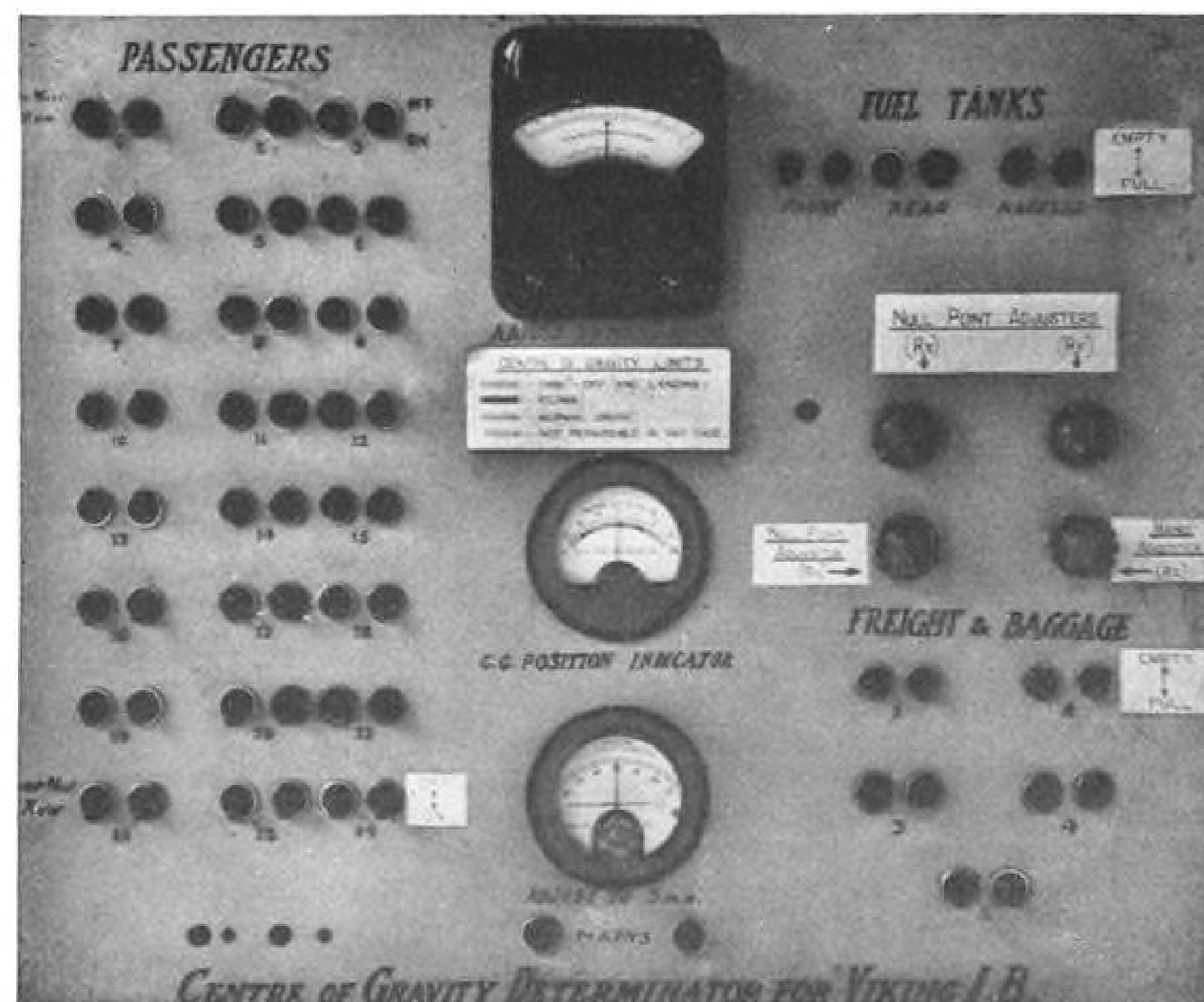
The following bid invitations have been selected from those announced by the Navy Dept. Aviation Supply Office at Philadelphia. Bid forms may be obtained from the Aviation Supply Office, Oxford Ave. and Martin's Mill Road, Philadelphia 11. Specifications are not furnished unless required by number.

Electric engine starter assembly & installation, 100 ea., Radioplane Co. dwg. 20059; invitation No. 9651; bids due Jan. 19.

Control wheels, 40 ea., pilots & co-pilots control col. assembly, for P4M-1 acft., Amer. Hard Rubber AC-152-F; invitation No. 9971; bids due Jan. 18.

Fire resistant coating, 2700 gal., adhesive, spec. MIL-C-3004; invitation No. 50,958; bids due Jan. 23.

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Aircraft Loading Figured Quickly

Indian government develops electrical device, replacing slide rule and charts, to give c. g. loading requirements.

An electrical load adjuster which quickly determines c.g. loading requirements of an aircraft with the flick of a few switches—replacing special slide rules and charts currently used by airlines—is one of the first aero engineering achievements reported by the newly-formed civil aviation department of the Government of India.

The portable instrument was developed by the Research and Test Laboratory of India's Civil Aviation Department.

While designed specifically for the Vickers Viking Mk. 1B transport, the unit evidently can be adapted for use with other types of planes.

► **Easy Operation**—According to P. Nilakantan and S. Ramamritham, the two CAD engineers responsible for its development, the new device is "the first instrument of its kind ever to have been developed."

They say it is superior to other types of aircraft load adjusters because it considerably reduces "chances of error and the amount of work by operational personnel." The unit is said to be simple to operate, highly accurate but flexible,

and designed so that controls can be manipulated and changed with maximum speed.

► **How It Works**—This is the way the electrical load adjuster works: Switches, located in a configuration similar to the seats in the aircraft, correspond to the number and position of passengers in the plane.

These switches are turned either on or off, depending on whether the seat is occupied. Weights of the fuel in the tanks and freight and the baggage in the holds are recorded in the device by means of variable control knobs graduated in convenient steps.

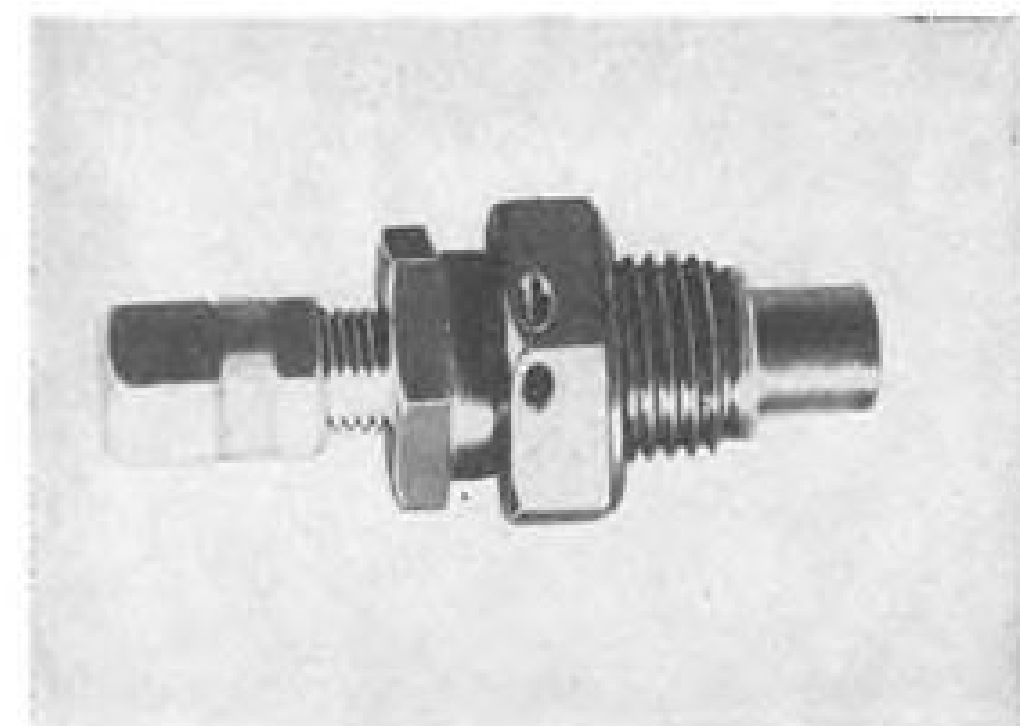
After setting these switches and making some small adjustments, the actual center of gravity position in the plane, as loaded, shows up on a c.g. dial indicator.

The c.g. indicator incorporates a scale graduated directly in inches aft or forward of the specified c.g. datum point. Permissible c.g. range for takeoff, landing, climb and cruise is indicated on the scale by sectors marked in different colors.

► **Procedure**—In actual operation of the

device, this procedure is followed:

- Set switches and control knobs to correspond to actual load distribution in the aircraft.
- Adjust null point galvanometer (top) to read zero.
- Adjust main current (bottom) to specified value constant for instrument.
- Read c.g. dial indicator, which now shows center of gravity position in the aircraft, as affected by loading. Determine from dial reading whether c.g. is within accepted limits, and adjust load accordingly.



Shock Strut Valve

Designed to replace AN812 valves on aircraft shock struts, air bottles and accumulators, high pressure air valve, Model 9894, offered by Aro Equipment Corp., Bryan, Ohio, may be installed (with or without gaging devices) on any boss having diameter of not less than 1 1/2 in., with or without serrations, and having a 1/2-20 centerline.

Conforming to specification AN-6287-1, unit is suitable for operating pressures up to 3000 psi. It is equipped with AN-809 valve core and AN-813 valve cap.

Set Screw Locks Self

"Zip-Grip" self-locking and adjusting set screws made by Set Screw & Mfg. Co., Bartlett, Ill., are specifically designed for use where excessive vibration is a factor, and for regulating and adjustment applications in which instantaneous locking at a precise point is desired.

Stated to be first set screw to have triple-locking action through a combination of interference fit, tension and locking of the screw against shaft, device also is intended to reduce production costs on tapping operations, since no closer fit than Class Two is required and extra tapping for counter-locking and the use of extra set screws are eliminated.

Screws are available with any type head, case hardened or heat-treated, and may be obtained made of any of the following materials: stainless steel, brass, bronze or aluminum.

USAF, Navy Bid Information

Air Material Command Procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention: MCPPSX72.

ABSTRACTS

For nuts (50-245): Companies sharing: Air Associates Inc., Teterboro, N. J., on a bid of \$10,949; Elastic Stop Nut Corp. of America, Union, N. J., on a bid of \$5473.85, and National Air Supply Co., Lynwood, Calif., on a bid of \$1058.13.

For ball bearing (50-359): Companies sharing: Ahlberg Bearing Co., Chicago, Ill., on a bid of \$1328; New Departure division, General Motors Corp., Bristol, Conn., on a bid of \$227.70, and Marlin Rockwell Corp., Jamestown, N. Y., on a bid of \$21,569.

