

AVIATION WEEK

NOV. 23, 1953

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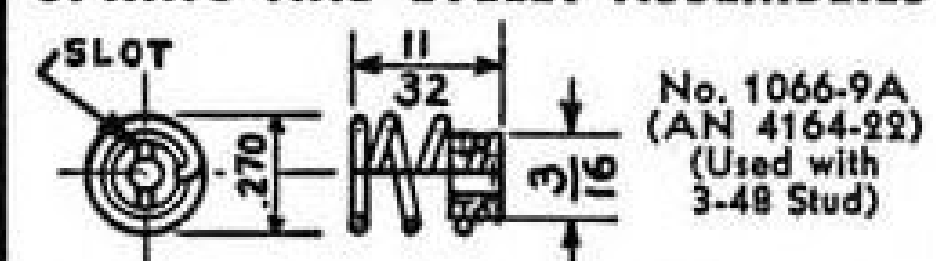
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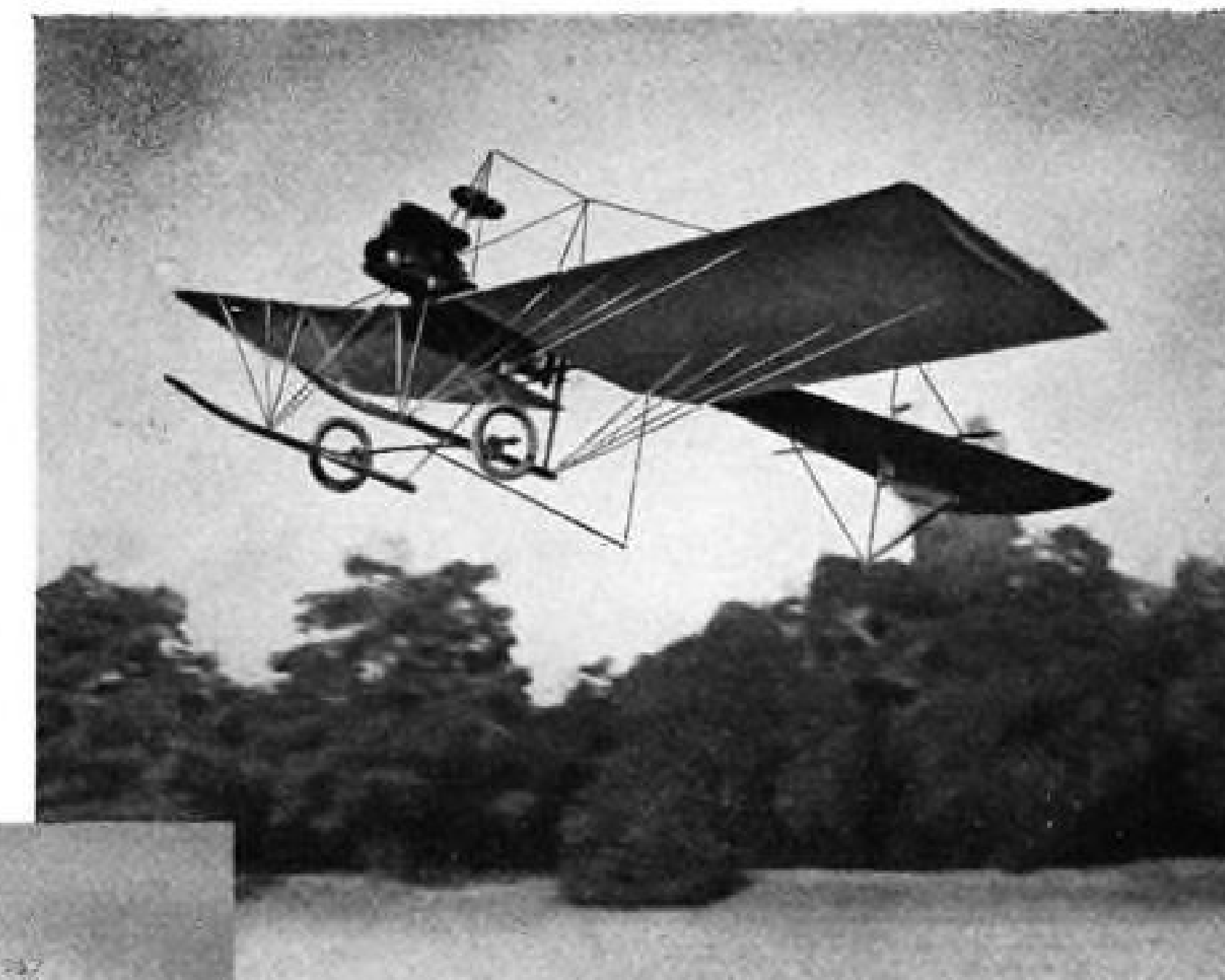


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Fokker Flies His "Spider"- 1910



By himself, Anthony Fokker built and flew his first airplane, "The Spider", as a young man of 20. Shown here taking off at a good angle of climb for those days, this plane, with its one-man crew, had no ailerons or wing-warping devices, being inherently stable. In "The Spider" Fokker won several awards from European governments in flying competitions. Later, during World War I, he became one of the world's outstanding airplane builders—and then, at the end of the war, recognizing the enormous possibilities of aviation in this country, Anthony Fokker came to the United States where his ideas, knowledge and skill made valuable contributions to the advancement of American aviation.

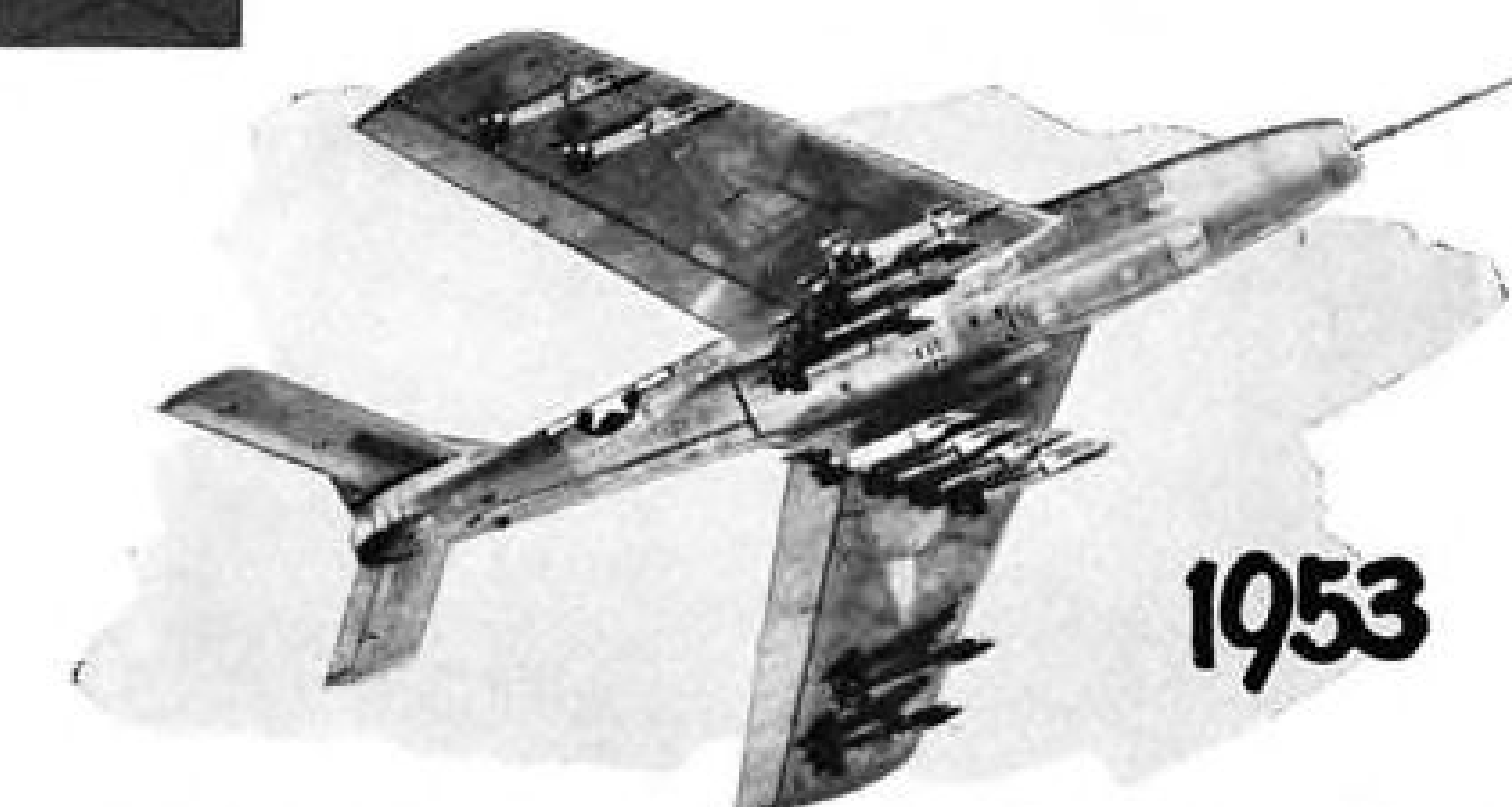


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Domestic

Lockheed Aircraft is setting up a new division to design, develop and produce pilotless aircraft and guided missiles at the company's Burbank, Calif., plant. The division will be headed by Lt. Gen. Elwood R. Quesada (USAF, Ret.), who will resign as vice president of Olin Industries to take over the Lockheed post.

Slick Airways last week announced sale of two DC-6As to Compagnie Maritime des Chargeurs Reunis, parent company of UAT, French carrier (AVIATION WEEK Oct. 26, p. 100). The airline took delivery of the first transport Nov. 12, will receive the second not later than Dec. 10. Price of each DC-6A: \$1,650,000 plus approximately \$200,000 in spares.

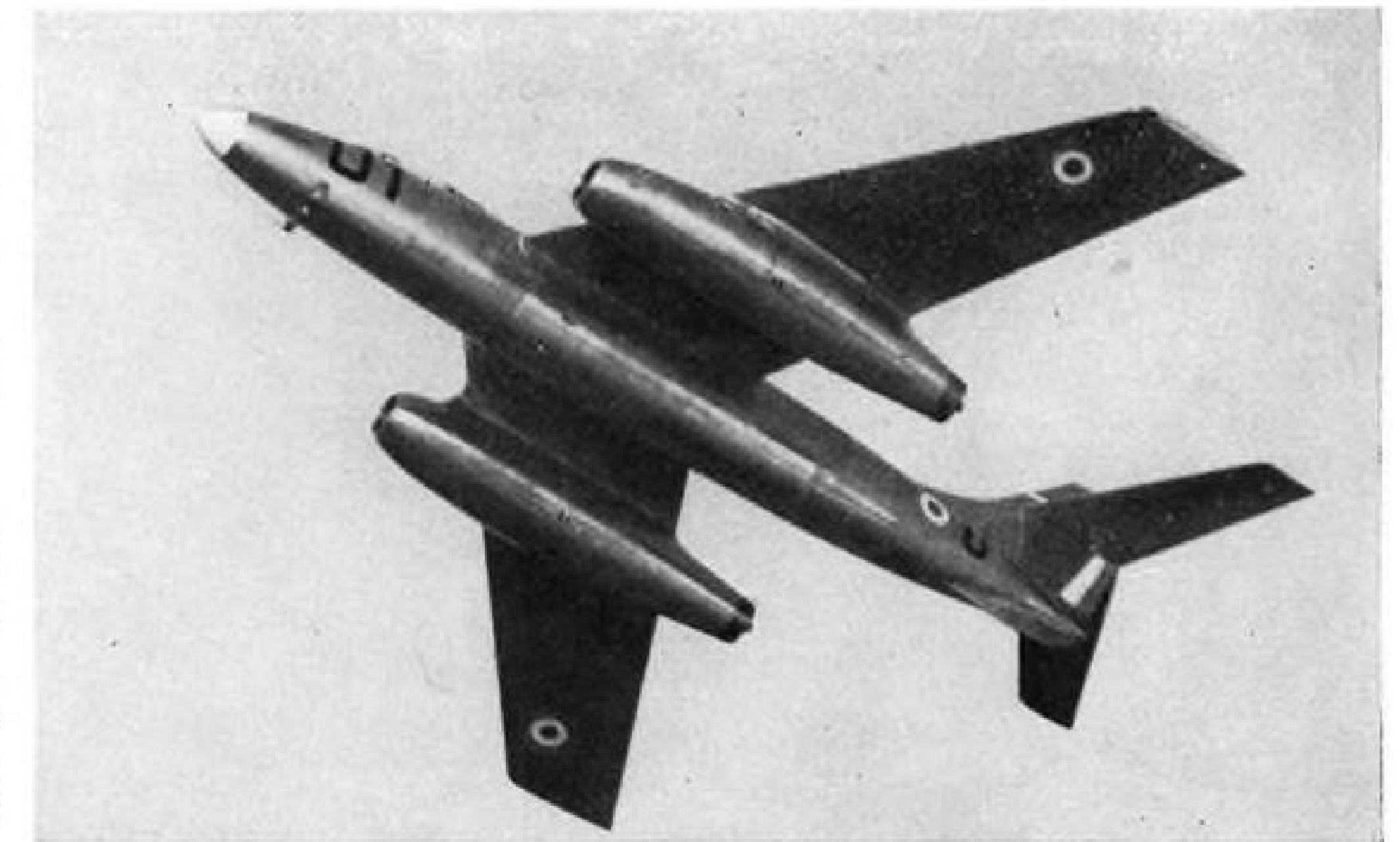
Douglas DC-7 received its CAA certification Nov. 12, just 22 months after the company agreed to build the transport. Douglas claims the time as a record for development and certification of an airliner.

Strikebound North American Aviation last week reported production of one plane each day since United Auto Workers (CIO) ordered wage walkouts Oct. 23 at NAA plants in Los Angeles, Fresno, Calif., and Columbus, Ohio. J. S. Smithson, vice president-manufacturing, said 21.6% of NAA's production and maintenance workers were on the job and that more were returning each day.

Barriers blocking construction of Sikorsky Aircraft's new \$17.5-million helicopter plant at Stratford, Conn., last week were cleared away when a majority of landowners surrendered in their four-month fight against the proposed factory. Town opinion overwhelmingly supported the United Aircraft Corp. Division, which employs 4,300 workers at nearby Bridgeport and plans to add 3,500 at the Stratford unit.

First progressive semi-automatic assembly line to be set up by the aircraft industry is producing Wright Turbo Compound engines at Curtiss-Wright Corp.'s Wood-Ridge, N. J., plant. Roy T. Hurley, president and chairman of Wright Aeronautical Division, says the new line takes 42% less space than the World War II system it replaced, can increase production capacity by 250%.

Airport facilities in the U. S. soon will be inadequate to meet the needs of growing airline passenger traffic, ex-



French Order Vautour Tactical Jets

The French Air Ministry has ordered an undisclosed quantity of twinjet S.O. 4050 Vautour tactical fighter-bombers, similar to the prototype shown above. Production versions of the Vautour will be powered by Sncma Atar 101C axial-flow turbojets rated at more than 6,000 lb. static thrust each. The prototype has 5,280 lb. thrust 101Bs. Plane can take a crew of one or two, depending upon the mission.

pected to increase more than 85% during the next 20 years, Adm. Emory S. Land, president of Air Transport Assn., forecast last week.

Douglas Aircraft last week delivered to Japan Air Lines the second of a fleet of DC-6Bs scheduled to inaugurate JAL's twice-weekly trans-Pacific service between Tokyo and San Francisco next February. A third DC-6B will be ferried to Japan later this month.

Safety mark of nearly a billion miles flown without a passenger fatality was completed by Military Air Transport Service during the first 10 months of this year, reports Lt. Gen. Joseph Smith, MATS commander.

First jet stream flight of the season was completed this month by Pan American World Airways, flying 3,870 mi. nonstop from Tokyo to Honolulu in 12 hr. 25 min.—2 hr. 10 min. under the record.

Bell Aircraft has sold Model 47C helicopters to France's national police force, the French armed forces and to Air Outre Mer, air charter service operating in French Indo-China.

John A. B. Smith, 72, aviation pioneer and retired vice president of Curtiss-Wright Corp., died this month at Middleboro, Mass.

Financial

United Aircraft Corp., East Hartford, Conn., reports consolidated net income of \$15,873,870 for the first nine months of 1953 from sales totaling \$579,605,570. Backlog and government letters of intent: Approximately \$1,550 million.

Pacific Northern Airlines net earnings for the first nine months of this year totaled \$178,000 from \$4,680,000 in operating revenues.

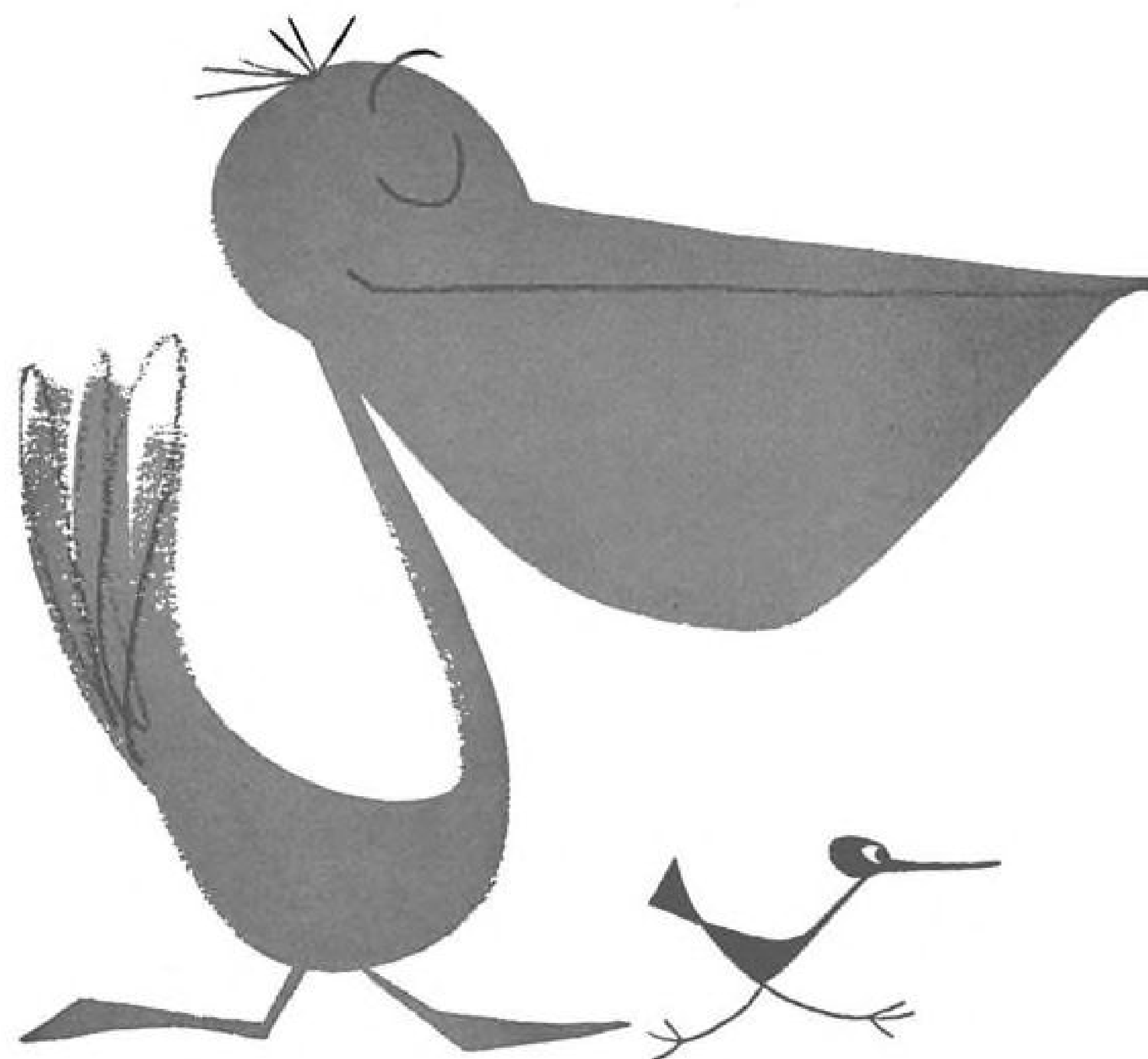
International

New international airport will be constructed at Bogota, Colombia, on a 1,900-acre site with two 13,000-ft., monodirectional runways.

Record air traffic business of \$23,452,000 was handled by International Air Transport Assn.'s clearing house in London during August, passing the peak of \$21,740,000 set last July, IATA reports. August total compared with \$20,869,000 for the same month last year.

Vicente Almandos Almonacid, 70, Argentine aviation pioneer, died Nov. 17 in Buenos Aires.

Passenger traffic at Dusseldorf's Lohausen Airport increased 48% during the first three quarters of this year, reflecting a gradual rise in air travel throughout West Germany.



THERE'S A BIG DIFFERENCE

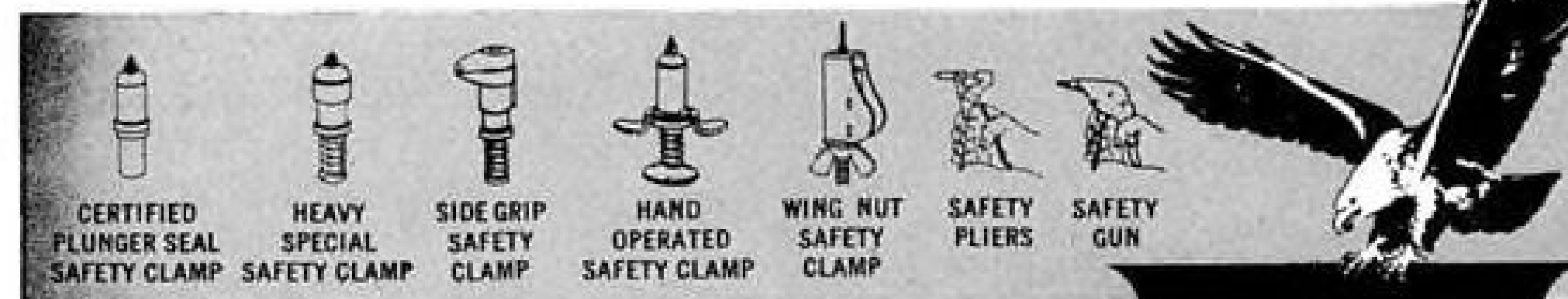


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The Aviation Week

November 23, 1953

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Washington Roundup

Arctic Defense

One of the real reasons behind President Eisenhower's recent visit to Canada was to help smooth discord between USAF and the Royal Canadian Air Force on air defense problems.

One major issue involved is location of early warning radar stations.

CAB Probe

Undersecretary of Commerce Robert Murray told a Washington audience that he knows of "no investigation that is important" regarding the Civil Aeronautics Board (AVIATION WEEK Nov. 9, p. 13). Murray said he does not believe any great change is contemplated in CAB. Rumors to this effect "could be the result of the harvest moon or the warm Indian Summer," according to Murray.

Bomber Problems

Future development of the Convair XB-58 supersonic bomber may be affected by the views of Gen. Curtis E. LeMay, head of Strategic Air Command on the future equipment requirements of SAC. LeMay is strongly on record in the Air Council as favoring a military requirement for a jet tanker for aerial refueling of SAC bombers and long-range fighters.

ARDC-AMC Feud

Pentagon observers believe the reign of Lieut. Gen. Orval Cook as USAF materiel czar with authority over Air Materiel Command and Air Research and Development Command may signal a truce in the bitter battle between these two commands.

Fireworks are predicted if and when Gen. Cook leaves his present post.

Off-Shore Buying

Future trend of off-shore procurement of military aircraft is being determined by conferences between Roger Kyes, Deputy Secretary of Defense, and Harold Stassen, head of the Foreign Operations Administration.

However, differences have developed between the Air Force and Defense Department over what type of plane to buy and how much to pay. Outlook is that the fiscal 1954 off-shore aircraft procurement program probably will be delayed until spring.

McCarthy Plans

No aircraft plants are now on the list of defense plants scheduled for investigations of communism by the Senate committee headed by Sen. Joseph McCarthy, but some may be included later. McCarthy's group is interested particularly in management's rights to fire employees with communist affiliations.

Air Mail Experiment

Among lessons learned by the Post Office Department from its initial experiment in hauling first-class mail by air on the New York, Washington and Chicago routes:

- Airlines have handled all the mail given them.

- Letters postmarked as late as 8 p. m. make early morning delivery at another city.

- Costs can't be estimated accurately. Detailed route studies are required.

- Directional imbalance is pronounced. In the first month of the service, with total 726 tons flown, breakdown in pounds was N. Y.-Chicago 405,529, Chicago-N. Y. 623,839, Washington-Chicago 147,330, Chicago-Washington 274,665.

- Airline pay for the 51 million letters carried in previously empty cargo space Oct. 6-31 was \$94,000.

Post Office's cost studies on a proposed Pacific Coast service are still in an early stage. New York-Pittsburgh service is also being considered.

Air Transport Assn. forecasts that expedited first-class letter mail by air will help boost total domestic airmail tonnage from 225,000 tons this year to 1,240,000 tons in 1970.

USAF Staff Problem

Among solutions suggested to ease the terrific work load on the top-level USAF brass is creation of an additional vice-chief of staff placing one in charge of operations and the other in charge of materiel.

Praise for Airlift

Pacific airlift is credited with handling more than 400,000 casualties during the Korean war with only five deaths. These occurred in an aircraft collision on the ground. Dr. Melvin A. Casberg, Assistant Defense Secretary (Health and Medical), also credits the airlift with maintaining an adequate supply of blood in the combat zone.

Westinghouse Jet Move

Congressional and labor union pressure is being exerted on Navy to block a Westinghouse Electric Corp. proposal to move its jet engineering facilities, (about one-quarter of its Essington plant at Lester, Pa.) to the government-owned plant at Kansas City, Mo., where the firm produces jet engines. The company overhauls engines and has its spare parts facility at Lester in addition to the jet engineering department. Westinghouse reasons its engineers are 1,500 mi. from the production plant and travel between the plants by company executives and engineers is too costly. Navy is not likely to decide the issue soon since Westinghouse would have to build additional facilities at the Kansas City plant in order to house the engineering department.

Civilian Comptrollers

Senate Armed Services Subcommittee under Sen. Ralph Flanders, which has been looking into Defense Department fiscal policies, is likely to recommend civilian assistant secretaries as comptrollers for the three services. The subcommittee's report is due early in December. Big question is whether Air Force Secretary Harold Talbott will continue to oppose civilian comptrollers, a plan recommended by Defense Secretary Charles Wilson (AVIATION WEEK Nov. 16, p. 12).

—Washington staff

INDUSTRY OBSERVER

► Convair F-102 delta all-weather interceptor hit Mach .98 in a steep climb during early flight tests before it crashed on takeoff (AVIATION WEEK Nov. 9, p. 18). Convair does not plan to salvage the damaged plane and is concentrating instead on rushing completion of the second F-102 prototype now scheduled to fly in early December. Convair pilot Sam Shannon will fly the second prototype, replacing Dick Johnson who was hurt in the crash.

► Sabena, Belgian National Airline, probably will buy from three to six Sikorsky 20-passenger S-56 twin-engine helicopters when they become available for commercial use. Sabena now is operating the first international passenger service with helicopters and is pleased with the performance of its eight-passenger Sikorsky S-55s.

► McDonnell, Hiller and Sikorsky are working on versions of a flying crane helicopter similar in function to the Hughes XH-17. This type of copter is aimed at lifting heavy loads, such as tanks and artillery across rivers, over ridges and other terrain obstacles.

► North American Aviation's Navaho long-range missile is nearing the flight test stage at Edwards AFB.

► Although Navv hasn't said so officially, it has virtually abandoned hope for its Allison T40 turboprop development using two power sections geared to a single set of propellers. North American's A2J powered by two of the twin-unit T40s was canceled some time ago and severe cutbacks are in the works for the Convair R3Y flying boat and the Douglas A2D carrier-based attack bomber, both dependent on the T40 powerplant. Meanwhile, the single-unit Allison T56 is coming along well and will be used in the Convair C-131C and the Lockheed C-130 transports.

► General Electric's J73 turbojet producing about 9,200 lb. static thrust is scheduled for use in several long-range missiles in addition to aircraft installations not yet announced.

► USAF mockup board recently inspected the mockup of the Republic delta F-105 fighter-bomber at Republic's Farmingdale plant. F-105 also is planned in an RF-105 reconnaissance version.

► Convair now is working with both General Electric and the Curtiss-Wright Corp. on its explorations of nuclear power for aircraft.

► McDonnell Aircraft Corp. F-101 Voodoo long-range fighter will be equipped with a retractable refueling probe for use with the probe-and-drogue aerial refueling system developed by Flight Refueling, Inc.

► Lockheed has developed a flying test bed with a 20-ft. wingspan for flight testing ramjet developments. The flying test bed is air-launched from a mother plane.

► Republic F-84F Thunderstreak is scheduled to get a slab, all-flying tail cranked into the production line somewhere between plane No. 250 and 300. Meanwhile, Republic is cocooning some of the excess F-84Fs that have come off the production line without J65 Sapphire turbojets.

► Navy recently completed carrier trials of its latest crop of sea-going aircraft including the Douglas F4D, McDonnell F3H Demon, Grumman F9F-7 Cougar, Grumman S2F anti-sub plane, North American FJ-2 and the Vought F7U-3. Trials were aboard the carrier Coral Sea off Norfolk.

► Bristol Aeroplane Co., Ltd. is reviving its Saturn turbojet engine project backed by W.E.W. Petter, designer of the lightweight Gnat fighter. The Saturn was originally scheduled for 3,800-lb.-thrust output for the 6,000-lb. Gnat. After British Ministry of Supply refused to support the Saturn project, Petter found private backing to revive the project as a 4,000-lb.-thrust engine. Gnat is scheduled to make its first flight within a year powered by a 1,640-lb. thrust Armstrong Siddeley Viper turbojet.

WHO'S WHERE

In the Front Office

John P. Riddle, former president of Riddle Airlines and onetime chief of Embry-Riddle School of Aviation, has been appointed president of National Union Life Insurance Co., Miami.

R. H. Weir will become principal director of Britain's Engine Research and Development Jan. 1, succeeding Air Commodore F. R. Banks, who plans to return to his firm, Associated Ethyl Co., Ltd.

Dean C. Smith, who resigned from Hughes Aircraft Co. to become customer relations director at Lear, Inc., Los Angeles, has been elected a vice president. Frank Squires, also a former Hughes employee, has joined the LearCal Division as quality manager.

Charles L. Hood is new vice president-sales of Riddle Airlines.

James R. Bradburn will become vice president in charge of Consolidated Engineering Corp.'s Computer Division Dec. 1. Also promoted: Joseph H. Lancor, Jr., vice president-engineering; Walter B. Claus, director Transducer Division.

R. F. Redemske is vice president in charge of Servomechanisms' new Components Division, Westbury, N. Y. Other division appointments: H. W. Brede, customer liaison director; S. Davis, chief development engineer; W. Berg, production manager; E. Karas, chief accountant; R. J. Corby, purchasing agent.

Willard F. Rockwell, Jr., president of Rockwell Manufacturing Co., has been elected a director of Allegheny Airlines. Jack K. Svitzer is new analysis and research director for Allegheny.

Russell M. Anderson is chairman of Coast Pro-Seal & Manufacturing Co., Los Angeles, new corporation formed when Coast Paint & Chemical Co. merged with Aircraft Metal Forming Co. and Aero-Cal Engineers. Other new executives: R. E. Meade, president and general manager; Walter W. Smith, vice president and assistant general manager; R. F. Baird, vice president-manufacturing; Ben F. Warner, vice president-sales; S. S. Buffum, sales manager of the Metals Division; J. M. Casey, sales manager, Coast Pro-Seal Division; W. H. McPhee, general sales manager. Verle N. Fry has resigned as president to resume duties as trustee and general counsel.

Changes

Gen. Stephen J. Chamberlin (USA Ret.) has retired as chief of General Services Division for Aro, Inc., operators of the Arnold Engineering Development Center at Tullahoma, Tenn. He was succeeded by Leonard Z. Dolan, former city manager at Johnson City, Tenn.

Betty Skelton is new secretary and general manager of Aeronautical Electronics, Inc., Raleigh, N. C. Julian W. Bunn, Jr., has become treasurer and production engineer.

Paul J. Papanek has been elected assistant secretary of Marquardt Aircraft Co.

(Continued on page 81)



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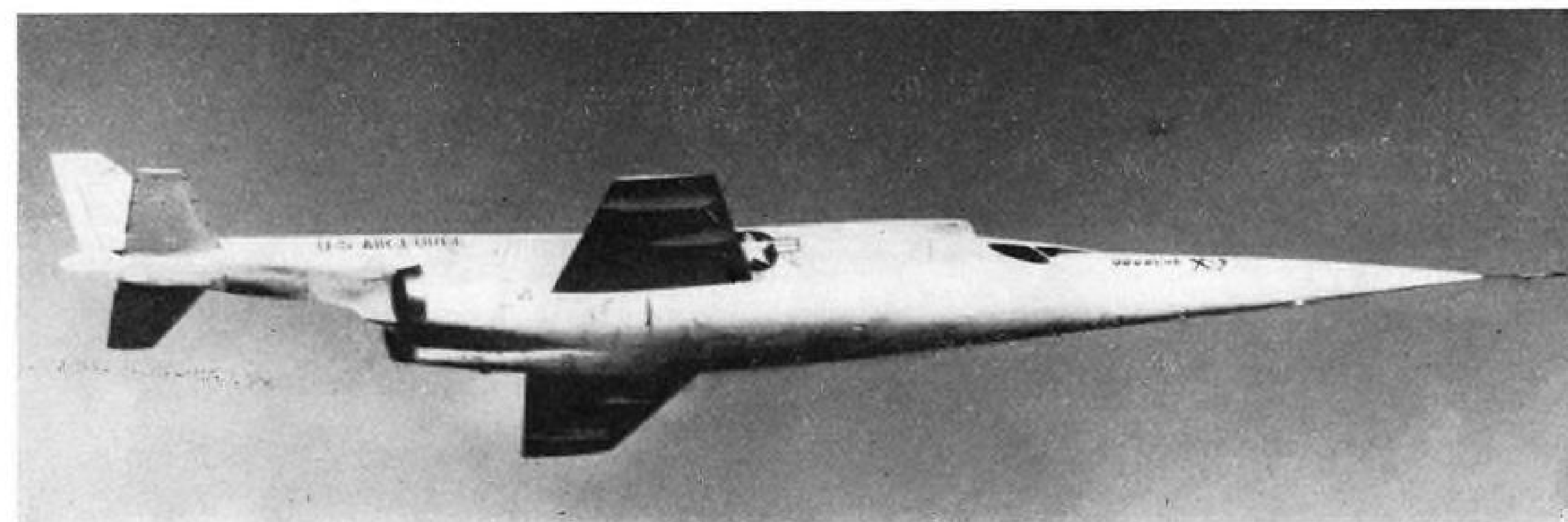


Headquarters for
VIBRATION CONTROL

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NEEDLE-NOSED DOUGLAS X-3 research plane pierces the air above Edwards AFB, Calif., during a flight test by the Air Force.