For roll (50-379): Buffalo Forge Co., Buffalo, N. Y., on a bid of \$3910.

For relay (50-403): Westinghouse Electric Corp., Dayton, Ohio, on a bid of \$20,591.80.

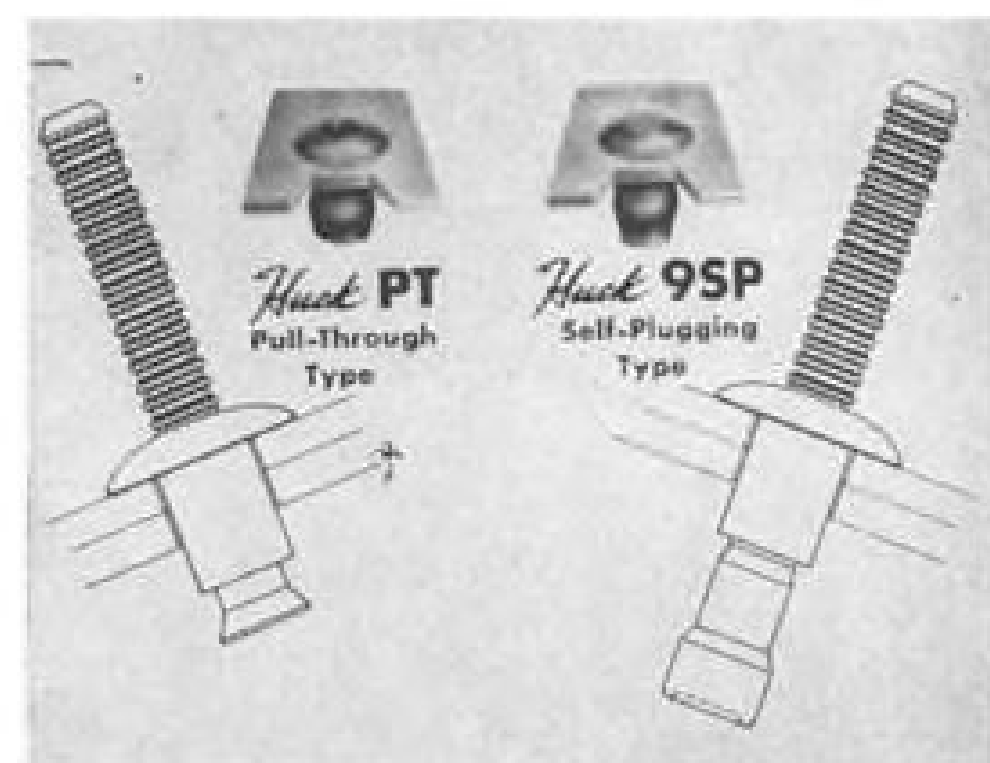
For sand blast cabinet (50-384): Ruemlin Mfg. Company, Milwaukee, Wis., on a bid of \$2979.

For cap, elbow, nut, plug, sleeve, tee adapter (50-329): Companies sharing: The Deutsch Co.,

Protective Coating

Plasti-Clad transparent plastic coating, offered by Metco Laboratories Corp., Indianapolis, Ind., can be applied to metal, wood and fabric surfaces on aircraft. Material seals against oxidizing and corrosive effects of weather and is represented not to check, peel or crack in extreme heat or cold.

Coating also will not discolor underlying paint and is said to fully protect against rain, sleet or salt water. In addition, it is stated to be impervious to gasoline and will not soften in oil. It is not affected by acids or alkali, resists abrasion caused by sand and dust and is fireproof. Material dries to less than 2 lb. added weight/gal.



Blind Rivets

Faster assembly and lower cost are advantages claimed for two new blind rivets announced by Huck Mfg. Co., Detroit, Mich.

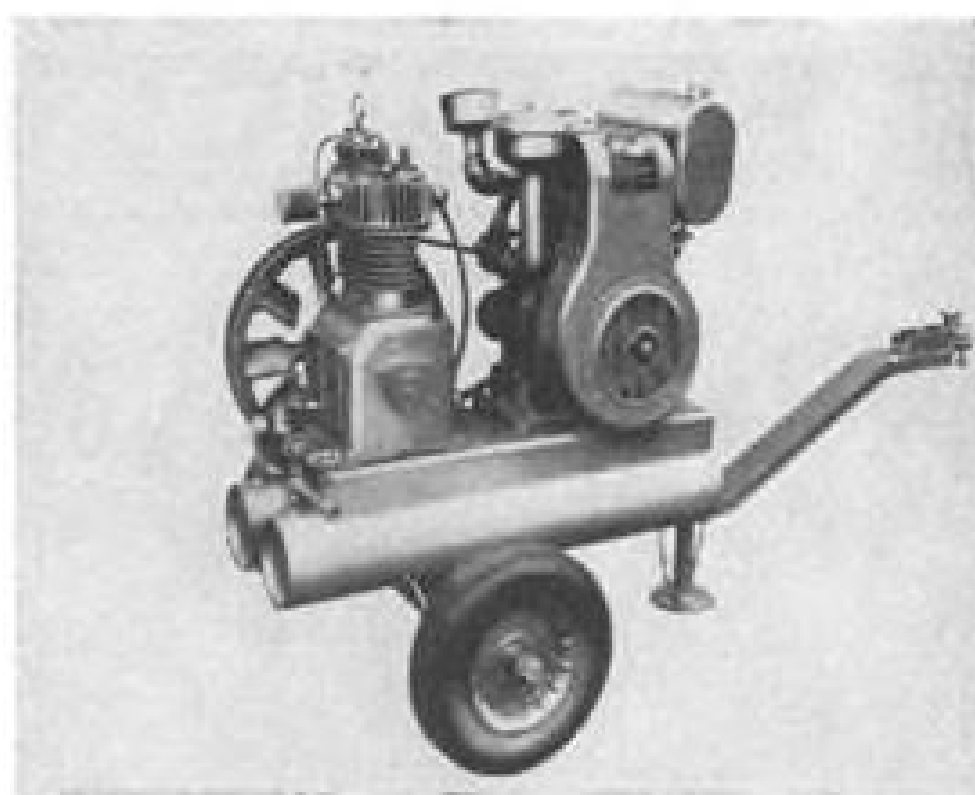
Designated PT (pull-through) and 9SP (self-plugging) type rivets, both are available in $\frac{1}{8}$, $\frac{3}{16}$, $\frac{1}{4}$ and $\frac{1}{2}$ in. diameters. They are furnished in aluminum alloys or cadmium-plated mild steel, with brazier or 100-deg. countersunk heads.

PT rivets have no minimum grip limitation, while 9SP rivets have grip range of .140 in. for any grip increment—claimed to be more than twice the grip range of other similar blind rivets. Splitting of rivet sleeve during formation of blind head is said to be eliminated.

Rivet pin tails are provided with pull grooves, to assure positive driving. Once inserted in the gun, they cannot wobble, fall out, or move to cause improper driving, and pulling section will not break off prematurely. Pin tail is automatically ejected by next rivet.

Fire Extinguisher

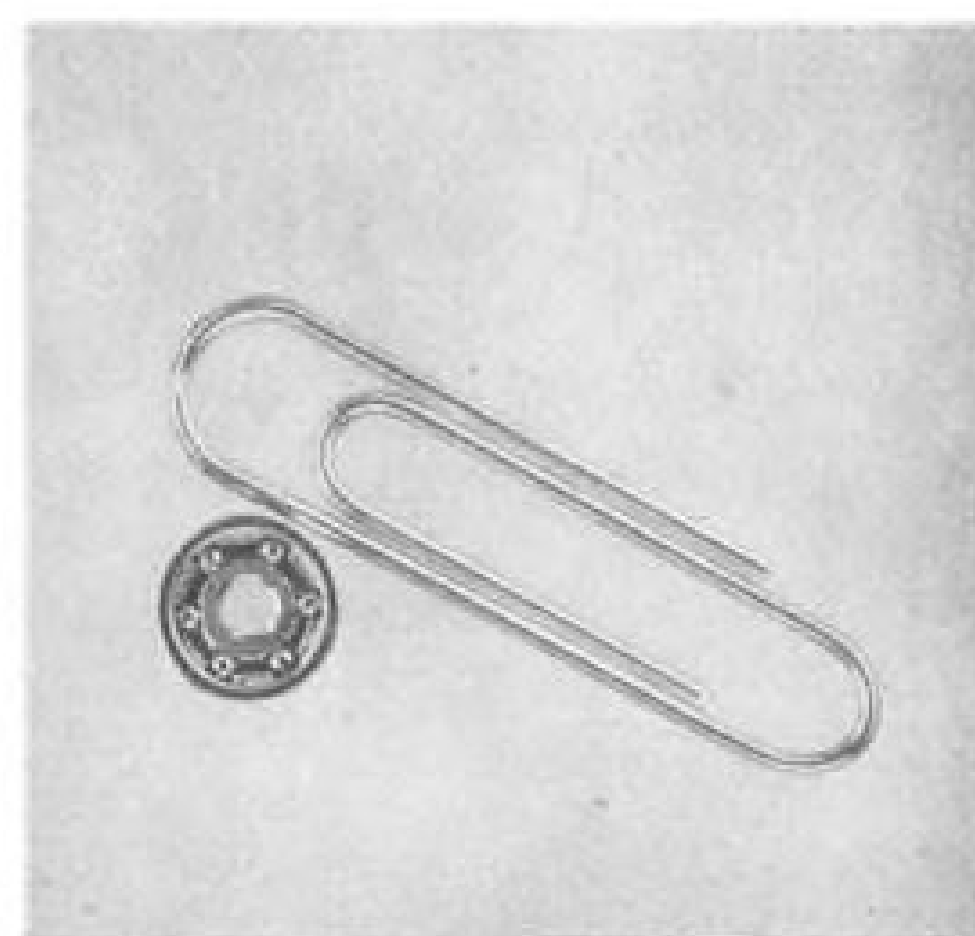
Improved dry chemical fire extinguisher, Model B, introduced by Ansul Chemical Co., Marinette, Wis. features special watertight seals in nozzle and receiver. Device has new threaded hose connections, cartridge guard finger grip and carrying handle, and is available in 20 and 30 lb. capacities.



Portable Compressor

Trailer-mounted portable compressors designed for operating small air tools on miscellaneous service jobs have been developed by Gardner-Denver Co., Quincy, Ill. Units are equipped with semi-pneumatic rubber-tired roller bearing wheels, drawbar, trailer hitch and stabilizer leg, and can be readily towed behind car or service truck.

Compressor capacity is sufficient to operate paint spray guns, chipping hammers, and airport apparatus such as light paving breakers, spaders, tampers and similar pneumatic equipment. Three sizes are available, each balanced for one-man handling.



Tiny Ball Bearing

Stated to be smallest conventional ball bearing ever produced in this country, Micro R 1-4, developed by New Hampshire Ball Bearings, Inc., Petersborough, N. H., is offered for wide range of applications in small mechanisms. Design makes it specially suitable for application in synchro and servo devices.

Compared to next smallest ball bearing made here, new bearing is claimed to represent $\frac{1}{3}$ reduction in size along with $\frac{1}{3}$ reduction in friction and internal surface speeds. Speed limit is 50 percent higher; weight and space requirements are cut by 70 percent, centrifugal forces by 80, and flywheel effect by 86 percent.

Of Conrad (retainer) design, unit is fully ground and has $\frac{1}{4}$ -in. o.d., $\frac{3}{16}$ -in.

width, and $\frac{1}{8}$ -in. bore dia., with both diameters being held to ± 0.0002 -in. tolerance.

Retainer (separator) is pressed and hardened beryllium copper, having 180,000 psi. tensile strength as against 40,000 given for usual pressed steel types.



Quick-Stopping Motor

For rotating or linear-motion jobs where extreme precision of movement is needed, and where the motor must be stopped from top speed in the minimum number of turns, a high-speed, reversible, 1/100 hp., d.c. motor, with built-in electrical-mechanical brake, is announced by Electro-Aire, Inc., 11439 Vanowen St., N. Hollywood, Calif.

Specially-designed brake is tamper-proof and is preset at factory. Running torque is 1.1 oz.-in. at 19,000 rpm., 28v. d.c. Brake operates within range of 18-30v. Dimensions of unit (excluding worm gear) are $3\frac{1}{2} \times 1\frac{1}{2}$ in.; mounting plate measures 2.7 x 3.4 in. Weight of motor is slightly over 1 lb.

For Hardness Tests

For more reliable and consistent hot Brinnell hardness testing of materials, Kennametal, Inc., Latrobe, Pa., offers "Kentanium" balls, made of heat-resistant material having titanium carbide base.

Balls are claimed to have unusually great strength combined with high resistance to oxidation, thermal shock, abrasion and corrosion. They are precision ground to true sphericity and close tolerance, and are available in standard 10 mm. size. In tests at 1500 F., it is reported that material showed high resistance to oxidation and that no appreciable deterioration of surfaces could be detected.

AIR TRANSPORT

How Is Air Coach Working Out?

Capital Airlines wonders, watching coach traffic slump as other carriers operate on same routes.

By Charles Adams

Capital Airlines, which pioneered scheduled domestic air coach flights, is experiencing some of the troubles it knew would develop as competitors boarded the cut-rate bandwagon.

Late last year, for the first time since inaugurating four-cents-a-mile service in November, 1948, Capital apparently lost money on its tourist-type operations. Reason for the dip into red ink, Capital indicated, were lower coach load factors induced by stiff reduced-fare competition from TWA, Northwest Airlines and Eastern Air Lines.

Figures filed with the Civil Aeronautics Board by Northwest and TWA showed the extent of that competition, and a Census Bureau survey gave further indication of the widespread use of all types of coach service by air travelers.

► **Good Thing Over-Done?**—Throughout its experiment with air coach, Capital has emphasized that there can be too much of a good thing. It has argued repeatedly that the high load factors essential to this type operation must be protected through close regulation of competition on each route.

Disclosure of Capital's recent slump in "Nighthawk" traffic was made in the company's exhibits in the Civil Aeronautics Board's transcontinental coach-type service case.

► **Decline Shown**—Capital warned that certification of additional coach service in the areas where it is already offering such flights would make all coach operations there uneconomical. To prove its point, the carrier stated:

- Traffic handled by Capital on its air coach services from New York and Washington to Chicago and Minneapolis fell from a peak of 8,998,000 revenue passenger miles in July to 5,686,000 in November.

- Whereas passenger business on Capital's regular-fare flights in this east-central territory dropped 24 percent from July to November, coach traffic plunged 36.8 percent.

Decline in the regular-fare traffic reflected seasonal trends and a series of airline accidents last fall, Capital explained. But, the company continued, the more severe dip in coach business "unquestionably" resulted in

substantial part from competing TWA and Northwest coach services.

► **More Competition**—With inauguration of nonstop New York-Chicago coach service by American Airlines and TWA on Dec. 27, Capital anticipates still further declines in its tourist-class business. Last month Capital discontinued its New York-Atlanta coach flights until next spring. (AVIATION WEEK, Dec. 5). The service was competitive with one offered by Eastern Air Lines.

Average passenger load factor on Capital's east-central area coach flights slipped from a high of 84.9 percent last June to 57.8 percent in November. With the southern coach flights to Atlanta and New Orleans (started last September) included, Capital's November coach load factor was only 49.4 percent.

The latter figure indicates an operating loss, since Capital estimates that on an added cost basis its break-even coach load factor is 50 percent. On an allocated cost basis, Capital's break-even coach load factor has been around 63 percent.

► **Profit Cited**—Despite the recent traffic trend, Capital has shown no loss of enthusiasm for air coach. Company



RENAMED TO CAB

Josh Lee, Civil Aeronautics Board member since 1943, has been reappointed to his second full six-year term by President Truman. The appointment is subject to Senate confirmation.

officials point out that even on an allocated cost basis air coach showed a profit of \$330,000 on gross revenues of \$1,979,176 during the first eight months of 1949.

While impressive when compared with regular-fare services, Capital's average air coach load factor of 76 percent during the first eight months of 1949 is not unique.

Northwest, which started four-cents-a-mile flights in March, reported a 60 percent coach load factor in April, 80 percent in May, 87 percent in June, 92 percent in July, 90 percent in August and 82 percent in September. During the same six months, load factor on NWA's regular-fare flights ranged from 47 to 68 percent.

TWA, which started Kansas City-Los Angeles coach operations last February with DC-3s, had an average 81 percent load factor on the service for the eight months ended Sept. 30. On its New York-Chicago Stratoliner coach operations started May 31, TWA had an average 83.7 percent load factor for the four months ended Sept. 30.

► **Census Bureau Study**—Meanwhile, a new survey made by U. S. Census Bureau personnel in connection with the transcontinental coach-type service case has shed more light on how much traffic the coast-to-coast nonskeds have been diverting from the certificated carriers.

Census Bureau representatives distributed questionnaires to over 2000 passengers on 52 nonscheduled flights leaving LaGuardia Field, Newark Airport and Lockheed Air Terminal during the two weeks from Oct. 17-30. It was found that less than one-third of the passengers had been diverted.

A previous study made by CAB last spring (AVIATION WEEK, Aug. 1) had shown that 34 percent of the passengers on the scheduled coach services of Capital, TWA, Northwest, Continental and Mid-Continent had been diverted from regular-fare airline flights. Nonskeds had claimed that only 10 percent came from regular airlines.

► **Diversion Figures**—Of the 1917 passengers filling in the nonsked questionnaire, 572 (30 percent) said they would have traveled by regular-fare airline if the nonsked coach service had not been available.

Among the remainder, 284 (15 percent) were diverted from rail Pullman; 241 (13 percent) from rail coach; 61 (4 percent) from automobiles; 30 (2 percent) from busses; 113 (6 percent) weren't sure how they would have traveled if air coach hadn't been available; and 25 (1 percent) would have gone by more than one form of transportation.

► **New Business**—Additional proof that air coach generates entirely new travel business was seen in the replies of 470

persons (23 percent of those answering) who said they would not have made their trip at all if air coach hadn't been available. Another 121 (6 percent) were uncertain whether or not they would have stayed at home without air coach.

Nonscheduled airlines whose patrons were polled by the Census Bureau were: Air America, Airline Transport Carriers, Arrow Airways, Associated Airways, Robin Airlines, Trans American Airways, Air Services, Inc., Golden Airways, New England Air Express, Trans National Airlines and Viking Airline. The first six of these carriers have asked CAB for certificates in the transcontinental coach-type service case.

1949 Record

U. S. scheduled lines set new safety mark for the second year in a row.

U.S. scheduled airlines set a new safety record in 1949 for the second year in a row.

Only four fatal accidents were reported as the certificated domestic trunklines, international flag lines and feeder operators flew an unprecedented total of 8,913,081,000 revenue passenger miles. There were 93 fatalities among the approximately 16,500,000 passengers carried.

The resulting passenger fatality rate per 100 million passenger miles flown was only 1.0. This compares with 1.3 fatalities per 100 million passenger miles flown in 1948, when 103 passengers were killed.

► **Overseas Mark**—Highlighting the safety picture is the record of U. S. international flag lines which have not had a passenger fatality since a Pan American Airways Constellation crashed at Shannon, Eire, Apr. 15, 1948. Ameri-

Airline Safety Record*				
Year	Passenger Deaths	Fatality Rate**		
1930	24	23.0	1941	37
1931	26	21.4	1942	55
1932	2	16.8	1943	32
1933	8	4.0	1944	65
1934	21	9.2	1945	93
1935	15	4.1	1946	115
1936	46	9.5	1947	219
1937	51	9.5	1948	103
1938	32	5.1	1949	93
1939	19	2.2	*Includes domestic trunklines, feeders and international flag lines.	
1940	35	2.7	**Passenger fatalities per 100 million passenger miles flown.	

can feederlines have not had a passenger fatality since the first short-haul operator inaugurated its service in August, 1945.

All of last year's fatal accidents were on domestic routes. First mishap was on July 30, when a stunting Navy Hellcat fighter plane collided with an Eastern Air Lines DC-3 near Fort Dix, N. J., killing 12 passengers and three crewmen on the transport. Previously, the airlines had flown for 11 months without a passenger fatality.

Collision of an Eastern Air Lines DC-4 and a P-38 fighter plane near Washington National Airport Nov. 1 resulted in the death of 51 passengers and four crewmen. An American Airlines DC-6 crashed during a landing at Dallas, Tex., Nov. 29, killing 26 passengers and two crew members.

Final fatal accident involved a Capital Airlines DC-3 which landed in the Potomac River while making an instrument approach to Washington National Airport on Dec. 12. Four passengers and two crewmen were killed in this accident.