NACA Takes Over X-3 Testing Program

- USAF ends flight trials of underpowered craft.
- Experts doubt plane will hit Mach 3 design speed.

Air Force last week passed on the Douglas X-3 supersonic research aircraft to the National Advisory Committee for Aeronautics after a year of desultory flight testing at Edwards AFB, Calif.

The X-3 originally was designed to be the fastest of the joint USAF-Navy-NACA stable of research aircraft. Its ultimate goal was exploration of supersonic speeds up to Mach 3 (above 2,000 mph. at extreme altitudes). However, lack of the special models of Westinghouse J46 axial-flow turbojets originally scheduled for the X-3 now makes it doubtful the aircraft will exceed the speeds already reached by NACA test pilots in the Douglas Skyrocket (see page 15).

► **Increased Diameters**—After development difficulties with early types of J46 turbojets Westinghouse was forced to increase the diameter of the later J46 models that are now used in the Chance Vought F7U-3 and scheduled for the Convair F2Y. The larger diameter J46 engines will not fit the dimensions available in the X-3 so two J34-17 engines with afterburners have been substituted. They produce 4,500 lb. thrust each.

Thus the X-3 now has only 9,000 lb. thrust available to push its 27,000-lb. weight, compared to more than 14,000 lb. thrust from the originally scheduled twin J46 installation with afterburners.



STUBBY WINGS, spanning only 22 ft. 8 in. are highlighted in this view of X-3.

NACA plans to continue flight testing the X-3 at Edwards with Scott Crossfield, the pilot who has flown fastest in the Skyrocket, at the controls. Because the X-3 requires a takeoff run of about 15,000 ft., it can only be

flown off the broad expanse of Rogers Dry Lake bed at Edwards.

► **The Beast**—During the first year of flight testing only Douglas test pilot William Bridgeman has flown the X-3, which he has dubbed "the beast."



JET INTAKES for X-3's two Westinghouse J34s flank fuselage closely behind the research aircraft's triangular-shaped canopy.

Bridgeman pushed the X-3 well past Mach 1 during these early test flights.

Design of the X-3 finally was selected from more than 60 combinations of airframes and powerplants to explore the efficiency of straight stubby wings utilizing a double-wedge airfoil at speeds up to Mach 3 and to gather data on the effects of thermodynamic heating at speeds above Mach 2. It also was designed to explore the efficiency of turbojet powerplants at these speeds, in contrast to the rocket power utilized in the X-1 and D-558 series of research aircraft.

► **Tapered Nose**—The X-3 has an extremely long, tapered nose merging into twin air inlets for the two Westinghouse J34-17 axial-flow turbojets mounted high on each side of the fuselage.

A triangular cockpit is designed to reduce the effects of thermodynamic heating and drag at supersonic speeds.

X-3 Specs

Length: 66 ft. 9 in.

Span: 22 ft. 8 in.

Gross weight: 27,000 lb.

Engines: two Westinghouse J34-17 turbojets with afterburners.

It is located just forward of the air inlets and provides limited visibility for the pilot. Provisions for bleeding off boundary layer airflow are visible in the air inlets.

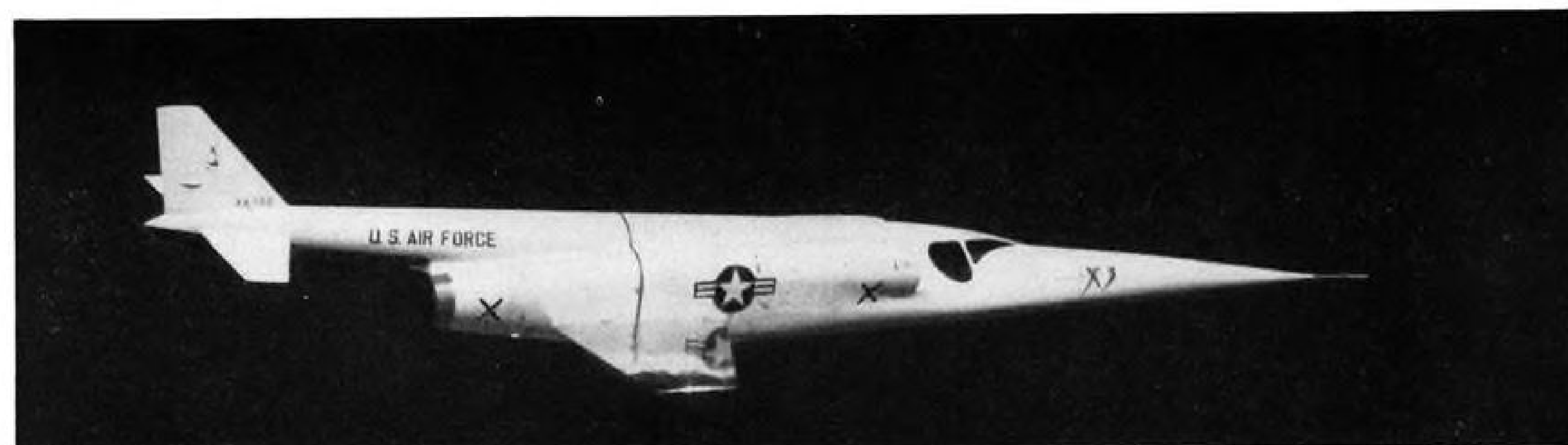
The wings are located well aft on the fuselage and just above the main landing gear struts. Total wing span is only 22 ft. 8 in., less than the span of the horizontal tail surfaces of a Douglas DC-3 transport. Wings taper slightly. Tail is mounted on a boom that sweeps up from the turbojet housings to put

the control surfaces well clear of the twin afterburner blast.

► **Weighs 27,000 lb.**—Gross weight of the X-3 is about 27,000 lb. Length is 66 ft. 9 in. It carries 1,200 lb. of research instruments in addition to pilot and fuel. Both a refrigeration system and special insulating material are used to protect pilot and instrumentation from the effects of thermodynamic heating.

Many of the airborne research instruments were specially designed for the X-3 by NACA. There are 850 pin holes in the skin to record pressures in flight. Temperature readings are registered at 150 points on the plane while 185 electric strain gages indicate air loads.

► **Releasing Information**—Information obtained during the design, development and flight testing of the X-3 is being made available to the aircraft industry through the NACA and military channels. The X-3 is the latest of a



SMALL TAIL, supported on slender boom, juts above and behind side-by-side jet exhaust pipes, clearing blast of twin afterburners.

dozen research aircraft to be unveiled since the flight test phase of the program began in 1947.

Others include the Bell X-1 series that made the first piloted supersonic flights in history (Oct. 14, 1947); the Northrop X-4, exploring tailless configurations at high subsonic speeds; Bell X-5, using variable-sweep wings; the Douglas D-558-I (Skystreak), utilizing straight wings and turbojet power in the transonic range; the Douglas D-558-II (Skyrocket), exploring short sweptwings and rocket power in the supersonic ranges up to Mach 2; and the Bell X-2, for supersonic research with rocket power, sweptwings and stainless steel construction.

Only the Bell X-2 research plane still is under security wraps.

► **Engineers' View**—Interpretation and scaling of the photographs by AVIATION WEEK engineers has revealed additional details of the X-3 wing and fuselage design.

The operating mechanisms for ailerons and leading-edge high-lift devices had to be mounted externally and covered with large fairings.

Total wing area is calculated at approximately 175 sq. ft., resulting in a takeoff wing loading of about 155 lb./sq. ft.

A split trailing-edge flap is fitted to the wing, in addition to the five-segmented leading-edge flap or slat.

Pilot probably escapes downward, using a standard ejection seat modified to prevent highspeed spinning started by the supersonic slipstream. Outlines of a hatch under the cockpit tend to confirm this point.

Civil Service Keeps Grip on CAA Jobs

Civil Service Commission has turned down a Commerce Department request to remove the position of Director of Information for Civil Aeronautics Administration from Civil Service status and make it a policy appointment.

The post now is filled by Ben Stern. A former Indiana newspaperman, Stern served as secretary to the late Democratic Sen. Frederick Van Nuys of Indiana. He was a Marine Corps officer during World War II, detailed to the Office of War Information—first under William Donovan and later under Elmer Davis.

Stern has been CAA's information director since 1943.

The commission also turned down Commerce Department's request to make one assistant in the CAA information office a policy appointment. CAA's present information assistants are: Ray Nathan, Charles Planck, Lee Willis, and Howard Bingham.

► **Weeks' Position**—The requests for

Skyrocket Hits Mach 1.96

A new unofficial world speed record of 1,272 mph. was set by Scott Crossfield, test pilot for the National Advisory Committee for Aeronautics, flying Douglas Aircraft's Skyrocket (D-558-II) at Edwards AFB. Previous record was 1,238 mph. set by Douglas test pilot Bill Bridgeman in the Skyrocket.

Crossfield set his record Oct. 14 and reached Mach 1.96 during the flight. Top speed was reached in temperature of -82F, indicating extreme altitude. These figures were confirmed by NACA.

Marine Lt. Col. Marion Carl set an altitude record of 83,235 ft. Aug. 21 in the D-558-II (AVIATION WEEK Sept. 7, p. 17). In later flights, Carl attained a speed of 1,143 mph., or Mach 1.7, at 68,000 ft.

► **New Try**—Meanwhile, both Douglas and Navy were considering an attempt at the all-altitude speed record with the Skyrocket. North American Aviation now has priority for the all-altitude speed course and Douglas would have to wait until NAA finishes its attempts with the F-100 or the priority expires (usually 90 days).

A recent interpretation of Federation Aeronautique Internationale (FAI) rules received in Washington by National Aeronautic Assn. will

permit an official world speed run by air-launched planes. Until 1940, FAI rules required that record runs be made by planes capable of taking off and landing under their own power.

Crossfield, Bridgeman and Carl were air-launched from a B-29 mother plane at altitude for their Skyrocket record runs.

► **Controversy Expected**—NAA officials said there was no reason why air-launched research aircraft such as the D-558-II or the Bell X-2 could not establish a world speed record now.

However, controversy over this point is expected to develop at next meeting of the FAI International Sporting Aviation Commission scheduled for next September in Turkey. There is some feeling that allowing research aircraft to set records would boost them so high it would be impossible to stimulate further interest in record activity by workhorse aircraft, and that the records of the workhorses are the true measure of aviation progress.

Crossfield has made more than 20 flights in the Skyrocket and has worked closely with Bridgeman and Carl since the research plane was turned over to NACA two years ago.

reclassification of the two CAA posts was in line with Secretary of Commerce Sinclair Weeks' position that the information offices of the department's subdivisions should be directed by appointees sympathetic to the new Administration.

CAA Administrator Fred Lee said that he did not recommend a change in status of the posts.

CSC did grant the department's request to remove the following six CAA positions from Civil Service and make them policy appointments: deputy administrator; general counsel; one confidential assistant to the administrator, and private secretaries to the administrator, deputy administrator and general counsel.

The reclassification applies only to future appointments.

Persons now holding these positions, aside from dismissals due to reductions in the personnel force, cannot be removed except with the approval of CSC.

CAA general counsel is Robert Boyle, who has been with CAA since 1938. Secretary to the administrator is Dortha Walsh, and the secretary to the general counsel is Marian Harvey, both CAA career employees. The positions of

deputy administrator, secretary to the deputy administrator and confidential assistant to the assistant to the administrator now are vacant.

► **16 Jobs**—Civil Aeronautics Board has listed 16 positions—mostly bureau chiefs and assistant chiefs—as policy-making. But CAB has made no request to have these declassified from Civil Service.

The Commerce request to declassify the CAA positions was made pursuant to an executive order authorizing all department and agency heads to propose changes considered necessary to execute policy effectively. Despite numerous political demands, CSC has approved only about half of the approximately 1,000 job declassifications that have been requested.

Political pressure on the agencies and CSC to put more jobs in the policy category is certain to mount over the coming months as the 1954 election approaches.

The Republicans claim that too many federal positions are held by Democrats protected by Civil Service. Sen. Homer Ferguson has proposed a blanket classification of all positions with salaries of more than \$4,200 a year as policy-making.

Stiff Fight Brews on Air Defense

Congress will try to untangle divergent views posed by seven studies on early warning vs. offensive forces.

Air Force will face a stiff fight in the next Congress over the crucial problem of continental air defense.

James H. Douglas, Air Force Undersecretary, recently stated the USAF viewpoint:

"As to the question 'should we place reliance on an air defense system as our best protection?' my answer is that we should not. . . .

"Science gives it great possibilities. But let us avoid the dangers of thinking it is our best protection. . . . To do so would be to put second things first and to divert us from concentrating our attention on the long-range atomic striking power."

But sharply divergent opinions have strong supporters, and the unresolved issues are numerous. The Senate Armed Services Committee has engaged Robert C. Sprague, electronics expert and board chairman of Sprague Electric Co., to evaluate them for presentation next January (AVIATION WEEK Nov. 2, p. 12).

The major defense studies:

- **Valley Study.** A month after Russia's 1949 atomic bomb explosion, USAF set up an eight-member committee headed by Dr. George Valley, professor of physics at Massachusetts Institute of Technology.

This committee proposed what was then considered a radically new air defense system of radar nets, communica-

tions facilities and information processing computers. It did not, however, make recommendations on defense weapons or consider early warning. It was estimated that interior defense would take eight to 10 mechanized systems and that each would cost about \$1 billion.

The Valley program was predicated on increasing the probable destruction of attacking enemy planes from 10% to 30%.

- **Project Charles.** Under impetus of the Air Force, the three services sponsored an air defense review by about 30 American scientists, several Canadian and British representatives and representatives of U. S. government departments under the chairmanship of Dr. F. W. Loomis, head of the physics department of the University of Illinois.

The Charles study group, working from February through July 1951, noted that the Valley study did not provide for adequate early warning of air attack. Project Charles recommended a major effort to develop the weapons of air defense. Outcome was establishment of the Lincoln Laboratory at MIT.

- **Project Lincoln.** Financed by Army, Navy and Air Force funds, the project was set up for scientific research and development of defense hardware. It is headed by Dr. A. G. Hill, MIT pro-

fessor of physics. Its continuing program started in August 1951.

Staff of Lincoln Laboratory has made no recommendations of what type of defense the U. S. should have or how much money should be spent.

- **Project East River.** When Project Charles was nearing completion, Civil Defense Administration set up its own review. It was conducted by Associated Universities, representing nine major colleges in the Northeastern area, and headed by Lloyd Berkner, a Naval Reserve captain and former official of the wartime Research and Development Board.

This group's report, made in December 1952, urged emphasis on an early warning defense system and civil evacuation measures, minimizing offensive military power as a defense measure.

The East River approach ran into strong opposition from military leaders, who argued that generalized warning, even if early, is of little use until the direction of an attacking force and its possible targets can be ascertained. They maintained that warning of an airborne enemy fleet is of little value.

- **Zacharias Summer Study Group.** During the summer of 1952, while Project East River still was under way, the staff of Lincoln Laboratory felt the Valley Study was too limited in time and space (it contemplated interior defense only and defense against weapons up to 1958) and that another look should be given defense against atomic attack.

Scientists who formed the Summer Study Group were headed by Dr. Jerrold Zacharias, prominent nuclear scientist, and close friend of Berkner—who seems to have been the dominant voice in the East River group—and a nephew of retired Rear Adm. Ellis Zacharias.

Berkner also was a member of this group, whose recommendations coincided with findings of Project East River. This added to the conflict between the military and the early warning system advocates.

Air Force estimated the cost of the early warning system proposed by the summer study would be between \$40 and \$50 billion and could not be undertaken without sharply curtailing striking military power.

- **Kelly Committee.** As a result of the disagreement, former Secretary of Defense Robert Lovett established the Kelly Committee of outstanding industrial engineers and scientists to make an independent evaluation.

Headed by M. J. Kelly, president of Bell Telephone Laboratory, the group included Arthur Raymond, vice president of Douglas Aircraft Co., in its seven-man membership. In a report made last June, the Kelly Committee took a middle-course view between the military, prone to depend on offensive and interior interceptor forces, and early

warning stressed by civil defense proponents. The report emphasized the requirement for powerful offensive capability, but it put down early warning of the approach of hostile aircraft as "a first essential of an effective active air defense and of a civil defense capable of avoiding a large loss of life."

Estimate on cost of full implementation of the Kelly recommendations is \$20 to \$25 billion over a period of six years.

- **Bull Committee.** The new Administration wanted its own study made. So National Security Council early this year set up a committee under the chairmanship of Lt. Gen. Harold Bull (USA Ret.); Air Force representative is Maj. Gen. Fred Smith.

This committee went beyond the scope of the preceding groups that had limited their considerations to attack by aircraft and missiles, including missiles fired from submarines. It considered, for example, the possibility of smuggling bombs in ships and suitcases to strategic targets. This committee did not, however, weigh offensive against defensive power, as the Kelly committee did.

In its recommendations, the Bull group leaned toward the military position that the defense program should proceed from the interior outward. It laid down a defense plan in three categories of priority. Implementation of the three categories is estimated at \$18 to \$26 billion over a six-year period.

IATA Approves 30% Cut in Freight Rates

North Atlantic airfreight tariffs on bulk shipments will be cut 30% for the 12 months starting Apr. 1, International Air Transport Assn. members agreed at their annual rate conference in Honolulu.

The rate agreement specifies that existing tariffs shall remain in effect to Mar. 31, but that for the 12 months thereafter there shall be a 30% discount on general merchandise shipments of over 200 kg. or about 450 lb.

Present basic rate structure New York-London is \$1.10 per lb., with a 25% discount for shipments of more than 45 kg. or about 100 lb.

- **Special Cargo Rules.**—The IATA conference also approved a new set of regulations covering international transit of "special cargoes" such as radioactive isotopes.

The new code, three years in process of drafting, provides for classification, certification, labeling and packaging of several thousand commodities that require special stowage and handling. Commodities affected include water purifiers, chemicals and disinfectants, as well as radioactive materials.

Million-Dollar F-86

(McGraw-Hill World News)

Italian-produced North American F-86Ds probably will cost U. S. Air Force nearly \$1 million each when they roll off Fiat assembly lines in Turin, USAF officers in Europe forecast in exclusive interviews with AVIATION WEEK.

Flyaway price of the all-weather jet fighter is \$400,000 under an off-shore procurement contract signed last May. But Air Force sources say the cost will more than double because of steadily increasing expenses for maintenance, technical assistance from North American Aviation, shipping charges and similar items.

Many USAF officers ask why the U. S. didn't buy the fighter direct from NAA and give them to Italy as needed.

They fear this will be a logical question for congressional budget-cutters to ask next spring when they cross-examine Air Force requests for new funds.

- **Political Contract.**—Politics was the deciding factor in giving the F-86D contract to Fiat instead of buying the fighters direct from North American.

Last May, before the off-shore contract was signed, the Italian producer was on the verge of laying off a large portion of its work force, the only big nucleus of

skilled aircraft production men in Italy.

Originally, the company was scheduled to build Britain's de Havilland Venom night fighter equipped with DH Ghost centrifugal jet engines. Fiat completed tooling before North Atlantic Treaty Organization planners ruled the Venom out on performance.

Political officers in Rome became alarmed about the possible repercussions of a layoff at Fiat on the eve of a nationwide election in Italy. Strong pressure was put on NATO defense planners to find a substitute immediately, and a contract was signed for production of 50 F-86Ds with General Electric J47 engines at Turin.

- **Down the Drain.**—Faced with ever-mounting costs, USAF officers in Europe say they are caught in a situation that will lose additional money despite any possible action now.

Assembly operations at Fiat theoretically could be stopped overnight and Britain's twin-engine, delta-wing Gloster Javelin used as a substitute. But flyaway price of the Javelin is estimated at \$420,000.

Any way the problem is sliced, a lot of money is going down the drain, USAF officers say, and Congress will not remember next spring politics started the situation.



Navy Demonstrates P2V-7 Prototype

Both props feathered, this Lockheed P2V-5 Neptune Navy patrol bomber, prototype of the new P2V-7, flies on its two Westinghouse J34 turbojet engines. One pod-mounted J34 is slung beneath each wing, just outboard of the plane's Wright Turbo Compound piston engines. The jets pro-

vide extra power to reduce takeoff run, provide extra speed while getting on target and after bomb run. The J34s cut takeoff run by 35%, Navy says, and add 50 knots to the P2V's speed. The P2V-5 demonstrator arrived at Anacostia NAS, Washington, D. C., last week on the last leg of a nationwide tour.

DC-7s, Connies Pave Way for EAL Jet Fleet

A program utilizing fleets of new Douglas DC-7s and Lockheed Super Constellations, all powered by Wright Turbo Compound engines, has been inaugurated by Eastern Air Lines to pave the way for the airline's transition from piston-powered transports to turbojets.

EAL chairman Eddie Rickenbacker indicates future power potential of the Wright Turbo Compound may make it possible for the U. S. to skip the turbo-prop as an intermediate stage to jets.

Initial moves in this direction announced last week by Rickenbacker:

- **Purchase of 12 DC-7s** of an "advanced model," featuring long-range wings and new high-performance flaps, at a cost of approximately \$25 million, with deliveries beginning in the late spring of 1955. This confirms an AVIATION WEEK report (Oct. 26, p. 100) that EAL was discussing with Douglas purchase of a number of DC-7s.

- **Inauguration today** (Nov. 23) of 3½-hr.

nonstop New York-Miami service using 88-passenger "Super C" Turbo Compound-powered 1049C Constellations. As additional units of the 16 new Super Connies are delivered, the airline will put them into "express" schedules on all of its major north-south trunk routes.

- **Expansion of aircoach operations** to equal 50% of EAL's total operations. Aircoach now represents 30% of the airline's total passenger volume and 20% of its income. Eastern has asked Civil Aeronautics Board to extend its basic coach network to St. Louis, Louisville, Philadelphia, Pittsburgh and St. Petersburg. In addition, EAL will step up aircoach operations Jan. 12 on all main operating routes, including day and night service.

- **Starting Dec. 15**, the airline will inaugurate "every-hour-on-the-hour" New York-Miami "commuter service" between 8 a.m. and 1 a.m. Total airlift minimum will be 4,500 passengers every 24 hr. between New York and Florida. Additional day or night aircoach sections will be assigned as needed, EAL says.

Blackout Lifted

- **Murray overrules Lee's plans to withhold news.**
- **New policy frees details of future CAA programs.**

By Lee Moore

Preparing the way for major policy recommendations to Congress, Commerce Undersecretary for Transportation Robert Murray has launched his "open door" policy concerning the Department's plans with his first formal press conference.

Murray, who always has been frank with individual reporters, told AVIATION WEEK he plans frequent conferences in the future with bureau chiefs present to provide details on Commerce programs.

This overrules the position of Civil Aeronautics Administrator Fred B. Lee, who had classified CAA budget and program changes as "administratively restricted" and rejected specific requests for information which was later furnished at the press conference at Murray's direction.

Principal conference points:

- **New transport policies** will be firm next month in time for presentation to Congress in January. These include decisions on the local service airline "problem," Murray said, and the question of subsidy to local airport construction.

"All fields (of transportation) are going through a period of study and re-evaluation. This is especially true in the aviation field," Murray said.

- **Present program cuts** already have reduced CAA annual salary and expense rate from \$105 million last July 1 to \$95.6 million projected for next June 30. Commerce Department personnel total 19% less than a year ago. CAA alone laid off nearly 1,000 persons from January to October and plans to drop an additional 650 by June 30.

► **CAA Budget Cuts**—Summarizing CAA reductions under way, Lee reported these figures to AVIATION WEEK:

- **Airways maintenance and training** down 5%, a \$1.4-million annual cut.

- **Aviation safety expenses**, largely salary, pared \$775,000 by delegating more authority to field agents and operators and eliminating administrative overhead.

- **Interstate aeronautical communications stations (INSACS)** cut \$1,107,000 with 35 to 452 stations consolidated or eliminated.

- **Overseas foreign aeronautical communications stations (OFACS)** cut \$1,665,000 with five stations consolidated or eliminated.

- **Low-frequency navigation ranges** cut

\$290,000 (50 to 60 of the 335 domestic ranges eliminated, in accordance with long-standing Air Coordinating Committee directive).

- **Auxiliary power generators** cut \$360,000 (575 of 1,260 decommissioned, due to buildup of primary power reliability and suitable alternate commercial and other power sources).

- **Overhead and "fringe" operations** eliminated—\$2 million.

Other points which were discussed during this first press conference included:

- **Andrews AFB use by airlines**, agreed to in principle last spring, still is not definite. Murray said he hoped to get agreement in 30 days. Fred Lee demurred, and Murray amended that forecast to 60 days.

- **User charges program** will be submitted to Congress. The CAA recommendations for a user charge were prepared in response to congressional committee requests, Lee said. Present CAA program probably will not be identical to the one Commerce ultimately submits to Congress.

- **Transport mobilization agencies** may be reorganized. This includes the Defense Air Transport Administration.

Top transportation chiefs present at the conference, in addition to CAA administrator Lee: Louis S. Rothschild, administrator of the Maritime Administration (and chairman of the Federal Maritime Board); Francis V. du Pont, commissioner of Bureau of Public Roads; Francis W. Reichelderfer, chief of Weather Bureau; R. S. A. Studds, director of Coast & Geodetic Survey.

CAA, Military Renew Air Navigation Fight

The debate between civil and military officials as to whether Civil Aeronautics Administration should abandon its present DME (distance measuring equipment) system for a newer military design (AVIATION WEEK Oct. 12, p. 7) may go to the President for final decision.

DME, together with VOR (omni-range), give the pilot a cockpit indication of distance and bearing from a DME-VOR station. The combination was the heart of the navigation system jointly planned and developed by U. S. military and civil users as the nation's standard air navigation system.

► **Cheaper to Scrap**—Commerce Department insists present civil DME is adequate and says it has installed about half of the 450 DME ground stations planned, has equipment for the remainder and will install these when its work load permits.

If CAA were to adopt newer military system, it probably would find it cheaper to scrap existing ground equipments than to modify them. Some civil users,

mostly business plane owners, already have ordered airborne units.

Meanwhile, airlines are not placing orders for civil DME airborne equipment because of the possibility that proponents of military DME may be able to force CAA to abandon its present civil system.

► **Second Round**—CAA-military dispute over DME first flared about three years ago.

The ensuing debate helped split the Air Navigation Development Board and navigation committee of Defense's Research and Development Board and resulted in civil and military each going it alone.

The fight has flared anew with recent attempts to re-wed civil and military to a "common system," in the interest of operating efficiency and budget economy.

U. S.-Canadian Truce Forecast in Air Rift

A U.S.-Canadian air transport dispute over Trans-Canada Air Lines Florida-Mexico City route request may be settled by the first of the year, State Department officials say.

Government-owned TCA asked "limited" Tampa-Mexico City traffic rights.

Civil Aeronautics Board refused on grounds that U. S. policy is to ask for, and grant to other countries, either full traffic rights or none at all between any two foreign traffic points.

Canadian Air Transport Board immediately struck back, ordering Pan American World Airways and Colonial Airlines to show cause by Dec. 15 why it should not cancel their flight privileges (AVIATION WEEK Nov. 16, p. 15).

U. S. officials say Trans-Canada was warned of CAB's policy but persisted in trying to schedule inauguration of Canada-Mexico City service as an extension of its Canada-Tampa flights.

State Department explains its position as follows:

- **Canada's U. S. permit** allows unlimited traffic rights from Canada to Tampa and some Caribbean points. It is similar to a U. S. domestic route. Within the route description, the airline may schedule traffic as it wishes. But it cannot go beyond the described route unless it gains a new permit, after full government hearings.

- **Canada's Mexico permit** allows direct Canada-Mexico service. But Canada may not combine its Mexican and U. S. rights to get a "limited" Canada-U. S.-Mexico service.

- **U. S. policy** (and agreement with Canada) provides full rights on specified routes and no more. Some other countries permit mixtures of full and limited rights.

Financing 2-0-2s

- **CCA proposes stock sale to pay for transports.**
- **Ex-U. S. Airlines chiefs help market the shares.**

California Central Airlines, Inc., has asked Securities & Exchange Commission approval to issue 890,000 common stock shares at 50 cents par value and \$600,000 worth of 7% convertible equipment trust certificates to purchase four Martin 2-0-2s and one DC-3.

The airline operates these transports on a lease basis from Airline Transport Carriers, Inc., an affiliate company with which CCA recently consolidated.

Proceeds of the proposed securities sale would enable the airline to pay off \$880,000 in liabilities assumed when it bought ATC and \$100,000 in delinquent taxes. Included in ATC's

liabilities are a \$310,000 chattel mortgage on three of the 2-0-2s, a \$65,925 chattel mortgage on the fourth, and a \$30,000 mortgage on the DC-3.

California Central and ATC formerly were affiliated under common control of Col. and Mrs. Charles C. Sherman, president and director of operations and secretary-treasurer of the airline, respectively.

CCA paid its former affiliate, ATC, \$1,958,288 from April 1952 to Aug. 7, 1953, for lease of the five aircraft involved, flight crews and other operational expense, the airline reports.

► **'Best Efforts' Basis**—The certificates would be offered for public sale at 100% of their principal amount by Gearhart & Otis, Inc., the airline's underwriter, on a "best efforts" basis, for which the underwriter will receive a 10% commission.

Of the common stock issued, Gearhart & Otis would be offered 400,000 shares on a "best efforts" basis at 75 cents a share, receiving a 20% sales commission.

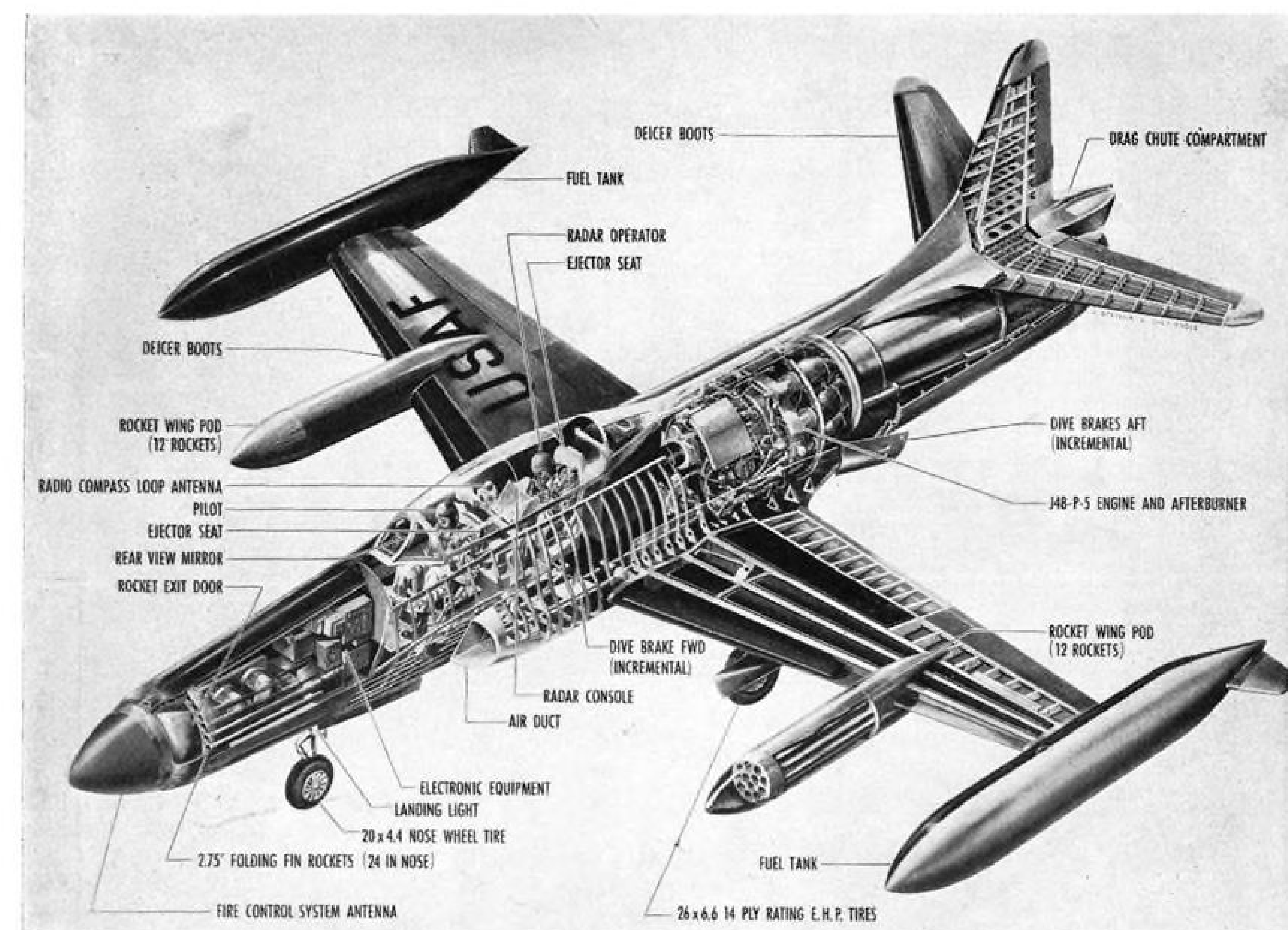
The underwriter also would be entitled to purchase 300,000 common shares at five cents a share, of which 50,000 shares are to be resold to James Wooten, former president of U. S. Airlines, at 25 cents a share. California Central also has agreed to sell 70,000 shares to Sig Shore; 70,000 shares to Fred Miller, also a former U. S. Airlines president; and 50,000 shares to Wooten, all at five cents a share.

A spokesman for Gearhart & Otis described the stocks earmarked for Wooten, Miller and Shore as "finders" commissions for helping to arrange the financing.

► **Semi-Annual Dividend**—Maturity date on the Series A equipment trust certificates, which CCA proposes to sell, is Dec. 1, 1957. Dividends would be paid semi-annually at 7% per annum. First dividend is scheduled for June 1, 1954.

The securities are redeemable at the option of the airline on 30 days notice at 105% of the prima facie value and accrued dividends.

At any time prior to maturity or



Inside Details of Lockheed F-94C Interceptor

Structural and equipment layout of USAF's new Lockheed F-94C Starfire all-rocket-armed jet interceptor is revealed for the first time in this detailed cutaway. Note the simplified wing makeup, permitting use of

most of the area for fuel tankage for the Starfire's P&WA J48 turbojet. A large tank also may be seen behind the radarman seated in the rear cockpit. Four dozen 2.75-in. folding-fin rockets are carried in the plane's nose

and in plastic-nosed wing pods. More than 1,200 lb. of avionics equipment is fitted in the Starfire, allowing all-weather operations and near-automatic interception of airborne targets.

prior to redemption date, if that be the case, trust certificate holders could convert their securities to common stock at one share for each dollar value.