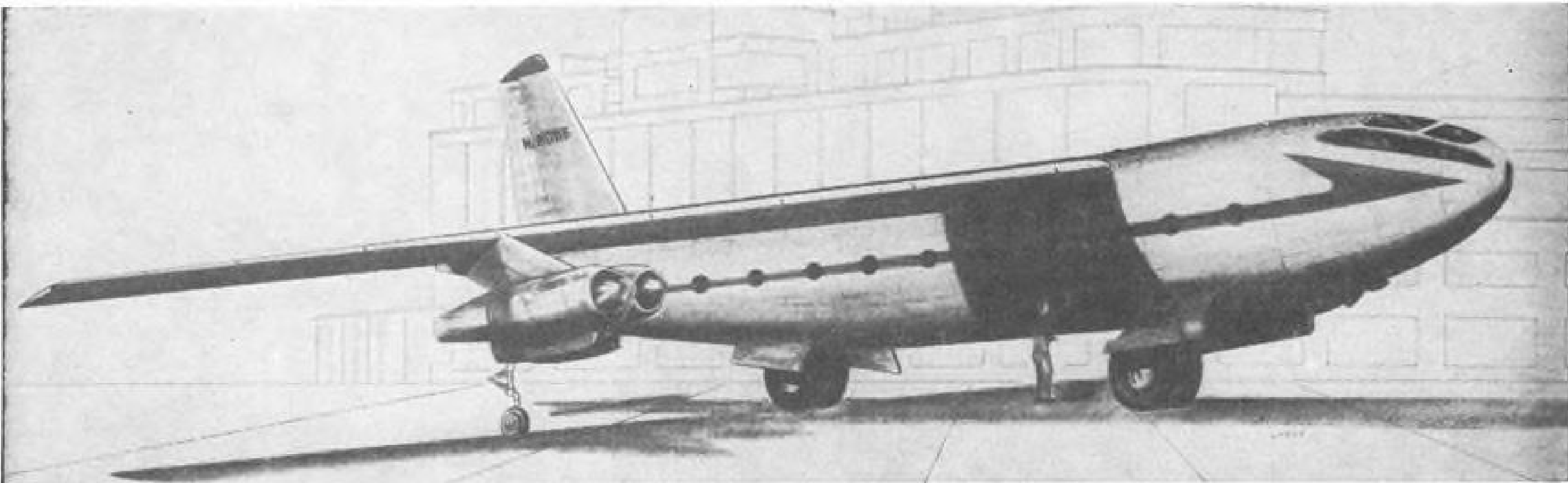
► **Rentzel Comments**—Reviewing the airlines' 1949 safety record, CAA Administrator D. W. Rentzel said it re-

flected the growing knowledge of correct operating methods combined with more and better air navigation and landing aids. He said there had been increasingly close cooperation between the operators and CAA on safety matters.

By the end of the year, CAA estimated it was well over half-way toward complete revision of the federal airways from low to very-high-frequency radio aids. Of the approximately 400 VHF ranges which will blanket the country, 370 are in; and most of these are either operating or ready to be turned on.

Instrument landing systems were in regular use at 87 points in continental U. S. and two in Alaska at the close of 1949.

CAA last year took special steps to promote airline safety by sending teams of supervisory safety agents into the field for conferences with the airlines on operating problems. The agency added that airlines have been making increasingly valuable use of CAA's "daily mechanical report," listing mechanical difficulties encountered by all U. S. certificated carriers and the remedial steps taken.



BOEING JET TRANSPORT STUDY

New sketch of a 40-passenger Boeing four-jet transport design study released by the manufacturer shows marked similarity to artist's conception of the plane in flight which appeared in AVIATION WEEK Oct. 10. Design is developed from the six-jet Boeing B-47 Stratojet bomber. External fuel tanks would be slung under

wings, inboard of the engines. Boeing says this is one of the several jet transport studies now on the boards. It may be shelved in favor of some of the other designs.

MATS' S. A. Service Called Fund Waste

Newly announced plans of the Military Air Transport Service to re-establish regular flights to South America have brought critical comment from the certificated airlines, which view the move as a waste of public funds.

Maj. Gen. Laurence S. Kuter, MATS commander, said the South American operations would include six round-trips monthly. Originating at Mobile, Ala., four of the trips will go down South America's east coast to Rio de Janeiro and Buenos Aires. Two round-trips monthly will follow the South American west coast to Santiago, Chile, via Guayaquil, Ecuador, and Lima, Peru.

► **Needs Reviewed**—MATS declared that the South American service is being resumed to meet requirements of U. S. missions and air attaches, as well as the U. S. Geodetic Survey team operating in the area. Prior to the Berlin Airlift, the Caribbean Air Command operated scheduled flights to stations on both coasts of South America, but in recent months only minimum service has been maintained.

The Air Transport Assn. said it could see no justification for the new MATS service to South America "which would only tend to dilute very light traffic now carried by the commercial airlines." It seems clear, ATA continued, that whatever need this new service is designed to meet could be met by the commercial carriers without difficulty.

MATS, which is prohibited by an armed services order from competing directly with certificated carriers, has been discussing mutual problems with ATA for some time.

► **Light Loads**—With regard to the South American run, ATA has pointed out that during fiscal 1949, Pan American Airways, Eastern Air Lines, Chicago & Southern Air Lines and Braniff Airways all operated to Latin America with less than a 50 percent load factor. ATA figures that the South American service will cost MATS over \$1.5 million annually, besides creating the possibility of increased subsidy requirements for the certificated airlines.

MATS contends it is merely renewing service disrupted by the Berlin Airlift, adding that no commercial traffic would be carried. It said operation of the South American routes is part of its mission of having service immediately available for emergencies.

Besides the operations of its continental division, extending from Alaska to South America, MATS' Atlantic division has routes from the U. S. east coast to Europe, the Mediterranean and the Middle East—connecting with

Pacific division routes at Dhahran, Saudi Arabia. The Pacific division operates scheduled flights from California through the Pacific area to Japan, Siam, India, the east coast of Africa and Dhahran.

Federated Eyes Holy Year Traffic

A second uncertificated airline is seeking Civil Aeronautics Board permission to tap the heavy New York-Rome Holy Year traffic during 1950.

Following the lead of Seaboard & Western Airlines (AVIATION WEEK, Dec. 12), Federated Airlines, Inc., New York, N. Y., has asked authority to make 395 New York-Rome charter trips this year under contract with Holy Year Pilgrimages, Inc. The large irregular operator would begin its overseas flights this month.

Holy Year Pilgrimages, Inc., the same nonprofit organization with which Seaboard & Western is dealing, plans to offer \$660 all-expense roundtrip tours to Rome. Federated Airlines would be paid \$19,440 per roundtrip.

► **Planes Leased**—Federated's president, Scott Chalfont, said he has three C-54Bs under lease from Trans Caribbean Air Cargo Lines, a C-54A from California Eastern Airways, and a C-54E from Robin Airlines. In addition, he said, California Eastern will make five C-54Bs available if they are needed.

The \$19,440 roundtrip charter payment to be made by Holy Year Pilgrimages, Inc. to Federated compares with the \$19,000 roundtrip charter rate that Felix Roma (another nonprofit Catholic organization) plans to pay Pan American Airways for its DC-4 round-trips. Price of Felix Roma's New York-Rome package tour is about \$698.

► **Profit Disputed**—PAA claims that on an added cost basis it can show a profit of \$965 per roundtrip under its Felix Roma contract. TWA, which is opposing the PAA contract flights, claims Pan American would lose money under the Felix Roma deal.

Regular roundtrip fare between New York and Rome is \$747.

Riddle Recommended For Cargo Route

Certification of Riddle Aviation Co., Miami, to carry cargo only between New York and Puerto Rico for a five-year period has been recommended by Civil Aeronautics Board examiner William J. Madden.

In his report on the need for additional service to Puerto Rico, Madden also urged that Eastern Air Lines be certificated to carry passengers, property and mail over a direct route be-

tween New York and San Juan. The latter authorization would be accompanied by institution of an investigation to determine whether Eastern's present Miami-San Juan link should be suspended.

► **Coach Setback**—Pointing out that passenger traffic between New York and Puerto Rico is increasing steadily, Madden said that Eastern Air Lines is best qualified to compete with Pan American Airways for the business. He recommended denial of applications by Trans Caribbean Air Cargo Lines, New York; Peninsular Air Transport, Miami Springs, Fla.; World Airways, New York; and Caribbean-Atlantic Airlines, San Juan, to conduct coach-type passenger services between New York and Puerto Rico.

Requests by Capital Airlines for route extensions from New York and Norfolk, Va., to San Juan and by Pan American Airways for designation of Boston, Philadelphia, Baltimore and Washington as co-terminals with New York on its San Juan service should be turned down, Madden said.

The examiner cited figures showing that during 1948, nonscheduled lines flew 63,352 passengers northbound and 27,764 southbound between the U. S. and Puerto Rico. In the same year, certificated lines (PAA and Eastern) flew 66,090 persons northbound and 60,210 southbound. About 90 percent of all U. S.-Puerto Rico passenger traffic now moves by air.

► **Cargo Gains**—Turning to air cargo, Madden said U. S.-Puerto Rico traffic had risen from 4,378,000 lb. in 1947 to 6,880,000 lb. in 1948 and should continue to grow. During 1948, nonscheduled handled two-thirds of the total. Biggest commodity is needlework.

In recommending Riddle for the cargo route certificate instead of Willis Air Service, Teterboro, N. J., the other freight applicant, Madden pointed out that Riddle in 1948 had flown over one-third of all the air cargo moving between the U. S. and Puerto Rico. He added that Riddle has been engaged exclusively and continuously in U. S.-Puerto Rico cargo operations since August, 1947, while Willis has become primarily engaged in servicing aircraft for other carriers.

Continental's Routes Extended

Continental Air Lines has been certificated to serve four more communities in New Mexico for a three-year period. Socorro, Hot Springs and Las Cruces will be served as intermediate points between Albuquerque and El Paso, Tex. Raton will be served as an intermediate point between Trinidad, Colo., and Las Vegas, N. Mex.

Damon on Jets

High fuel consumption, stacking, and turbulent air are still problems.

Six-hour trips across the Atlantic and four-hour coast-to-coast flights will probably be a scheduled actuality by 1960, according to Trans World Airline President Ralph S. Damon.

Damon, speaking in New York City, told members of the American Legion's Aviators Post that there is still work to be done "before the recent 450-mph. flight of a British (jet) airliner will mean a new and faster service for the public."

► **Problems Outlined**—"My own rough figuring," he said, "indicates that on the London-Libya flight, the Comet, which carries a smaller payload than the Constellation, burned 6000 lb. more fuel per thousand miles than the Constellation. That 6000 lb. is equivalent to 30 passengers and their baggage."

Damon feels present airway traffic-control stacking procedures "would be disastrous to the payload of a jet airplane which had to remain at slow speed and altitude in a letting-down stack at a terminal airport under minimum weather conditions."

And, he continued, "while fuel weights preclude jets from long-haul flights, the fact that their greatest efficiency is at 40,000 ft. or higher and at 400 mph. or more precludes them from short-haul operations."