► **Salaries to Be Raised**—Salaries of its two chief executives, the co-owners, for the fiscal year ended Mar. 31, 1953, were \$13,200 to Col. Sherman and \$6,600 to Edna K. Sherman. With the transfer of the aircraft from ATC to the airline, the salaries will be increased to \$20,000 and \$12,000 respectively.

Sherman holds 808,279 common stock shares and his wife holds 792,940 shares.

The airline has taken a loss for the last few years, it reports to SEC. On Mar. 31, 1952, the balance sheet reported a \$10,912 loss. On Mar. 31, 1953, the loss was \$9,573. From April 1, 1953, to Aug. 7, the company showed a \$21,370 loss.

► **Increasing Traffic**—At the end of 1949, the first year of operation, the airline had flown 83,086 passengers 27,077,814 mi. This year, as of Oct. 30, CCA has flown 120,708 passengers 35,018,473 mi.

CCA presently operates solely in California, serving San Diego, Los Angeles, Burbank, San Francisco and Oakland. An application has been filed with Civil Aeronautics Board to extend the route to Reno and Las Vegas, Nev.

Fairchild Offers Jet Design to Airlines

First details of a new jet transport design study, planned around a "cusp" wing, were revealed to representatives of 12 domestic airlines last week by Walter Tydon, chief engineer of Fairchild En-

gine and Airplane Corp.'s Aircraft Division.

Two Wright J67 turbojets, rated at an estimated minimum of 12,000 lb. thrust, have been selected as the powerplants for the plane.

Although Tydon said the cusp wing is a hybrid of the delta and straight plan forms, observers noted a great similarity to the Handley Page Victor's crescent wing.

Other specifications of the study: normal gross weight, 75,000 lb.; normal passenger capacity, 44; cruising speed, 570 mph. at 46,000 ft.; range, 1,500 mi.; wingspan, 100 ft.

Tydon said the transport would cost about \$1.7 million, assuming that at least 100 were produced.

Defense Sets Policy On Contract Financing

Defense Department's program to tighten government contract financing has moved forward with a new declaration of general policies and designation of responsibility for implementing these with uniform rules, procedures, and forms (AVIATION WEEK Oct. 12, p. 14; Oct. 19, p. 15).

This "order of preference" is established for: (1) private financing, without governmental guarantee; (2) guaranteed loans, with financing institutions participating to an extent appropriate to the risk involved; (3) progress payments; (4) advance payments. It is recognized, however, that there may be "valid" exceptions in specific cases or classes.

► **Note of Caution**—But in putting emphasis on private financing, there was a note of caution: "Financing must sup-

port procurement and should be designed to aid, not impede, essential procurement, but should be so administered as to avoid the risk of monetary loss to the government to the extent compatible with aiding essential procurement."

The order (No. 7800.1) issued by Defense Secretary Charles Wilson establishes these guideposts:

• **Government financing** "should be provided only if, and to the extent, reasonably required for prompt and efficient performance of government contracts and subcontracts."

• **Advance payments** or guaranteed loan financing may be made available to a supplier in cases where "(1) the production or service is essential and (2) no alternative source is readily available without prejudice to the national defense." These do not apply to small businesses.

• **Termination financing** "may be made available, with appropriate protection of the government's interest, either in connection with or independently of performance financing." The impact of termination, it is pointed out, should "encourage suppliers to invest their own funds in performance" of contracts.

► **Uniform Administration**—Top responsibility for insuring uniform administration of financing is placed with the Defense Comptroller, Assistant Secretary W. J. McNeil. He is to be advised by an eight-member "Contract Finance Committee" on the application of policies and the development of procedures and forms for financing.

The committee is to be headed by a representative of McNeil, and include a representative of the Assistant Secretary of Defense for Supply and Logistics (Charles Thomas) and two representatives of each of the services, one representing procurement and one representing financing activities.

Day-to-day financing operations are to be the responsibility of each of the services. Undersecretary Thomas Gates and Assistant Secretary for Management H. Lee White are to have responsibility for Navy and Air Force financing activities, respectively.

► **Functions Separated**—The procurement and financing functions in each of the services are to be separated, "but close cooperation . . . should be preserved at all times." If there is disagreement between the financing office and the procurement office as to the extent or the form of financing, the issue is to be resolved by the secretary of the service, or his representative.

When a procurement office requests financing through loans or advance payments, it must certify that the case meets the requirement that "the production or service is essential" and that "no alternative source is readily available without prejudice to the national defense" and substantiate the certification with supporting data.



Bondolite—T. M. Goodyear Aircraft Corporation, Akron 15, Ohio

HOW TO GIVE A BEE AN INFERIORITY COMPLEX

THE giant honeycomb structure shown above being fabricated by skilled assemblymen at the Goodyear Aircraft Corporation will soon be a mammoth radar-reflector "dish" carried by one of the nation's largest airplanes—a dish with an area of 61 square feet yet weighing less than 100 pounds!

This amazing low-weight-to-size ratio is the key to the success of Bondolite—the strong and feather-light structural material developed by Goodyear Aircraft.

It consists of a lightweight "filler"—such as the aluminum honeycomb core shown here—to which thin, exterior sheets of aluminum, stainless steel or some other metal are bonded by an adhesive. In some cases adhesive-impregnated glass fiber cloth is used.

Goodyear Aircraft, a pioneer in producing difficult

double-contoured sandwich structures such as the radar-reflector dish, manufactures complete panels to any specifications desired by the customers—utilizing core materials ranging from honeycombs of metal, plastic, paper, cloth, to solid wood cross sections.

Bondolite construction results in tremendous weight savings over conventional structural materials, has excellent sound and heat insulational qualities. Among its many aircraft uses are compartment panels, decks, bomb bay doors, and wing trailing edges; it has varied commercial applications: superstructures of sea-going vessels, railroad cars, housing, trailers, office equipment.

Bondolite is another product of Goodyear Aircraft—developed for the aeronautics industry—with unlimited uses in the commercial field. Goodyear Aircraft Corporation, Dept. 65, Akron 15, Ohio.



New Russian Copter Shown at Air Display

Flight demonstrations of large helicopters, like the one above, were a feature of a public show of Russian aircraft held at Tushin Airport, near Moscow earlier this year. This picture, distributed by the official Russian

agency, Sovfoto, shows a new copter closely resembling the Sikorsky S-55, even to the nose-mounted engine. The Russian craft has a four-blade main rotor, three-blade tail rotor and fixed four-wheel landing gear.

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Industry Warns:

New Planes Need More Titanium

Aircraft builders predict they "will be in trouble" if metal output fails to meet future design requirements.

Los Angeles—High-performance supersonic planes now on drawing boards call for as much as 40% titanium, and the aircraft industry "will be in trouble" if it doesn't get the lightweight metal, West Coast airframe builders warn.

In testimony to the Senate Strategic Metal Subcommittee of the Interior and Insular Affairs Committee, industry officials confirmed a report by Gen. Kern Metzger, chief of Air Materiel Command's Product Resources Division, that U. S. titanium capacity must be expanded as fast as possible (AVIATION WEEK Oct. 26, p. 14).

Future plans call for up to 40%—and in some cases 60%—titanium in these aircraft, industry leaders say. If titanium is not available, increased weight will penalize design performance, they predict.

► **Subsidy Gamble**—Sen. George Malone moved the titanium investigation into its second phase here after Metzger forecast production of the strategic metal would fall short of USAF's 1953 requirement by 1,000 tons.

The subcommittee chairman invited industry leaders to testify on present and future use of titanium.

He reports that two companies—Titanium Metals Corp. at Henderson, Nev., and du Pont de Nemours Corp. in New Jersey—are under contract to produce 10 tons of titanium per day but presently are producing only four tons each per day. Both plants were given a \$15-million government subsidy.

"We want to know whether we should gamble subsidizing additional plants," the senator says.

► **Payload Savings**—Donald W. Douglas, president of Douglas Aircraft Co., reports: "In spite of the fact titanium is expensive, we are using it on our commercial planes, DC-7s, and are making it pay. . . ."

"We are now using from 1 to 3% of the weight of an airplane in titanium, and in 1957 we probably will be using in excess of 20%."

By using 528 lb. of titanium per plane, Douglas saves 200 lb. in weight. "This is a very important thing," the president adds. "We figure every pound saved is worth \$40 in additional payload."

► **Greater Use**—Thomas Lamphier, vice president of Consolidated Vultee Aircraft Corp., told the committee that by 1960 Convair would use somewhere

near 40% of the airframe weight of military planes in titanium—"provided it is available and the quality is uniform, easily formable, and much cheaper."

"We could use three times as much titanium in airplanes today if we knew three years ago what we know now about the metal," he says.

Convair's projected designs include greater use of titanium, and "we will be in trouble if we don't get it," Lamphier warns.

► **Commercial Qualities**—Robert E. Gross, president of Lockheed Aircraft Corp., testifies: "We are generally enthusiastic about the possibilities of the metal. Investigation shows that it is attractive commercially as well as militarily. . . ."

"Proper application will increase the speed and maneuverability of aircraft. Because of the strength and heat resistant qualities, titanium has safety characteristics which the commercial field likes."

Lockheed will require approximately 62,000 lb. of titanium in 1954 and about 152,000 lb. in 1955. Projecting military and commercial requirements for several years to come, Gross predicts figures will be "doubled and even tripled," providing price is reduced and quality is improved.

► **Costly Redesign**—J. L. Atwood, president of North American Aviation, says

his company is optimistic about the use of titanium in aircraft structures.

"Weight savings as high as 40%, and resulting improved performance, can be attained," he forecasts.

"One percent titanium is incorporated in the structure of the F-86, 5% in the F-100, and it is possible that 60 to 75% will be going into designs contemplated 10 to 15 years hence. . . ."

"It is important to note that if titanium is designed into an airframe and thereafter it becomes necessary as a result of a shortage to substitute steel, costly and time-consuming redesign is necessary to eliminate weight and balance problems created by the substitutions."

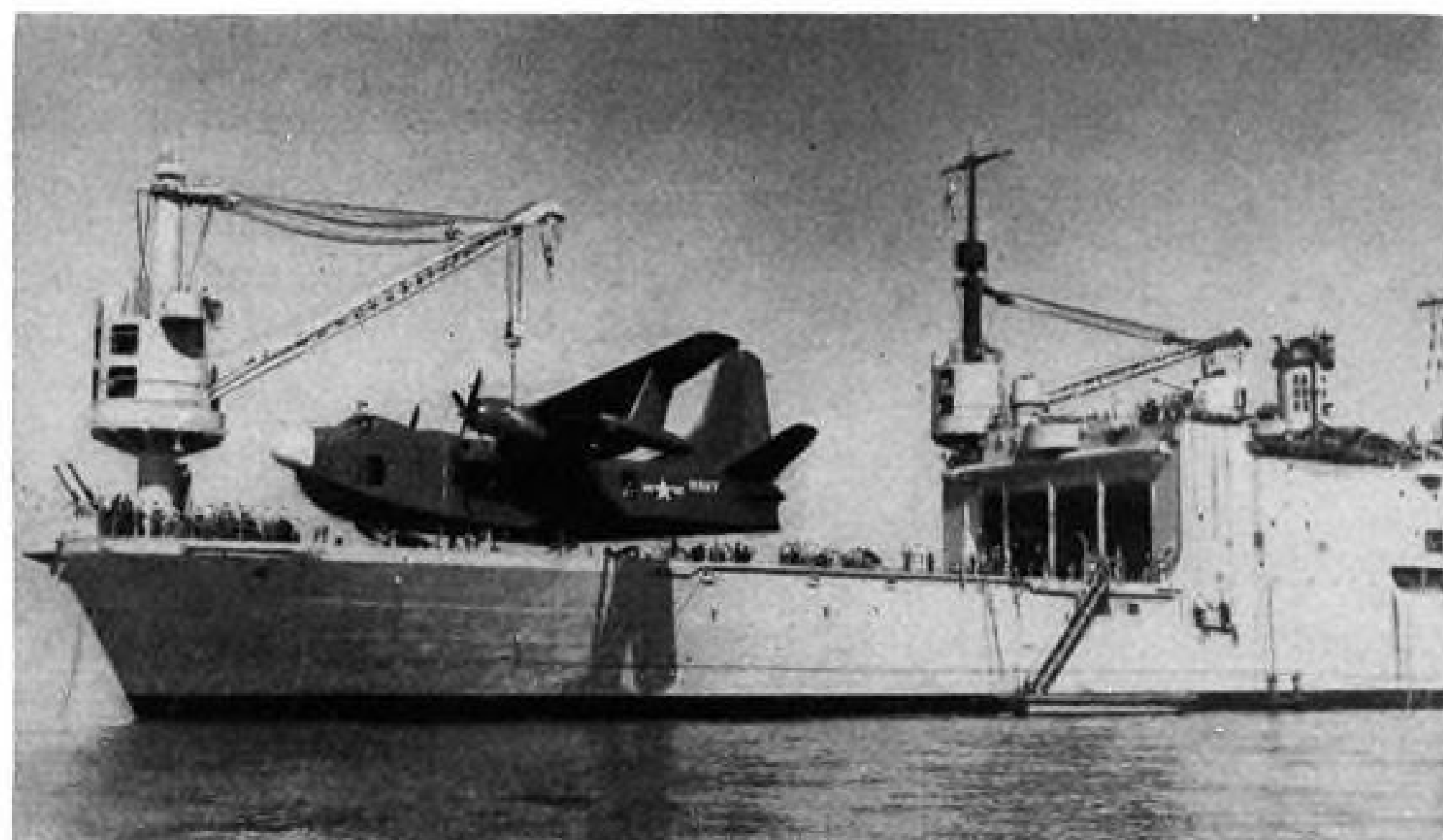
Atwood points out that this fact assumes great importance when thinking in terms of large quantities of high-performance aircraft that would be required in a short time in the event of a major mobilization effort.

► **"Great Hopes"**—Gen. Oliver P. Echols, president of Northrop Aviation, estimates that in four or five years Northrop will require about 250,000 tons of titanium annually.

"We are not using titanium presently because it has not been designed into the planes, but future designs incorporate 20% titanium and as time goes on it is possible this will be increased to 40%," Echols says.

L. M. Hitchcock, in charge of structure and engineering procedures at Boeing Airplane Co., Seattle, says his company has "great hopes for the use of titanium."

He agrees with Gen. Metzger that 800,000 tons of the vital metal might be needed in 1960 should the United States require major mobilization by the aircraft industry.



Navy Lands a Marlin

Addition of the new Martin P5M-1 Marlin patrol flying boat to the Navy's roster has required some changes in handling and servicing equipment to take care of planes

larger than previous twin-engine types. The Navy seaplane tender U.S.S. Salisbury Sound (above) has its starboard crane moved to the stern to take the big plane aboard.



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ANGLgears are described fully in the I.A.S. Aeronautical Engineering Catalog. We suggest you refer to this publication for complete data.



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NAL, Northrop List Executive Salaries

National Airlines paid \$406,550 to officers and directors during fiscal 1953, and Northrop Aircraft officials received salaries totaling more than \$301,000, according to reports to the Securities and Exchange Commission.

McDonnell Aircraft Corp. has set up annual retirement payments for four top executives that total more than \$67,000.

Companies must file pensions with annual reports, according to SEC law. The reports:

National Airlines

National paid its president, G. T. Baker, a \$30,000 salary, \$41,631 in bonus and profit shares plus \$6,724 in retirement benefits, during the fiscal year ended June 30.

J. C. Brawner, treasurer and director, received a \$12,000 salary plus \$16,852 bonus and \$3,064 for retirement; R. P. Foreman, secretary, \$12,000 salary, \$16,852 bonus and \$2,512 for retirement; E. J. Kershaw, vice president-operations, \$16,000 salary, \$22,469 bonus, and \$3,374 for retirement.

Walter Sternberg, who resigned June 1 as vice president-sales to become president of Resort Airlines, received a \$18,333 salary and \$25,746 in bonus and profit shares.

All 19 officers and directors received a total of \$160,108 in salaries, \$212,317 in bonuses and \$24,225 in profit shares.

National says Baker owns 168,464 common stock shares, representing 16.6% of total shares issued. Officers and directors own 184,682 shares, 18.27% of the total.

Estimated annual retirement benefits

to be paid top officers of the airline, based on present salaries: Baker, \$19,951; Brawner, \$8,370; Foreman, \$10,317; and Kershaw, \$12,772.

Northrop Aircraft

Northrop paid its board chairman, president and general manager, Oliver P. Echols, \$60,000 during the fiscal year ending July 31.

Of the \$301,629 paid all officers and directors, Roland J. Pagen, vice president, treasurer and director, received \$33,250; John W. Myers, vice president and director, \$33,250; Kenneth P. Bowen, vice president, \$33,250.

At the usual retirement age of 65, based on present salaries, Echols will receive \$5,856; Pagen, \$3,268; Myers, \$13,320; and Bowen, \$7,973. All present officers and directors will receive a total of \$67,937 at retirement, the firm discloses.

McDonnell Aircraft

McDonnell will pay its president, James S. McDonnell, Jr., \$21,297 annually when he retires at 65.

Based on present salaries, the firm also will pay these annual pension retirement benefits: C. Warren Drake, vice president-manufacturing, \$17,538; Kendall Perkins, vice president-engineering, \$12,060; and Robert H. Charles, vice president-contracts, \$16,998.

President McDonnell holds 91,957 common stock shares, 13.41% of the total stock issue, the firm reports. As guardian of his two sons—James S. III, and John F. McDonnell—he holds 45,705 common shares for each, 6.67% of the total for each holding.

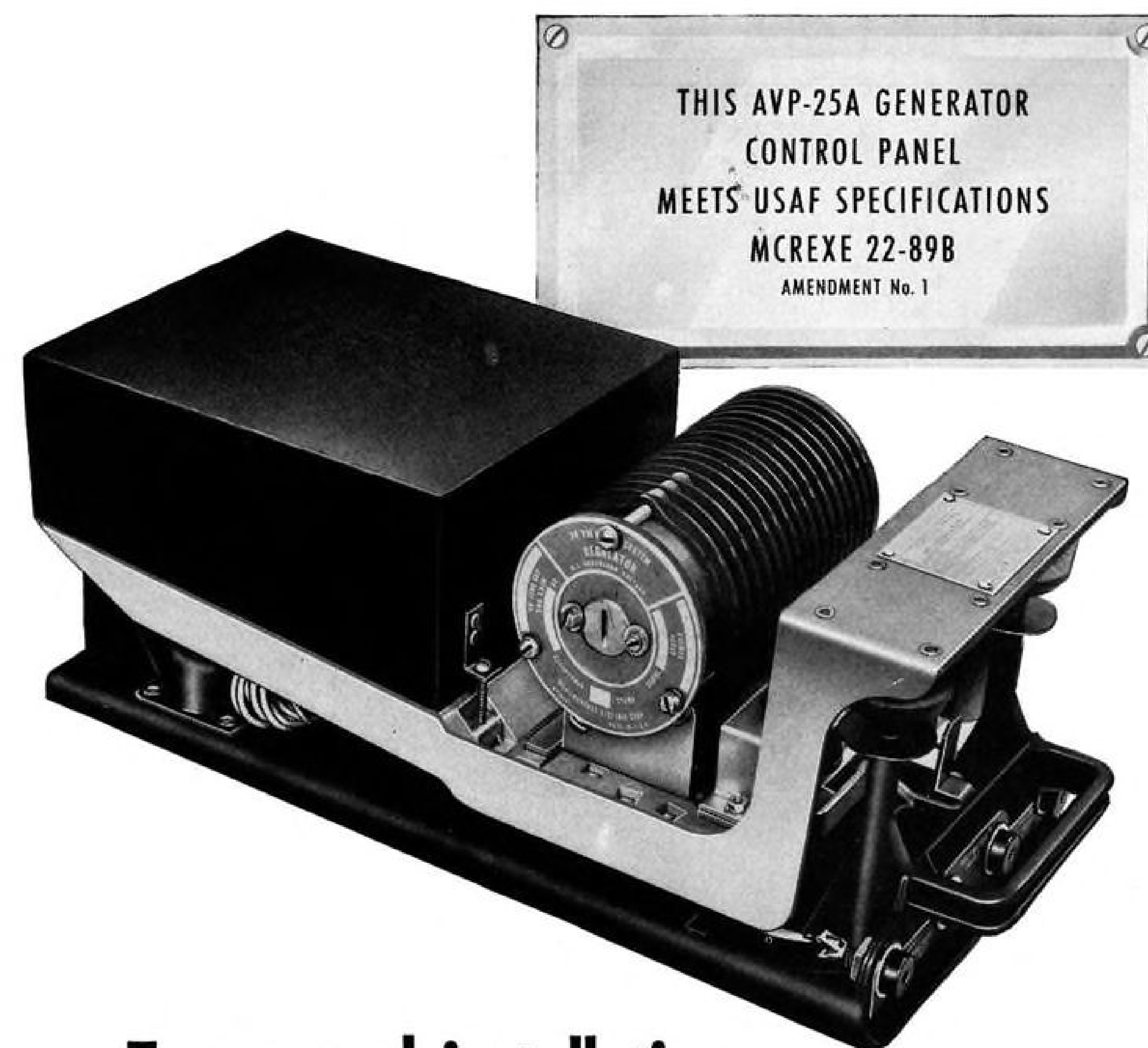
All officers and directors of the company hold a total of 30,346 shares, 4.43% of the total.



1954 Cessna 170 Price Down \$155

First flight view of the 1954 Cessna 170 four-place personal or business plane on which deliveries started Nov. 6. Price of the standard model is \$8,295 flyaway Wichita, a reduction of \$155 from last year's price for the same model. Produc-

tion and buying efficiencies made the cut possible, says Cessna. Powerplant is a 145-hp. Continental fitted with a McCauley prop. The new 170 also can be equipped with Edo 2000 floats and is certificated by CAA for ski operation.



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60 MPH. Impact into earth embankment, simulating severe stall-spin crash, collapses nose of Piper Cub test plane into front occupant. However, rear occupant would stand a good chance of survival if he wore sufficiently strong shoulder harness.



42 MPH. Impact during NACA test indicates that rear occupant would be safe if he wore shoulder harness, front occupant would suffer fatal injury unless he had harness. Carefully staged "crashes" were recorded from all angles.

NACA Reveals Crash Data to Industry

Detailed information on the factors affecting human survival in aircraft crashes is being made available to the aircraft industry. The data is the result of comprehensive studies conducted with actual aircraft by the National Advisory Committee for Aeronautics (AVIATION WEEK Jan. 26, p. 74). The NACA studies included both transports and lightplanes.

Transports

The tests on obsolete Curtiss C-46 and Fairchild C-82 transport planes simulated engine failure during takeoff under conditions where the possibility of serious fire was high, but that of structural damage moderate.

The planes were sent down a runway

under their own power, guided along a monorail. Barriers in their path tore off landing gears and caused the craft to slide on their bellies with subsequent damage to propellers, engines and fuel tanks. This provided optimum fire conditions.

Detailed analysis of the results are contained in NACA Technical Note 2996.

► **Crash Survival**—Factors in human survival described in the NACA study include:

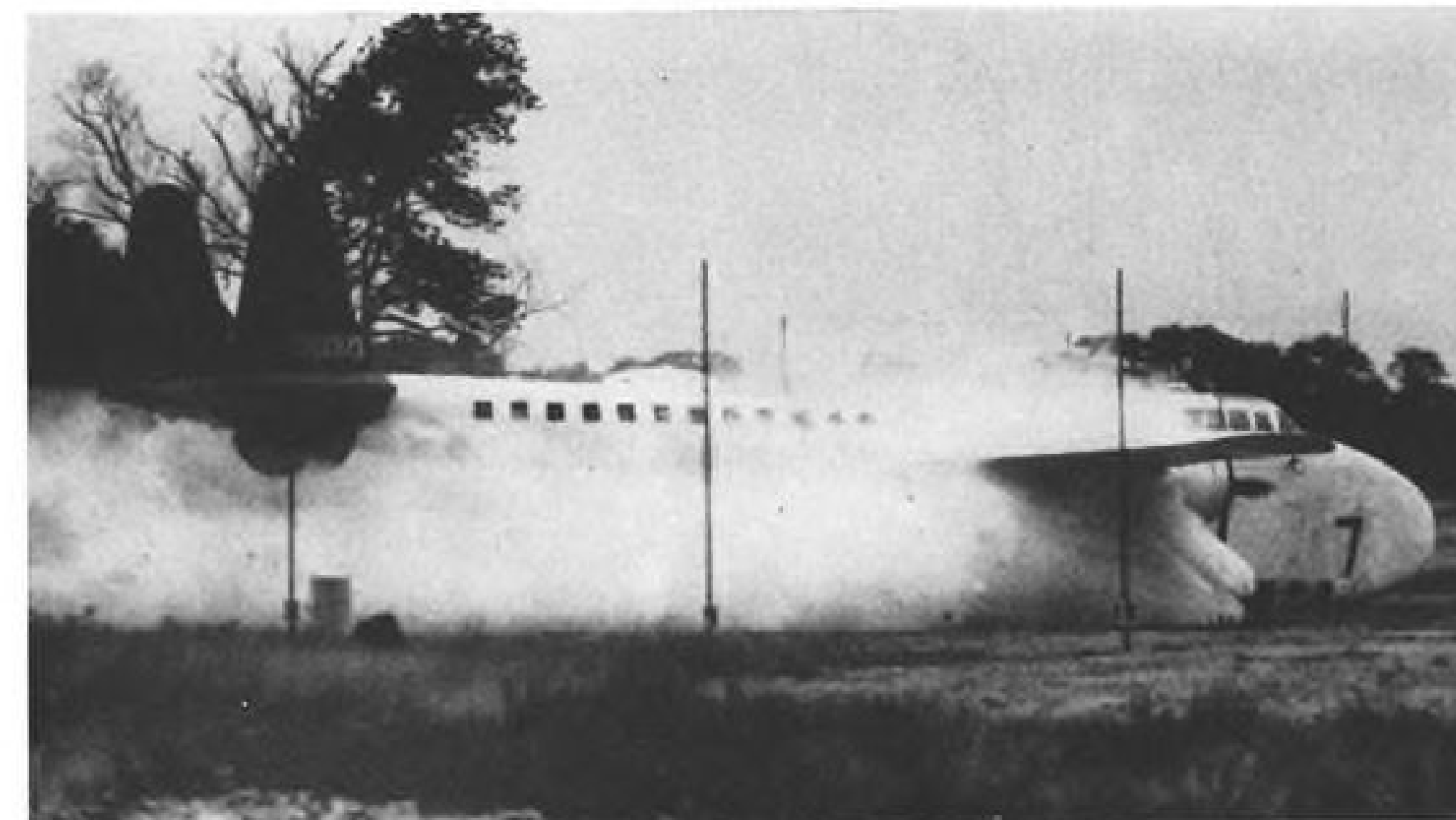
- **Survival time** generally varies from 50 to 300 sec., depending on terrain slope, wind direction and what parts of the plane are wetted by burning fuel. In cases of unusually severe fire caused by fuel spillage forward and inboard of the engine nacelles, fire can burn

through the fuselage skin in seven seconds, cutting survival time inside the plane to "appreciably less than 50 seconds."

- **Thermal and sound insulation** "presently used in transport airplanes will not increase the escape time appreciably and may decrease the escape time slightly." NACA recommends that "materials that could serve as an adequate flame and gas barrier" should be substituted for present sound and thermal insulation. Such material should be infra-red-radiation-resistant, gas-tight, flameproof and have sufficient mechanical strength to support itself between bulkheads and frames so as to sustain the weight of molten metal dripping upon it.

- **Cabin windows** should be fire-resist-

Transport Crash Investigations...



FUEL MIST which forms when plane is in motion with fuel tanks ruptured is seen enveloping Fairchild C-82 during NACA test.



PROP BLADES of deliberately crashed Curtiss C-46 hurtle through the air (circles). Note their impact points (arrows).



CABIN FLOOR of C-46 suffered "insignificant damage" because fuselage structure and engine nacelles afforded protection.

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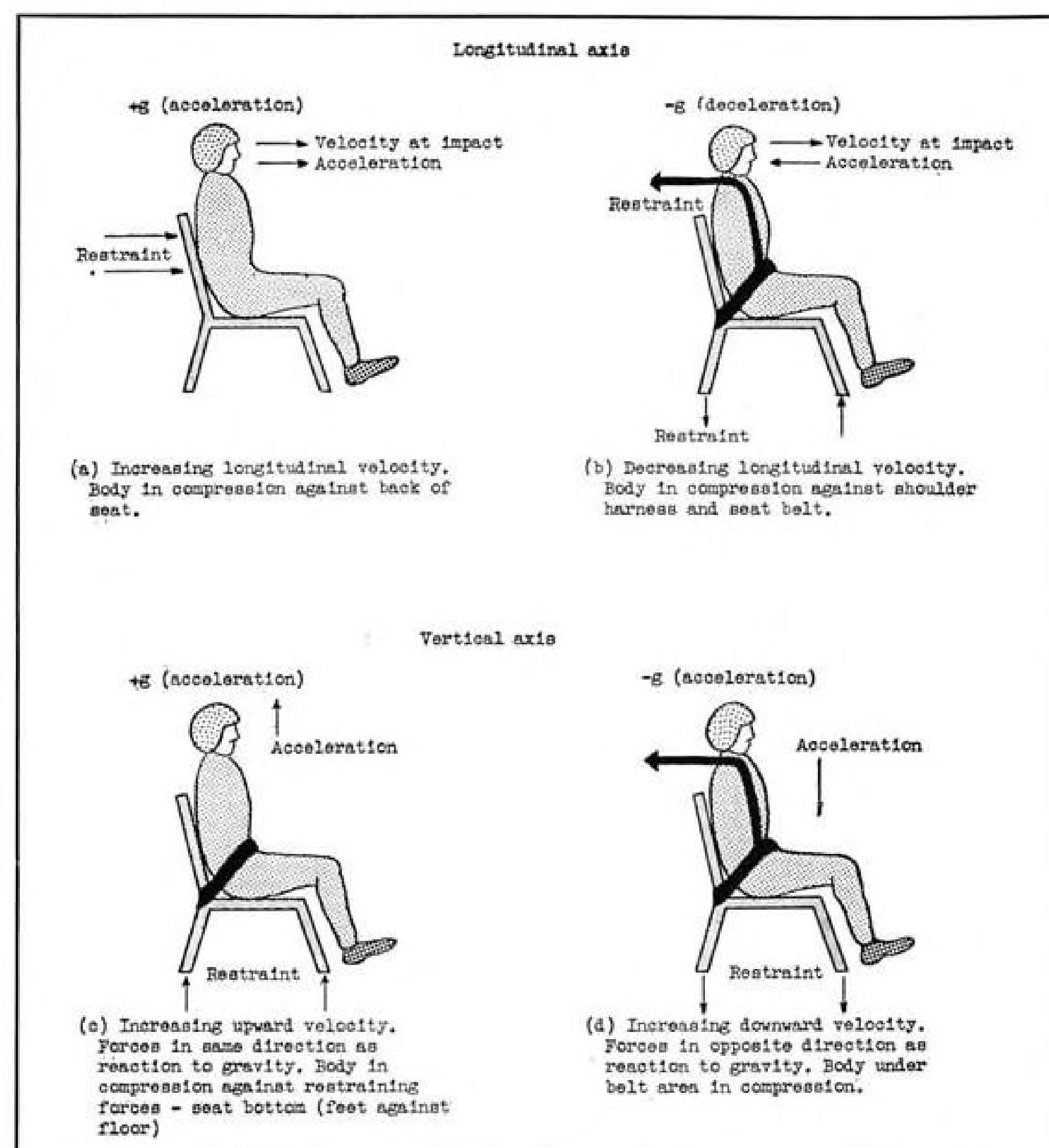
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REACTION of a seated body to longitudinal and vertical accelerations is shown in these diagrams of effects of plus and minus Gs.

ant. The NACA study notes that "the plastic materials sometimes used for window panes soften rapidly when heated and melt so that passengers will be exposed directly to flame, hot gases and smoke." A calorimeter bulb placed by the window in the forward cabin of one of the transports deliberately crashed by NACA indicated a temperature of 700 F within 100 seconds after the plane caught fire. Three lethal factors in crashes followed by fire are: Skin burning, respiratory injury and toxic gases. Therefore, NACA says, "more protection must be provided against all three to improve escape chances (time) significantly."

- **Lower fuel volatility** extends the escape time when liquid fuel spills, but does not help when a heavy fuel mist forms around a plane which is moving rapidly.
- **Propeller fragments** from prop contacts with the ground are less likely to enter the cockpit if the blades rotate so that they are moving away from the fuselage below the hub axis. Hollow-steel blades sometimes twist out of the hub in their entirety after impact when engines are at takeoff power, the report notes; forged aluminum blades generally do not come out of the hub

but break off at the tips, which then become missiles.

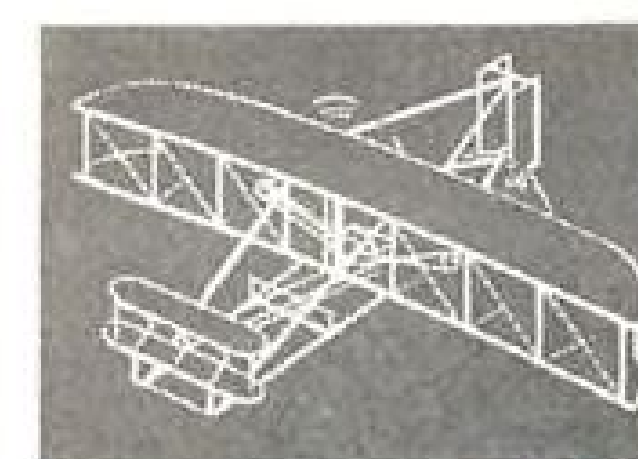
Lightplanes

Shoulder harness normally would protect the occupants of a typical two-place fabric-covered trainer in stall-spin-type crashes at impact speeds up to 60 mph., the NACA concludes from its series of full-scale tests on lightplanes. Details on these studies are contained in NACA Technical Note 2991.