Another problem, he stated, was to minimize effect of turbulence when a jet airliner encounters rough air at super speeds.

► **Likes Propjet**—The TWA president indicated he was impressed with the Vickers Viscount, in which he flew during a recent trip to Europe. "The turbo-prop gives an unbelievably smooth and vibration-free passenger ride at a moderate increase in fuel consumption," he told his audience.

Financially, TWA had two of the best quarters in its history in 1949, with each showing a profit before taxes of more than \$3.5 million. Barring unforeseen complications, Damon said, he expects the barometer to "rise at the same rate for 1950."

Airline Profits Almost Triple

The nation's scheduled airlines will show a net operating profit of \$44,830,248 for 1949, almost triple the \$16,321,327 recorded by domestic trunk lines, feeder lines and U. S. flag carriers in 1948.

Figures for 1949, based on final re-

ports for the first ten months and estimates for November and December by the Air Transport Assn., indicate that, as a whole, the carriers showed a 13 percent increase in gross revenues and a 9 percent increase in operating expenses over 1948's figures.

► **Category Breakdown**—When final results are in, here's how the respective categories are expected to line up:

• **Domestic trunk lines**—Passenger-miles flown jumped 13.9 percent over 1948, figures to reach 6,633,319,000 during 1949.

Mail ton-miles reached 40,772,181, an 8.7 percent increase. Total revenue ton-miles flown by the trunk lines in 1949 was 808,815,907, a 15 percent increase over the 703,089,009 ton-miles flown in 1948. Total operating revenue during 1949 reached \$460,527,463 and total operating expenses climbed to \$434,707,137.

• **Feeder Lines**—Biggest jump in revenue passenger-miles flown was made by the feeders. They flew 135,750,000 passenger-miles for, a 54.4 percent increase over 1948 figures. Total revenue ton-miles reached 14,368,765, a 58.9 percent hike over 1948. But total operating expenses of \$22,456,136 were not outweighed by total operating revenues of \$21,401,136, and, as a group, the feeders showed a \$1,055,000 net operating loss.

• **International Flag Lines**—Overseas carriers showed a net operating income of \$20,064,922 for 1949, a 43.9 percent increase over 1948 figures. Revenue passenger-miles reached 2,144,012,000 in 1949, a 13.5 percent upsurge. Total revenue ton-miles totaled 309,789,817 in 1949.

Meanwhile, Sir William P. Hildred, director general of the International Air Transport Assn., said the world's scheduled airlines carried more than 25 million people during 1949, with loads averaging more than 70,000 passengers per day throughout the year.

Trans-Atlantic airlines flew a total of approximately 11,000 scheduled flights across the North Atlantic, for an average of 30 per day. They carried a record total of nearly 300,000 passengers between Europe and North America.

Hildred said that within Europe alone, scheduled carriers flew more than 10,000 passengers each day.

Rebate on BEA

(McGraw-Hill World News)

London—A British European Airways credit travel card will be worth more than convenience this year—card holders who travel £200 worth within the British Isles during 1950 will be entitled to a 5 percent rebate on their fares.

Lock Device Failure Cited In NEA Crash

A malfunctioning locking device that permitted movement of the throttles beyond the stop and into the propeller reverse-pitch position was the probable cause of a Northeast Airlines Convair-Liner crash at Portland, Me., Aug. 11, 1949, according to the Civil Aeronautics Board.

Investigators concluded this after a study of the accident in which the plane was destroyed by fire and the crew of three and 25 passengers were evacuated without injury.

The Convair-Liner was passing over the approach end of the runway at an altitude of about 20-25 ft., and indicated airspeed of 120 mph., when the pilot brought the throttles back to what was expected to be closed position. According to the Board, malfunctioning of the propeller lock mechanism caused the throttles to be brought back beyond the closed position and into the propeller reverse position instead. Reversal of propeller pitch in flight caused an extremely hard landing 237 ft. past the approach end of the runway. The plane continued along the runway a distance of 1065 ft., although it suffered serious damage on the initial impact.

Spilled fuel was ignited by sparks from the damaged plane and from propellers scraping on the runway surface.

As a result of the crash, Northeast had added to its pre-landing check list a positive determination of position of this control.

Elal Starts Service

(McGraw-Hill World News)

London—Elal Israel National Airlines has begun scheduled flights between Lydda and London, Zurich and Paris, using a 50-passenger DC-4, formerly the American Airlines Flagship "Little Rock."

British Overseas Airways Corp. handles ground servicing at London for the Israeli carrier. Elal currently operates two DC-4s.

CMA Buys DC-6s

Mexico City—Compania Mexicana de Aviacion has ordered three of the latest model DC-6s from Douglas Aircraft Co.

The planes, which will cost CMA slightly less than \$3 million dollars, of which the airline has paid down some \$650,000 dollars.

The new planes, which will be the most modern in use by any Mexican airline, will be used on the Mexico City to Havana and the Mexico City to Los Angeles runs. They will allow CMA to

cut its flying time to Havana to 3 hours and 50 minutes and to Los Angeles to 5 hours and 30 minutes. Delivery is expected in the spring.

Flight Forecasts Recorded by AA

A new device to simplify air travel for passengers leaving New York will make its appearance this month.

Persons wanting information on the departure of American Airlines flights will be able to dial a number and get flight forecasts just as they now get weather forecasts by telephone. A recorded voice direct from the flight dispatch office will give the information.

► **How it Works**—Flight superintendents will normally record specific departure information every two hours and offer a guide to expected conditions beyond that time. When circumstances warrant, the forecast will be changed more frequently.

Whatever the passenger's destination, he can dial the telephone number and learn whether his flight will take off on schedule or be delayed by weather.

► **Capabilities**—American has installed announcing and control equipment sufficient to handle the greatest anticipated number of simultaneous calls. During periods of doubtful weather, incoming calls to airline reservations offices at LaGuardia Field increase one-third as ticketed passengers seek information about their flights.

Outgoing calls also increase as reservationists call passengers to inform them of departure delays. American expects to cut peak telephone loads substantially through use of the automatic device.

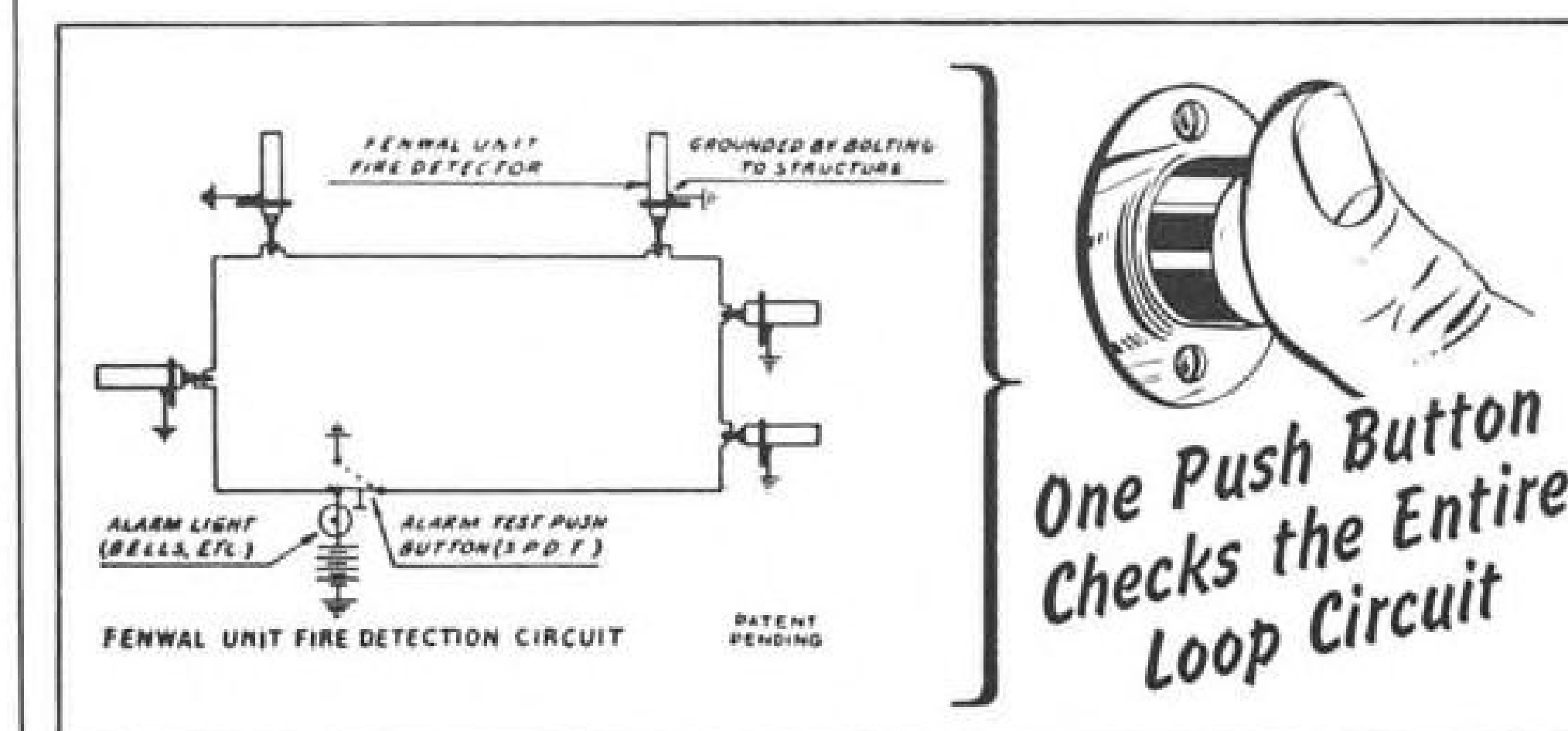
SWA Granted New Routes

Southwest Airways, which hopes eventually to weld together a single feeder system extending the entire length of the West Coast, has been granted new routes reaching almost to the Mexican border.

In a supplemental opinion to its California-Nevada service case, the Civil Aeronautics Board has given Southwest new links from its present terminal at Los Angeles to Phoenix, Ariz., via Santa Ana, Laguna Beach, Oceanside, San Diego and El Centro, Calif., and Yuma and Ajo, Ariz. SWA now operates from Los Angeles north to Medford, Ore.

CAB also authorized Western Air Lines to suspend service temporarily at El Centro and Yuma. It dismissed the application of Western Air Lines and Arizona Airways, an inactive feederline,

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for permission to transfer WAL's Yuma-El Centro-San Diego segment to Arizona.

Western was ordered by CAB to show cause why the part of its certificate authorizing service to El Centro, Yuma, San Bernardino and Palm Springs shouldn't be suspended during the period Southwest holds a certificate to operate between the points. Arizona Airways was told to show cause why its certificate for Phoenix-Ajo-Yuma service shouldn't be suspended while Southwest holds authority to operate the link.

Credit Cards Stay

U. S. scheduled airlines will continue to expand their national and international travel credit plan despite the recent decision of a number of large railroads to withdraw a similar travel credit arrangement. Thirty-six certificated U. S. airlines now make available credit card buying of air transportation.

SHORTLINES

► **British South American Airways**—Official inquiry into the disappearance of a BSAA Tudor IV between Bermuda and Jamaica Jan. 17, 1949, has failed to shed light on the mishap. Wreckage of the plane—the second BSAA Tudor IV to vanish on over-water flights in less than a year—was never found.

► **Civil Aeronautics Board**—Has issued show-cause orders providing increased mail pay for Caribbean-Atlantic Airlines, San Juan, P. R.; Cordova Air Service, Cordova, Alaska; and Ellis Air Lines, Ketchikan, Alaska. The Board found that the carriers' mail rates apparently have been inadequate and additional temporary payments are necessary to relieve the companies' critical financial conditions.

► **Mid-Continent**—Reported a \$20,726 net profit in November, compared with a \$11,937 net loss in the same 1948 month. Net profit of \$328,514 in the first 11 months of 1949 compared with a \$97,246 profit in the same 1948 period. Operating revenues in November, 1949, were up 11 percent over November, 1948.

► **Piedmont**—Has asked CAB to extend its feeder routes to Columbus, Ohio.

► **Pioneer**—Has declared a 25-cents-a-share dividend on its common stock.

► **Seaboard & Western**—U. S. Court of Appeals for the District of Columbia has ruled that the Civil Aeronautics Board could properly refuse to permit S&W to intervene in proceedings setting temporary mail rates for the trans-Atlantic operations of Pan American

Airways, American Overseas Airlines and TWA. The Court said S&W would be accorded its full rights if it participates in the cases which result in determination of the final mail rates. S&W has opposed the use of mail pay to subsidize competitive trans-Atlantic cargo services.

► **Turner Airlines**—The Indianapolis-based feeder reports its DC-3s had a 13 percent passenger load factor on its Indianapolis-Grand Rapids route segment between Nov. 12, when service was inaugurated, and Nov. 30. Turner planned to begin service to Cincinnati, Louisville, Connersville, Bloomington and Lafayette, Ind.; and Chicago early this month. Beech Bonanzas will serve these cities because some airports are inadequate for DC-3 operations.

► **TWA**—Has received CAB permission to suspend service at the co-terminal points Chicago and Detroit on its international route until June 1, 1950.

► **Trans-Texas**—Braniff has asked CAB to suspend the feeder's tariff proposing extension of cut-rate family fares to every day of the week but Friday. Plan is now effective only on Mondays, Tuesdays and Wednesdays.

► **United**—Plans to start California-Hawaii Stratocruiser service Jan. 15.

CAB SCHEDULE

Jan. 9—Prehearing conference on CAB's enforcement action against Trans American Airways, Great Lakes Airlines, Golden Airways, Edward Ware Tabor and Sky Coach Airtravel, Inc. (Docket 4161)

Jan. 9—Oral argument in National Airlines route consolidation case. (Docket 2967)

Jan. 11—Prehearing conference on enforcement proceeding involving alleged unauthorized operations of National Travel Club, Inc. (Docket 4194)

Jan. 12—Oral argument on TWA's complaint against Seaboard & Western Airlines. (Docket 3346)

Jan. 16—Hearing on Nationwide Airlines' application for Michigan routes. (Docket 2832)

Jan. 17—Hearing in National Airlines route transfer case. (Docket 3500)

Jan. 23—Oral argument on enforcement proceeding against Viking Airlines. Postponed from Jan. 5. (Docket 3447)

Jan. 23—Hearing on air freight accumulation, assembly and distribution tariffs. (Docket 1705 et al)

Jan. 23—Hearing on Cuba-Florida foreign air carrier permit case. (Docket 3717 et al)

Jan. 23—Prehearing conference on TWA and American Overseas Airlines' requests to suspend service at Philadelphia on trans-Atlantic routes. (Dockets 4228 and 4229)

Jan. 23—Hearing on enforcement proceeding against New England Air Express. (Docket 4151)

Feb. 6—Hearing in New York area helicopter case. Postponed from Jan. 16. (Docket 946 et al)

Feb. 6—Hearing in Colonial Airlines mail rate case. (Docket 2724)

Feb. 13—Hearing in West Coast Airlines' certificate renewal case. (Docket 3966)

Feb. 13—Hearing on Eastern Air Lines and National Airlines summer excursion fares. (Docket 4166)

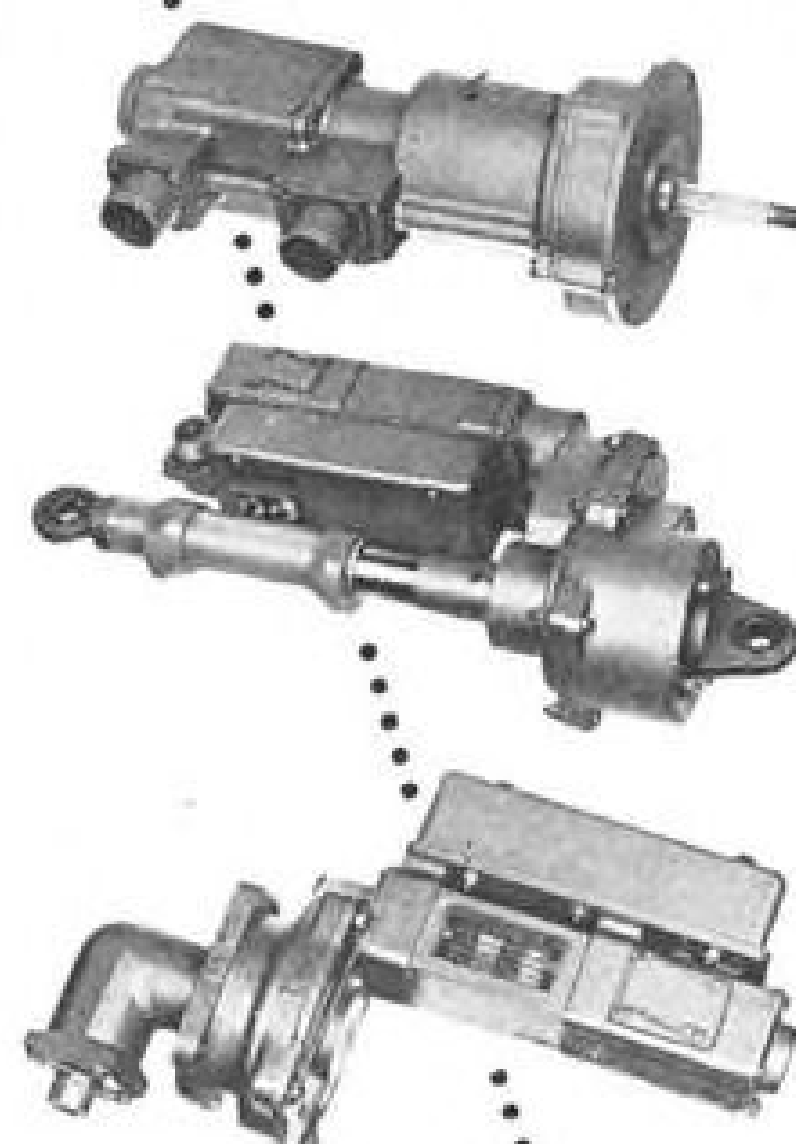
Feb. 24—Hearing on CAB's enforcement action against Meteor Air Transport. (Docket 4100)

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LETTERS

National Flight System

From time to time I have read items in AVIATION WEEK about National Flight System. Since June of this year they have had \$500 of my money which was paid for a "Dealer Membership Agreement."

To date they have not done any of the things they promised and since Aug. 24, 1949, I have not been able to get any answers to letters I have written to the headquarters in San Francisco. If AVIATION WEEK is interested in looking into the matter I will be happy to show you or your representative my complete file on my dealings with National Flight System.

A FIXED BASE OPERATOR

AVIATION WEEK is withholding the name of the writer of the letter above. We requested our McGraw-Hill News Bureau chief in San Francisco, Ted Palmer, to investigate. A summary of his report follows:

"After learning little authentic from the local Chamber of Commerce, Better Business Bureau, and various flight schools, I went to the last known address of the organization published in AVIATION WEEK Sept. 5 at 690 Market St., San Francisco. It had closed its office. I finally found an elevator operator who gave me a forwarding address, in one of the outlying shopping districts. Then I looked in the phone book for the names of the officials previously published in AVIATION WEEK, and found listed Frank Demeter. His wife there gave me a business phone number, which turned out to be the address given me by the postman. When I called I was greeted with the words, 'Pacific Television.' It seems that both the vice president and president of NFS are trying to recoup their losses by selling television sets.

"I talked to Robert F. Gunnell, who says he is president of NFS. He conceded that NFS is in a very bad financial spot. NFS is a California corporation still doing business. The creditors know that if they started legal proceedings they would get nothing, but by letting them operate on a small basis they may get something.

"NFS, at least through late October, had one paid employee who received \$225 a month for mailing out the company's ground school correspondence course. According to Gunnell, there were in late October between 400 and 500 students still receiving this course and they will continue to receive it until their last lesson. The national organization, which consisted of salesmen throughout the country who were working on a strictly commission basis, no longer exists, and anyone saying they represent NFS to dealers, operators, or prospective students is a phoney.

"Gunnell and Demeter both say they have salary claims against the company. They also hope to put it back on its feet some day on a little sounder basis. They think the principle was good, but that it was mismanaged. Apparently they are still getting payments from students receiving the ground courses, and with this they have been paying their one helper, mailing costs,

and trying to clear up their debts.

"They say they signed up over 40 'dealer membership agreements.' Apparently they feel that these dealers have no claim against them that will stand up legally, and according to them there was no guarantee of any kind in the contract. They seem to feel that the dealers who are complaining—and there are apparently many of them—are partly to blame for any fix they are in because of their own lack of promotional effort.

"The stock in the company is owned by Gunnell and Demeter, with a minority amount still held by Dick Powell.

"The trouble seems to have started when another individual, said to be a Robert Pike, was vice president and general manager in their former Los Angeles headquarters. I am told he was to put up \$15,000 and on the basis of this amount the national program was launched. But my information is that he put up only \$7500 and this loss of expected operating capital supposedly was the downfall of the company. Also, they apparently expected to get approval of the Veterans Administration, but this never happened.