Major findings of these tests, in which dummies were used in place of passengers:

- **Deceleration force** of shoulder harness on the dummy's chest ranged from 32 to 50G when impact speed varied from 42-60 mph.
- **Without shoulder harness**, severe-to-fatal injury is likely, due to head and body striking the instrument panel, unless the space in front of the occupant is free of obstacles for a distance approximately equal to the length of the torso from hips to the top of the head, plus seat-belt elongation. This would necessitate a 31-45-in. space clear of any solid or unyielding protuberances. As crash speed increases, the

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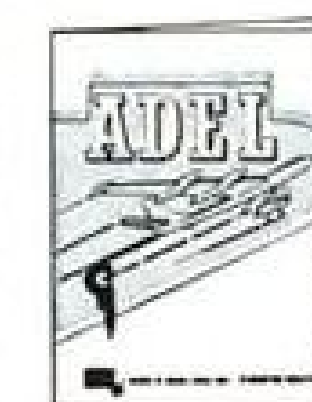
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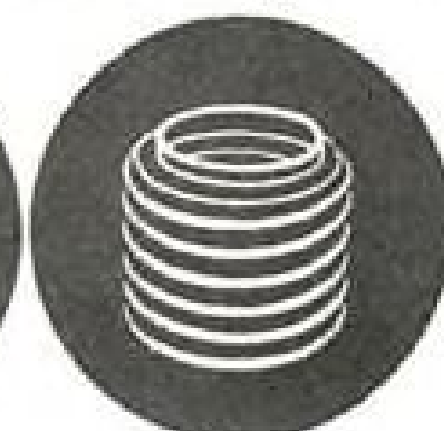
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instrument panel is moved farther back by the impact.

• Fire hazard is relatively slight in this type aircraft. Civil Aeronautics Board statistics show that less than 4% of lightplane accidents are followed by fire.

• Seat belts used without shoulder harness "should be capable of withstanding higher breaking loads than those presently used," NACA technicians note.

THRUST & DRAG

Messages We Doubt Were Ever Radioed: According to a contemporary weekly (not specializing in aviation) one test pilot of North American's new F-100 radioed back to earth: "If I were ten years older, this plane would be a great substitute for sex."

Having been privileged to know a few test pilots, my reaction would be that I didn't think North American had any pilots that old.

* * *

While we're on the subject, most quotations purporting to come from test pilots don't ring true. "It's a sweet ship," one will be quoted, "and I believe that we really have a world-beater in the Binswanger Bullfighter." Or, immediately on stepping out of the cockpit, another pilot will supposedly say: "Our design team of engineers and production men have come up with another unbeatable combination in the Fairweather Fighter. It performed superbly on this test flight."

But we know what pilots say, don't we? "Who in God's name designed those ailerons?" "Can't ya fix that damned heater?" Or, the ultimate, accompanied by flinging the Lombard helmet to the ground and grinding it into the sand: "Never again, dammit, never again."

* * *

A nice boost for the work at the Air Force Missile Test Center, with special accent on the down-range safety problem, has been given by artist Leslie Turner in his adventure strip "Capt. Easy," syndicated by NEA Service. Turner, who lives not too far from Patrick AFB, treated the subject with care and—most important—with accuracy, explaining the elaborate precautions for safety in simple language with pictures. It was in this strip, incidentally, that the Northrop P-61 Black Widow made its first public appearance in World War II. Turner saw dozens of them flying over his place every day, and drew one into a rescue sequence for Capt. Easy.

* * *

Just before a group of us recently took off in a medium transport, Av Wk's Avionics Editor Phil Klass ques-

AVIATION WEEK, November 23, 1953



Forged-in Quality means Longer Life for Eaton Valve-Seat Inserts

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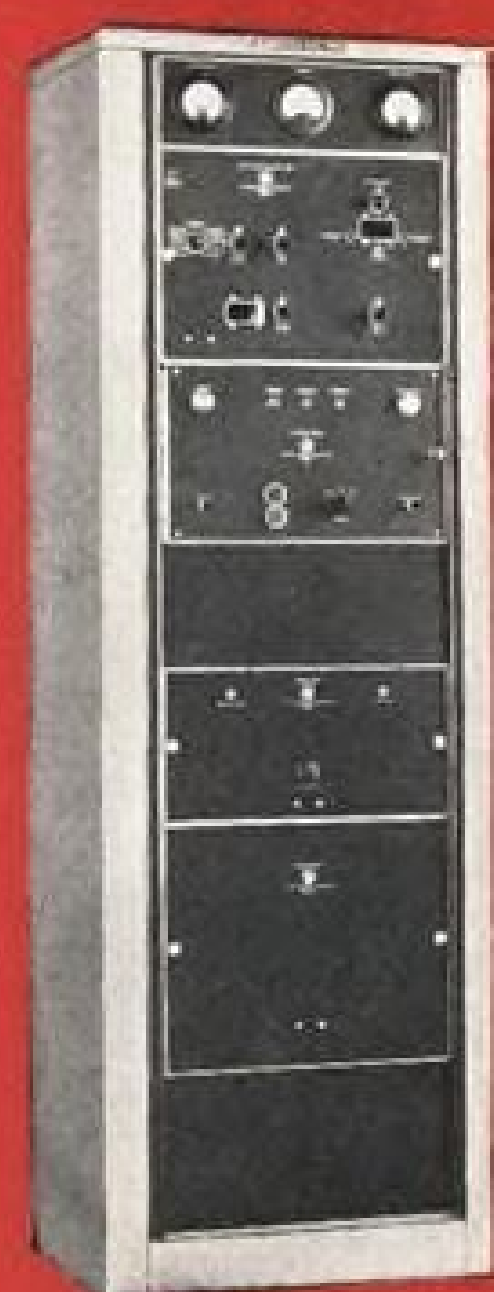
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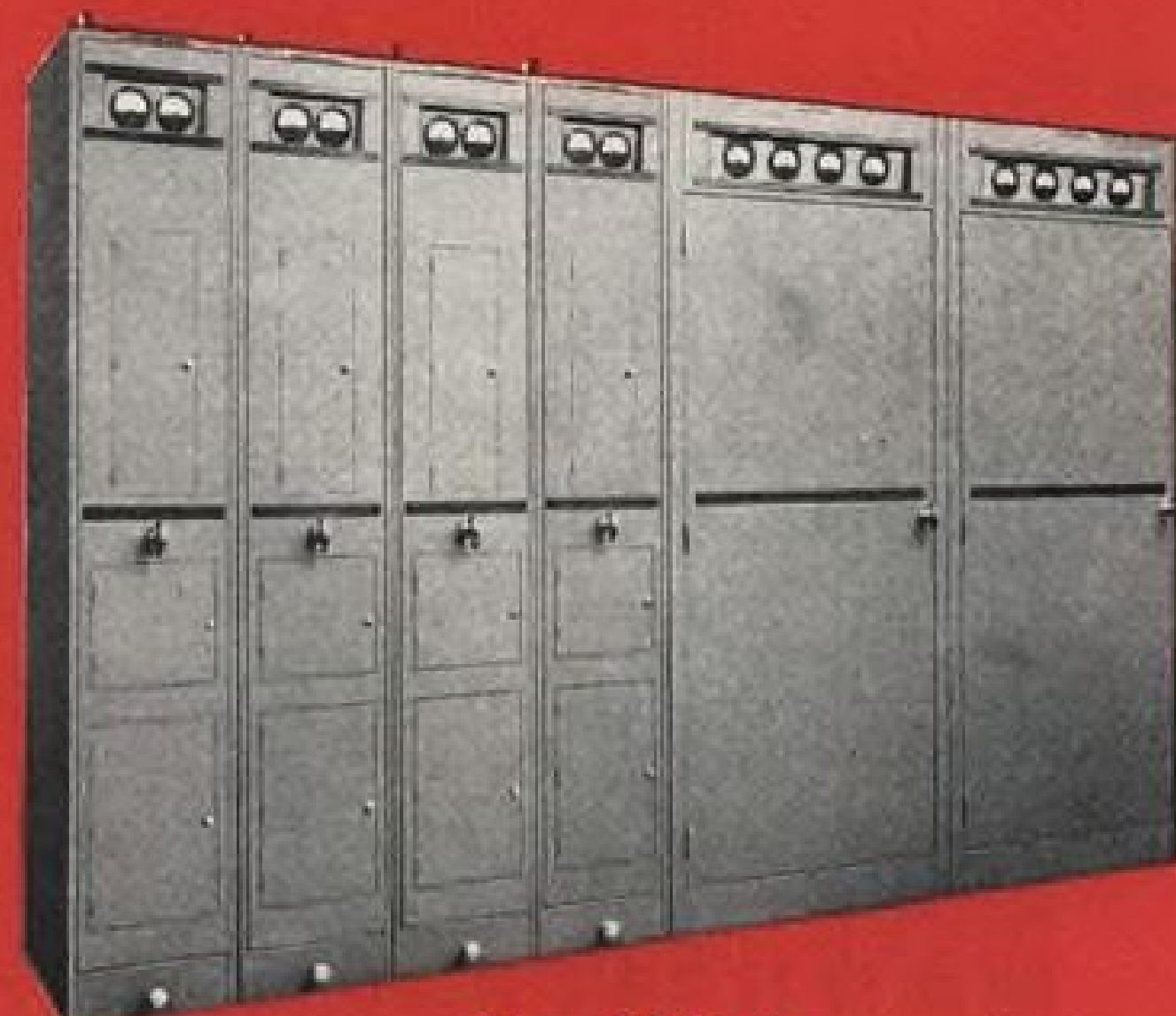
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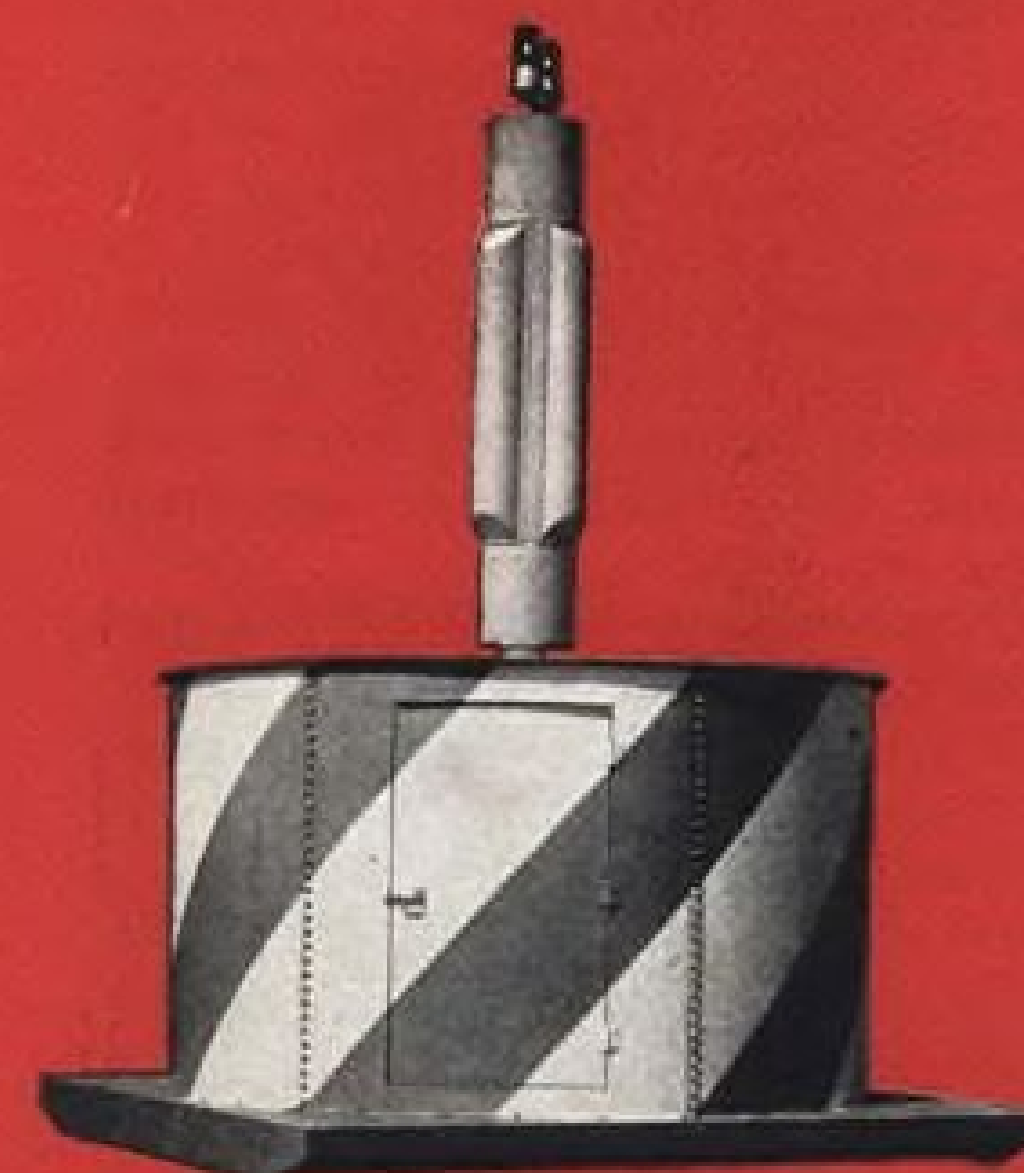
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Terminal VHF
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Low cost answer to improved safety
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tioned the stewardess about a horrendous banging that we could hear. It came from under the third row of seats from the tail, and sounded like a hatch banging. She smiled sweetly and said, "That? Oh, that's the turbines." We smiled too. —DAA

French Air Industry Asks Import Limit

(McGraw-Hill World News)

Paris—The aircraft industry in France is facing a crisis that threatens its continued existence, warns an association representing the country's top manufacturing firms.

In a brochure sharply criticizing the aviation policies followed by all post-war French governments, the Union Syndicale des Industries Aeronautiques charges:

- Funds for military aircraft production have been too small; an increase of approximately 50%, or \$100 million, is asked.

- Industry lacks a coherent over-all program. A firm schedule of production should be established not subject to periodic changes, reductions or cancellations, says the association. Also, deliveries of U. S. planes under military air program, should be limited to heavy bombers and other types the French industry does not have the financial means to build.

- French airlines, including nationalized Air France, have been permitted to buy nearly all of their planes abroad. The government could prohibit purchase of foreign planes by refusing to make the necessary foreign exchange available.

- Nothing has been done by the government to help French aircraft builders develop foreign markets. The association asks for an export program that eliminates custom duties on machines and materials used to build aircraft, grants longterm credits by the government to foreign purchasers of French aircraft and simplifies the regulations governing export.

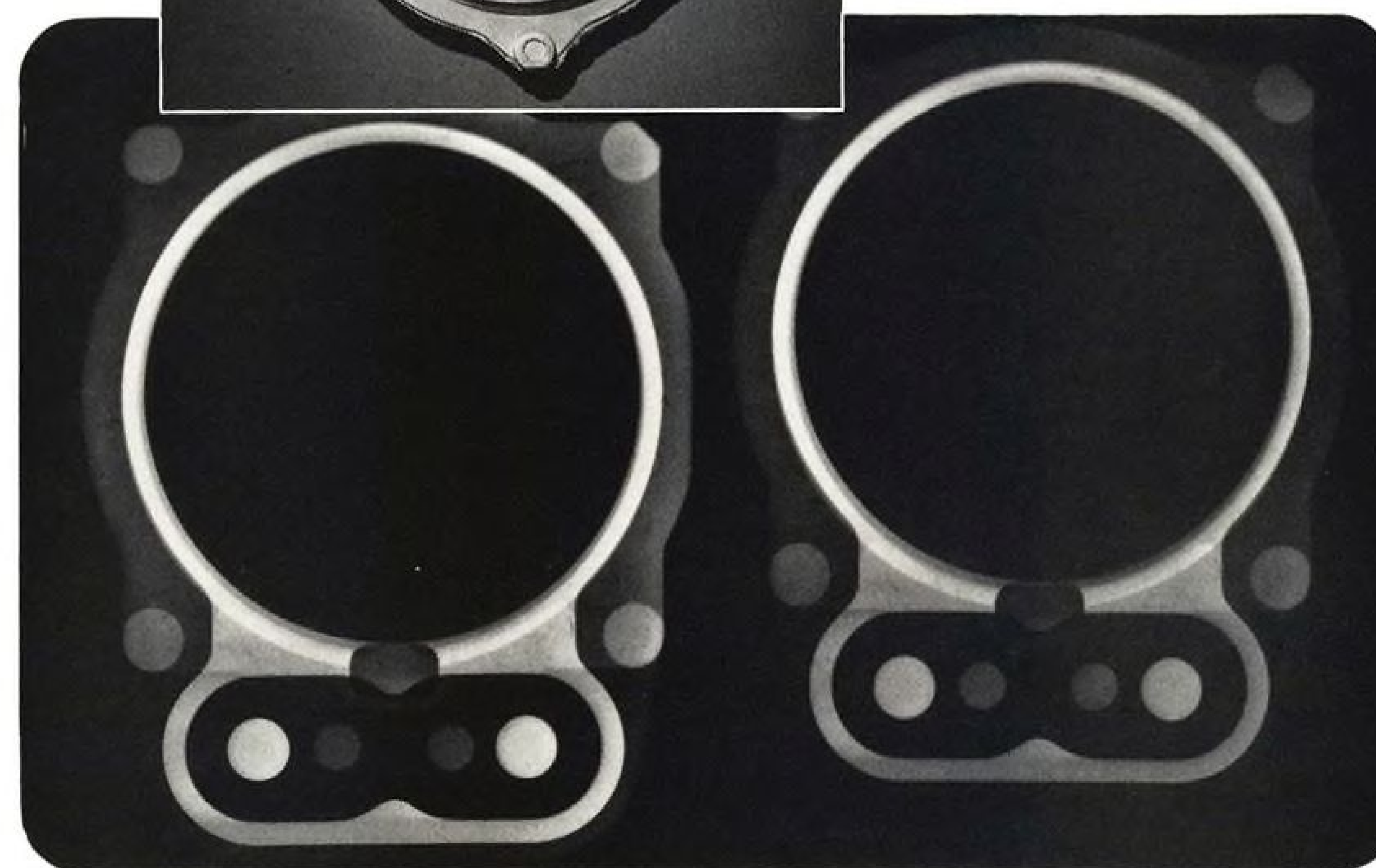
USIA recommends creation of a permanent committee of the National Assembly to study and deal with aviation matters.