"I did not meet Gunnell or Demeter personally, but over the phone they sounded sincere in their belief that they would someday get NFS back on its feet. They state emphatically that the company is still in business."

NFS Letter to Dealers

After Mr. Palmer talked to Messrs. Gunnell and Demeter, the latter sent out the letter below to their dealers. This copy was furnished to AVIATION WEEK by NFS:

Dear Mr. Blank: With reference to your recent correspondence expressing dissatisfaction with the NFS picture as it has evolved in your area, I am writing this with reluctance and only after every possibility has been exhausted to maintain the field organization you seem to require to operate the NFS program.

The extensive promotional activity undertaken early this year was unfortunately considerably more expensive than anticipated, caused principally by the interference of the Veterans Administration in certain areas. This, coupled with the reluctant acceptance of the industry and native lack of sales consciousness of those in it, has brought about an extremely critical financial situation at the national level.

The dealers have, in most areas, been unable to produce a volume of business great enough to meet the minimums set by the most conservative estimates based on past experience and have therefore not provided the support necessary to maintain the field organization. This has resulted in the inability of many otherwise well-qualified men to continue in the field in the face of dwindling financial resources. This drain on the national organization has created a situation in which we now find ourselves considerably over-ex-

tended credit-wise and with no assets other than a substantial lesson inventory which of course has no value unless effectively merchandised.

We appreciate your concern over the situation in which you find yourselves and regret the basic misfortune which has created it. The corporation is not financially able to effect any reimbursements even should that be found justifiable since there is barely enough income to meet expenses and no more venture capital available to further support the promotion of the organization.

The sales plan is good, the ground school course is good, and the package is good. It has been and is being sold by dealers without the benefit of constant field supervision, and it is available to you if you feel that you too will be able to effectively carry on the program with the written material provided and the help we can give you by mail from headquarters.

The present officers of the corporation are drawing nothing from it in the form of remuneration for their efforts. We are putting every cent of income into the liquidation of present debts and the continuance of service to the students. We feel that with the inventory on hand and the personal support we are able to afford, we shall be able to continue the service to your present and future students unless the corporation is forced into bankruptcy by an unreasoning creditor. In other words, the "merchandise" you contracted to sell is available. From its sale you can still realize a substantial profit. Without it, and your efforts toward moving it, neither the corporation nor any of its dealers have anything.

The undersigned has personally undertaken the operation of the corporation in an insolvent position in an effort to keep faith with the industry of which I have so long been a part. It is not an enviable task but we feel it can be completed. In any event we are willing to keep on trying without pay for as long as we are able. We will be happy to give you such assistance as we are able to give by mail for as long as you wish to continue with NFS. Should you elect another course, we would of course be powerless to prevent it but it must be apparent that any legal costs would represent an added expense, the result of which would avail nothing to anyone.

Again, let me say both Mr. Demeter and I, the present management, regret the turn of events which has developed the present situation—perhaps more than you—having personally lost far more in both money and time than any of the dealers, and that we are doing everything within our power to see that the service is continued. There seems to be nothing further we can do at the present.

ROBERT F. GUNNELL
National Flight System

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POSITION VACANT

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ATR PILOT, 35, 10 years military and airline flying. Currently employed major airline but desire work as Company pilot. P.W-1576, Aviation Week.

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UNIFORM MAKES THE PILOT—G. H. Macomber, general traffic & sales manager of Lamsa, writes from Mexico City about a new Lamsa ticket agent who had just obtained his resplendent uniform and struck up a conversation with a friendly stranger at a lunch counter. The new agent, a bit conscious of his impressive appearance, confessed modestly, "I'm a pilot with Lamsa." The stranger was so interested that the agent described the cities he flew to, and finally was led into a detailed description of a typical landing procedure. The stranger finally presented his card. It said "Chief Pilot of Lamsa."

* * *

HINTON ISN'T LOST; CREEDY IS—Our Strictly Personal column asking the whereabouts of Walter Hinton was hardly off the press before Republic's Ken Ellington called to say Harold lives at 532 Manhasset Woods Rd., Manhasset, L. I., N. Y. So far, this column has a 100% record for locating lost aviation people . . . John Creedy of Pan American's prolific news bureau says he has positively stopped the flow of alleged whimsy to this column in favor of the New Yorker. This latter, lesser-known rag, actually sent him a check for \$15. "Why give it away when you can be paid for it?" says he. But is it as much fun, being a pro, Creedy?

* * *

MAYBE IT WAS MOULTING?—According to A. A. Boon Hartsinck, some weeks ago the Community Chest in Los Angeles staged a big campaign-opening rally. Pershing Square was set up to exhibit the dignitaries and the committee hired a Hiller 360 helicopter from Pacific Helicopters to toss out one million (you count 'em) red feathers. For the statistically minded, these weighed about 50 pounds. The helicopter descended to 300 feet and tossed the feathers out with a flourish. Shortly thereafter, telephones began to ring at the Society for the Prevention of Cruelty to Animals. Sundry ladies were complaining that the city had found a new way to kill off the birds in Pershing Square. They were slicing them up with a Helicopter, and the bloody feathers were raining out of the sky. Boon says, "If I hadn't been in the office when the calls came in, I'd never believed it."

* * *

A HY POWERED WAIL FROM A WRITER—That most literary of airline captains, Hy Sheridan, must be writing a romantic novel. He takes a moment off to pen us a wail:

"It is hard to be original about amour; love is just one crib after another."

* * *

OLD TIMERS—If you know of the whereabouts of an aviation "old timer," let us hear from you. John W. White of Tampa, Fla., reports Clem Whittenbeck, former inverted acrobatic champion and Cleveland racer and plane designer, is in Tampa, manufacturing amusement devices such as pinball machines. But he's still air-minded. "He recently cracked up a Laird Special in an air show here . . ." Reader White, one of several complainants recently, adds, "Try to get the column in the magazine more often; we miss it down here."

* * *

THE CHILDREN'S CORNER—With this issue we open a Bright Sayings dept., but a bit circuitously. Bob Boylan complains to the Aviation Writers Assn. Newsletter: "I understand AVIATION WEEK has an item that has been hanging on the overset of its Strictly Personal column ever since the birth of our baby, Robert J. Boylan, Jr. The item says the boy's first comment was AWA. By the time Wood gets around to printing that, R. J. B., Jr., will be able to play and sing 'Mule Train'." Sorry, Bob. We checked and discovered the printers, who even enjoy the parts of this column that are crowded out each week, got tired of reading your item and killed it on the overset galley proofs before it appeared in the magazine.

—R. H. W.

WHAT'S NEW

New Books

"Jane's All the World's Aircraft 1949-50" edited by Leonard Bridgmen. In its fortieth year, this internationally famous volume continues to uphold the reputation of being the outstanding authority on civil and military aviation. This edition contains the latest facts and figures on the aircraft and engines of 45 nations, and there are over 3000 illustrations, including three-view drawings. U. S. aviation industry dominates the aircraft section, having 95 pages and 219 illustrations.

A three-column layout has been introduced for improving readability and giving greater flexibility in choice and location of photographs. Specifications and other data are detailed, and a high standard of accuracy is maintained.

To mark the fortieth edition, there are included historical articles by two of aviation's pioneers, Glenn L. Martin and Sir Frederick Handley Page, reviewing the progress aviation has achieved in four decades. There is also a special article by Air Commodore F. R. Banks in which he reviews aircraft engine progress over the same period.

Whittlesey House, McGraw-Hill Book Co., 330 W. 42d St., New York 18, N. Y. are the publishers and distributors for the United States, Canada, and South America by arrangement with the English publisher, Sampson Low, Marston & Co., Ltd. Price of the volume is \$16.50.

"Modern Arms and Free Men" by Vannevar Bush. Here is a carefully considered appraisal, by one of the nation's top scientists, of the role free science played in winning the last war, and how it can be used to help settle the pressing problems of a world engaged in a cold war of ideologies.

Dr. Bush analyzes the research errors made by the Germans and Japs in the last conflict, and explains how in many instances the enemy stifled the efforts of his own scientists by subordinating them to political bureaucratic controls.

The author sounds a warning that we must stress continued accumulation of fundamental scientific knowledge: "Should a new war have to be fought in a decade or so, there will be innovations, but in all serious probability no such burst of new devices as accrued when organized science and engineering first turned their full effort into war, drawing without inhibition or restraint upon the great unused accumulations of the past."

Published by Simon & Schuster, Inc., Rockefeller Center, 1230 Sixth Ave., New York 20, N. Y., 273 pages \$3.50.

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AVIATION WEEK—JANUARY 9, 1950

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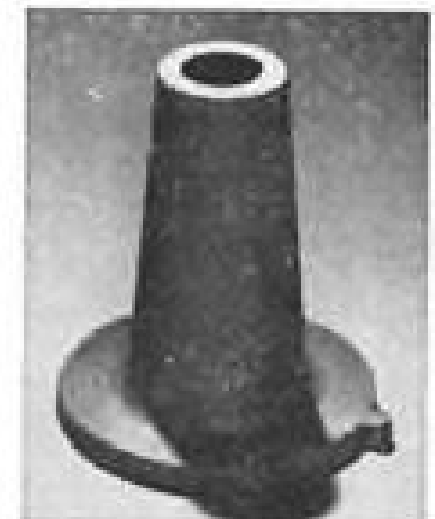
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EDITORIAL

How to Promote the Copter?

This is a delicate subject. Because in no way is this plea an invitation for anyone to invest in any stock and run an unusually dangerous risk of losing money. Let it be made clear that we have in mind only that sporting segment of the public who are constantly seeking new opportunities in frankly speculative issues.

Presidents of two youthful helicopter manufacturers have poured out their hearts to us in recent weeks on the frigid reception they have been handed in the hallowed financial district of New York City.

The technical merits and sales possibilities of the individual machines seem rather unimportant to most underwriters, promoters, consultants, and those who ingeniously match their wits in Lower Manhattan as contact men. Instead of intelligent questions, the struggling young helicopter spokesman gets the same story everywhere:

"The public just isn't interested in helicopter stocks these days, even in speculative issues. We wouldn't be able to sell your stock if we offered it."

We think this is the lazy man's answer. A more accurate admission might be:

"Frankly, we are afraid to come out with a helicopter issue. We climbed on the helicopter bandwagon several years ago, with some of the best houses in the Street. We tried to cash in on the publicity hysteria for helicopters then, didn't make enough investigation of the technical problems connected with the machine we promoted (or underwrote), and got burned plenty. Even if helicopters are good, we're through dabbling in them for a while."

Now, we don't censure these unfortunates for protecting certain once-unprotected patches of their fiscal anatomies. But we think the alibi is unfair.

Too many budding helicopter schemes have fizzled. True. And the public has lost too much money on them. True. But suppose the underwriters and promoters had paid even half as much attention to investigating the technical merits and sales possibilities of the individual machine as they did to the intricacies of the underwriting agreements. We believe there would have been fewer flops and therefore fewer financially distressed citizens.

The opinions of these venerable and astute financial gentlemen to the contrary, we respectfully contend that the great air-minded public would still far rather invest in a new helicopter venture—after someone with a good reputation has done a reasonable amount of engineering and sales analysis—than in many other equally speculative issues in utilities, gold and uranium mines, and television. And we shudder to think how many good citizens are

sinking their dollars in television stocks because some of these same underwriters are merely cashing in on the current public craze. Yesterday it was helicopters.

Certainly, there must be promising yet small helicopter projects in many a garage and back room that, somehow, deserve some independent and expert technical analysis. Certainly the worthier projects deserve at least an equal break with some of the bright, new television companies, which they are not getting.

As far as we are able to discover, those whose business is promoting or selling even frankly speculative stocks are doing little if any independent research; they are cashing in on the public craze of the moment.

So let's don't blame the public for the mistakes of others. Give the public a sporting chance and there will always be a fair-sized segment who will select an aviation stock to ride. The helicopter has a brilliant future, and the public knows it, even if the underwriters don't. But, we must admit, this profound conclusion still doesn't help the little helicopter man. Somebody should.

Full Fare Luxury for Cargo

Aviation has more striking contrasts than anybody else's business! On a recent visit to the West Coast we discovered that one airline which has been stolidly anti-coach because it said it took so much pride in offering its passengers only first class, luxury service has been piling cargo in the forward section of passenger cabins recently.

Special Award

Although it is primarily an intra-company matter, we believe you readers may be interested to learn of a special award to AVIATION WEEK. This publication was selected as the magazine "with the most outstanding record of accomplishment" in the McGraw-Hill company in 1949. There are 26 domestic publications under the company banner. Company executives, including Mr. James H. McGraw, Jr., the company chairman and president, approved this award to AVIATION WEEK.

In a special memorandum to Robert F. Boger, the magazine's publisher, they pointed out that AVIATION WEEK has won reader preference studies consistently and decisively. Its subscriber renewal percentage has advanced steadily. New subscriptions have been sold with relative ease and low cost. It has the largest gain in advertising page volume of any McGraw-Hill magazine this year.

ROBERT H. WOOD

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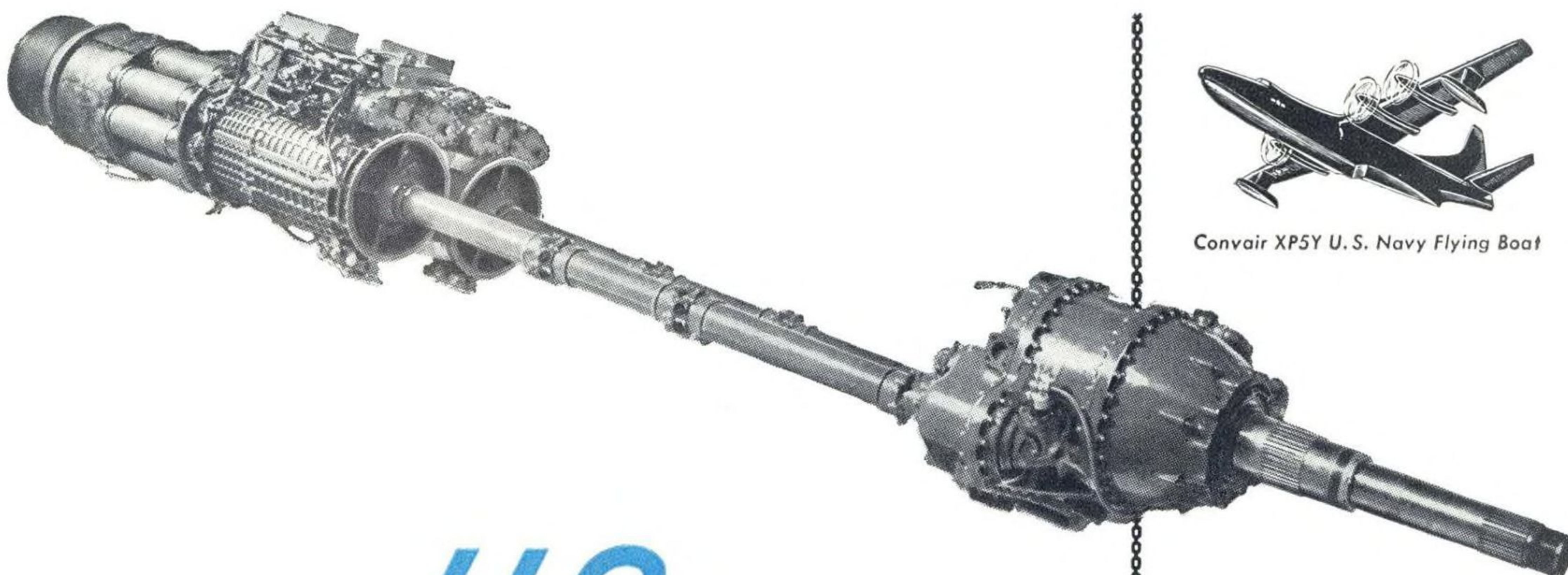
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A new American aircraft engine — the most advanced type in the world — is now revealed by the U. S. Navy. It's the new Allison XT40 *turbo-prop* which develops more horsepower per pound of weight, with good fuel economy, than any propeller-type engine ever built by any nation. The engine currently is rated at 5500 horsepower.

The new Allison *turbo-prop* will enable any propeller-driven aircraft — for the military services or commercial airlines — to fly faster and carry increased pay loads over longer distances at higher altitudes.

This outstanding performance is accomplished through the engine's high power, small size and light weight. Yet, fuel economy comparable to the best present-day commercial engines is retained.

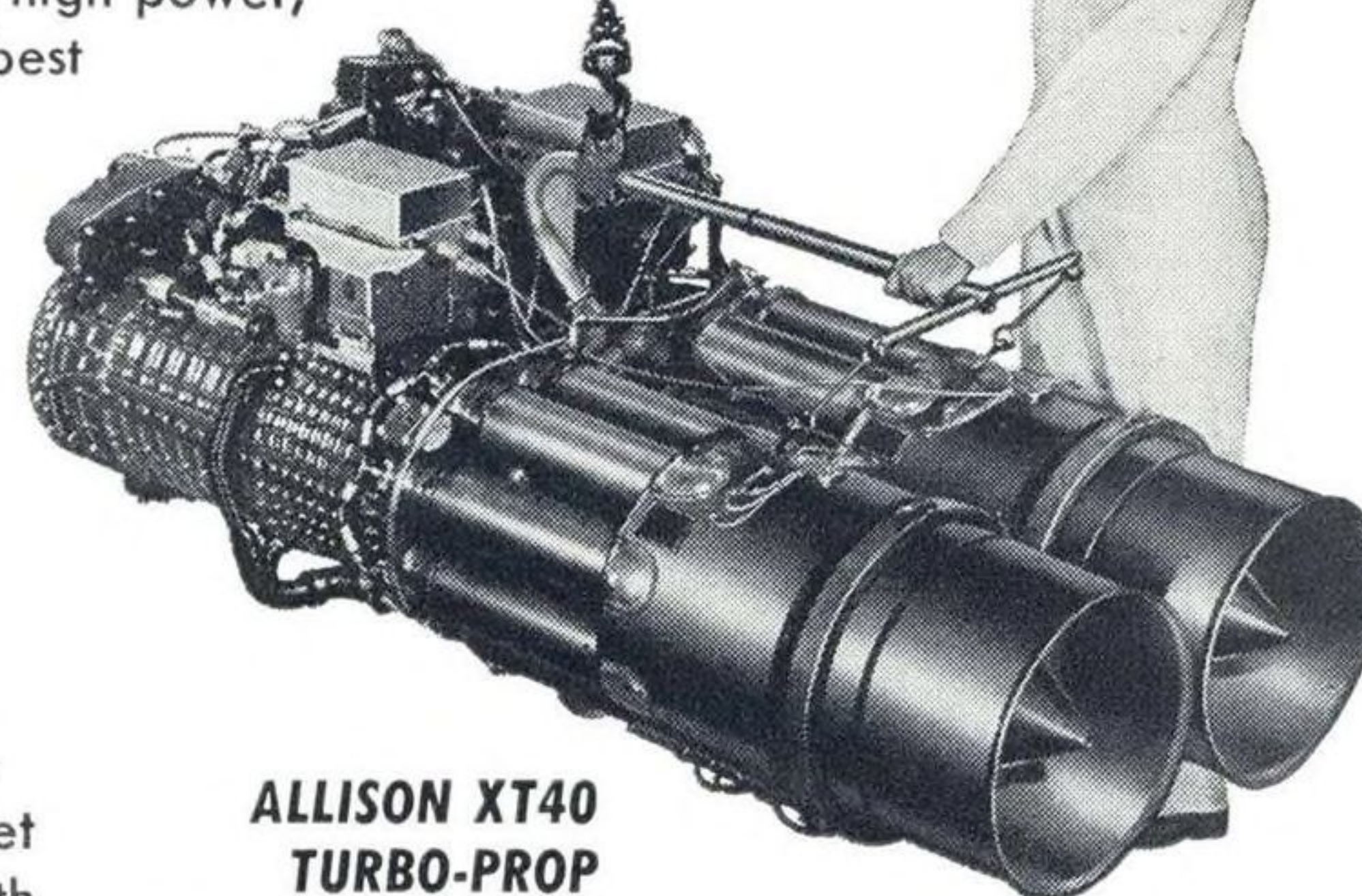
Horsepower-to-weight ratio, including extension shafting and reduction gear, is double that of our best present-day reciprocating engines — actually more than two horsepower per pound of engine weight.

The new Allison XT40, consisting of two super-powered gas turbines, achieves these important results through high-compression ratio and the flexibility of the twin power plant.

By outperforming reciprocating engines now in use, this new *turbo-prop* engine becomes a highly valuable stablemate for the turbo-jet engines which power today's very high speed military airplanes. Both these turbine-type engines use the same low-grade, readily available fuel; they do not need high-octane aviation gasoline.

The ease and flexibility of installation of this type engine are demonstrated by its first application in the Navy XP5Y Convair flying boat. Designers can utilize this compact, more powerful engine in all types of aircraft — both military and commercial — to gain improved range and performance.

Once more Allison, a world leader in aircraft engine development and production, has made an outstanding contribution to help keep America first in the air.



**ALLISON XT40
TURBO-PROP**

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of this engine, developing
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