Distribution of the brochure to government officials and members of the National Assembly followed soon after announcement of the closing of Societe National de Construction Aeronautiques du Nord's (Sncan) large aircraft factory at le Havre.

It also coincided with rumors of a reorganization among the three big nationalized airframe builders that would result in shutting down other plants and possibly elimination of Sncan.



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quality castings. They have found it helps build an enviable reputation for delivering only good work. And besides, by radiographing pilot castings, changes in procedures are frequently indicated which increase the yield in long runs.

If you'd like details on how radiography can improve your operations, get in touch with your x-ray dealer. Or, if you like, write us for a free copy of "Radiography as a Foundry Tool."

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X-ray Division, Rochester 4, N. Y.

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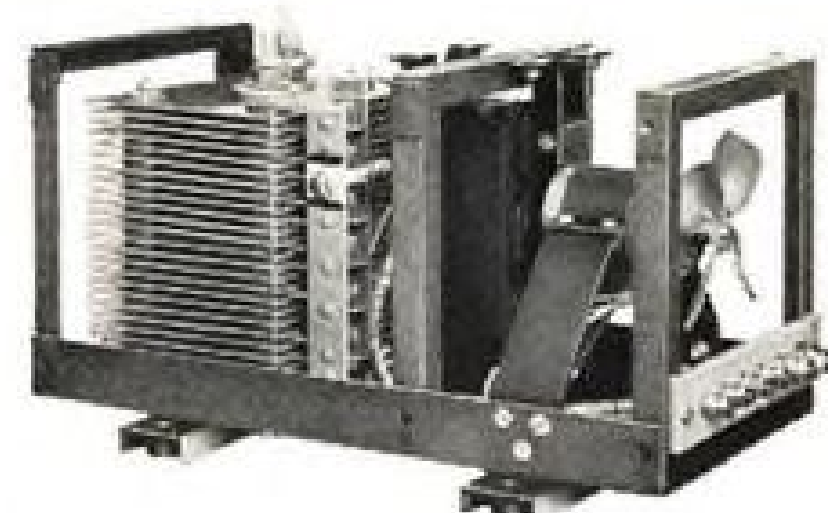
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In the "tradition of rugged dependability" established by Boeing's famous Flying Fortresses and Superforts, Boeing has selected Federal's 3146-BS Airborne Power Supply to provide the B-52 with a DC output of 50 amperes, 28 volts.

Federal's 3146-BS is only one of a complete line of rugged, compact and efficient airborne and ground power supplies developed to meet aviation's growing trend from generated DC to 400-cycle AC... to furnish dependable DC power where required. Federal equipments are designed without expendable parts that require frequent replacement. And all are powered by Federal Selenium Rectifiers... first in the field... outstanding for long service life and trouble-free performance!

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- Dimensions: 15 1/4" long; 9" wide; 8 1/4" high.

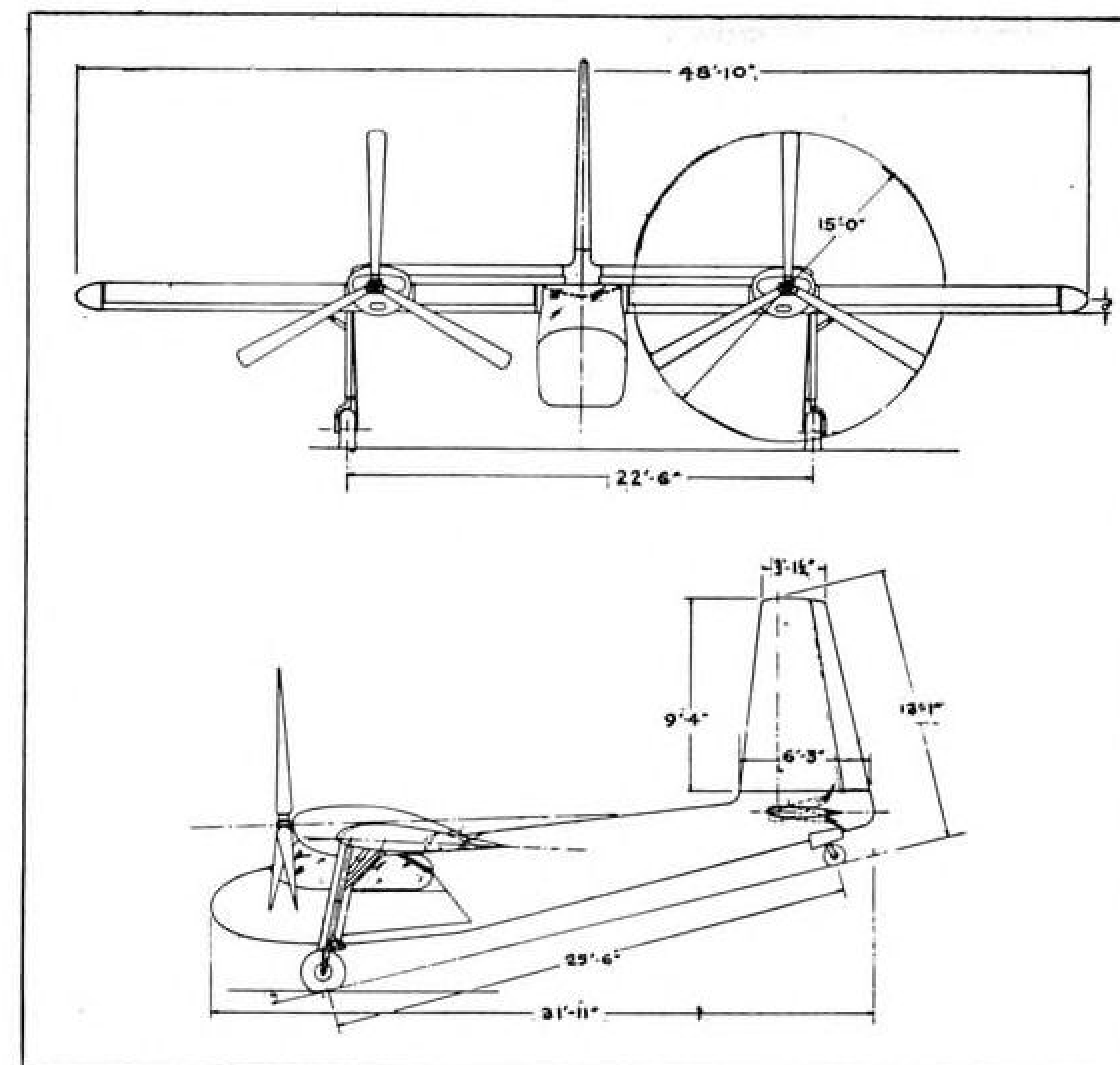


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TWIN-ENGINE H-6 would fly as slow as 20 mph., as fast as 200 mph., Helio says.

New Helio Design Lands Slow

A six-place, twin-engine transport for a 20- to 200-mph. flight speed range coupled with short-distance takeoff and landing is the latest design development of Helio Aircraft Corp., Norwood, Mass.

Design specifications of the configuration were revealed only recently, although estimated performance details were submitted to the Air Materiel Command's Engineering Division in mid-1951.

► **Improved Design**—Designated the H-6, this plane design represents an improvement of the unusual characteristics demonstrated previously in flight by predecessor aircraft in the Helio plane series.

One of these, the single-engine YL-24 (AVIATION WEEK July 27, p. 7) recently was delivered to the Army for service tests. This plane is basically similar to the four-place Helio Courier certificated by Civil Aeronautics Administration.

► **Lowspeed Combination**—Helio's H-6 embodies basic characteristics of the stall-proof and spin-proof Courier, whose lowspeed performance is reported to result from a combination of highlift flaps, automatic leading edge slats and a system of lateral controls inducing instantaneous response at slowest speed.

The H-6 Helio plane has the following specifications:

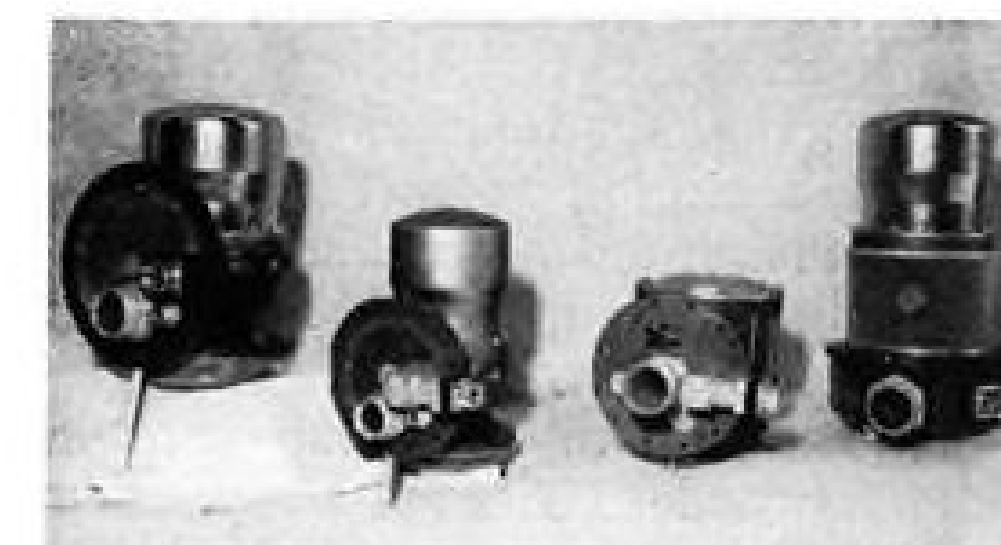
- Design gross weight, 5,000 lb.
- Useful load, 1,945 lb.
- Engines are two 260-hp. Lycomings, driving 15-ft.-diameter propellers.
- Wing area is 400 sq. ft.
- Wing span is 48 ft.
- Takeoff run, 93 ft. This contrasts with 220-ft. takeoff distance for the single-engine Courier with a gross of 2,800 lb.
- Takeoff distance over a 50-ft. obstacle is 300 ft. Corresponding figure for the Courier is 500 ft.
- Minimum speed is pegged at under 20 mph. Experience with the Helio plane control system on the single-engine model indicates that power-on level flight with full gross load at speeds under 20 mph. appears attainable, Helio claims.
- Helio says that with partial load, the vertical component of propeller thrust exceeds the weight of the airplane. Because a substantial part of the control surfaces lie within the slipstream, the company reports a strong possibility exists hovering may be practicable with further development.
- Maximum speed at sea level, 201 mph.
- Cruising speed at 8,500 ft. is 189 mph.
- Rate of climb at 5,000 ft., 1,715 fpm.
- Rate of climb, at sea level with one engine, 770 fpm.
- Angle of climb, sea level, 29 deg.

- Service ceiling, 27,900 ft.

The H-6 and previous Helio plane aircraft were designed by Prof. Otto C. Koppen, in charge of aeronautical design courses at Massachusetts Institute of Technology.

Original specs were conceived by Dr. Lynn L. Bollinger, Harvard Business Research professor who now is Helio's board chairman.

In addition to the Courier delivered to the Army, two other Helio planes are flying at Norwood—a two-place version with large-diameter propeller and a four-place model with conventional size prop.



Fuel booster pumps made by Pulsometer.

Air Turbine to Drive 3,500-Gph. Pump

A British manufacturer is currently developing a jet aircraft air turbine-driven pump with a 3,500-gph. discharge rate.

The company, Pulsometer Engineering Co., Ltd., Nine Elms Iron Works, Reading, England, makes 40 types of aircraft fuel and fuel booster pumps whose capacities range from 11 to 2,000 gph. and develop pressures up to 30 psi.

Pulsometer's pumps are suitable for use with gasoline, kerosene, methanol and water, and diesel oil. They will function satisfactorily up to 38,000 ft. on 100 octane fuel. Under favorable conditions this fuel can be handled up to over 50,000 ft.

The manufacturer says his pumps are used by most British airframe manufacturers including de Havilland, Fairey, Gloster, Handley Page, Hawker, Vickers-Armstrongs, A. V. Roe and Westland.

Argentine Jet Liner

A 40-passenger jet transport powered by four Rolls-Royce Avons has been designed by Dr. Kurt Tank, former top engineer with Germany's Focke-Wulf Aircraft during World War II, who now resides in Argentina.

Dr. Tank predicts his jet transport will be capable of cruising at approximately 600 mph. Placement of the turbojet powerplants "is quite revolutionary and still secret," the designer says.

Waffles Stiffen Highspeed Structures

- Grid provides two-way integral stiffening.
- Lockheed reports tests in forging this pattern.

Development of very highspeed aircraft imposes new responsibilities on the structures specialist and the production engineer that conventional design and fabricating methods do not meet. Newer techniques are needed for maximum structural efficiency and top manufacturing economies.

The usual built-up assemblies, with skin fastened to internal structure, do not fit adequately in the scheme which calls more and more for thin wings and highly stressed airframes. Integrally stiffened structures—where the sheet and its internal support are one piece—provide a solution to this problem.

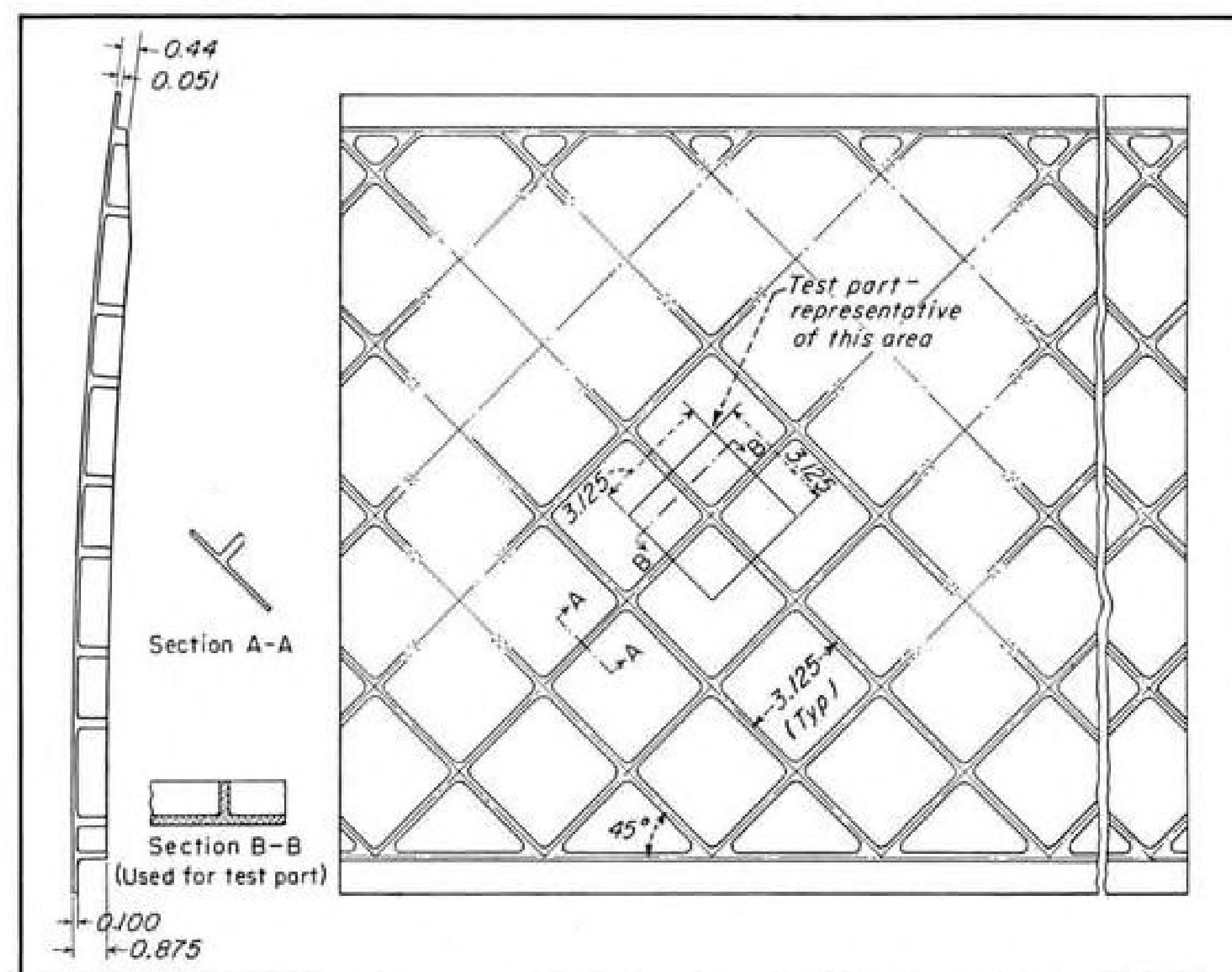
► **New Configuration**—The "waffle" pattern is one of the promising new configurations now under consideration for integral stiffening (AVIATION WEEK Jan. 5, p. 20). It gets its name from the way the stiffeners run—both longitudinal and transverse—to form a waffle effect.

On this makeup for integral panel structures, Lockheed Aircraft Corp., has done considerable research on its own. It also is conducting additional studies in conjunction with the Air Materiel Command. Aim is to get full-size, waffle-stiffened test panels which would be useable directly as aircraft components.

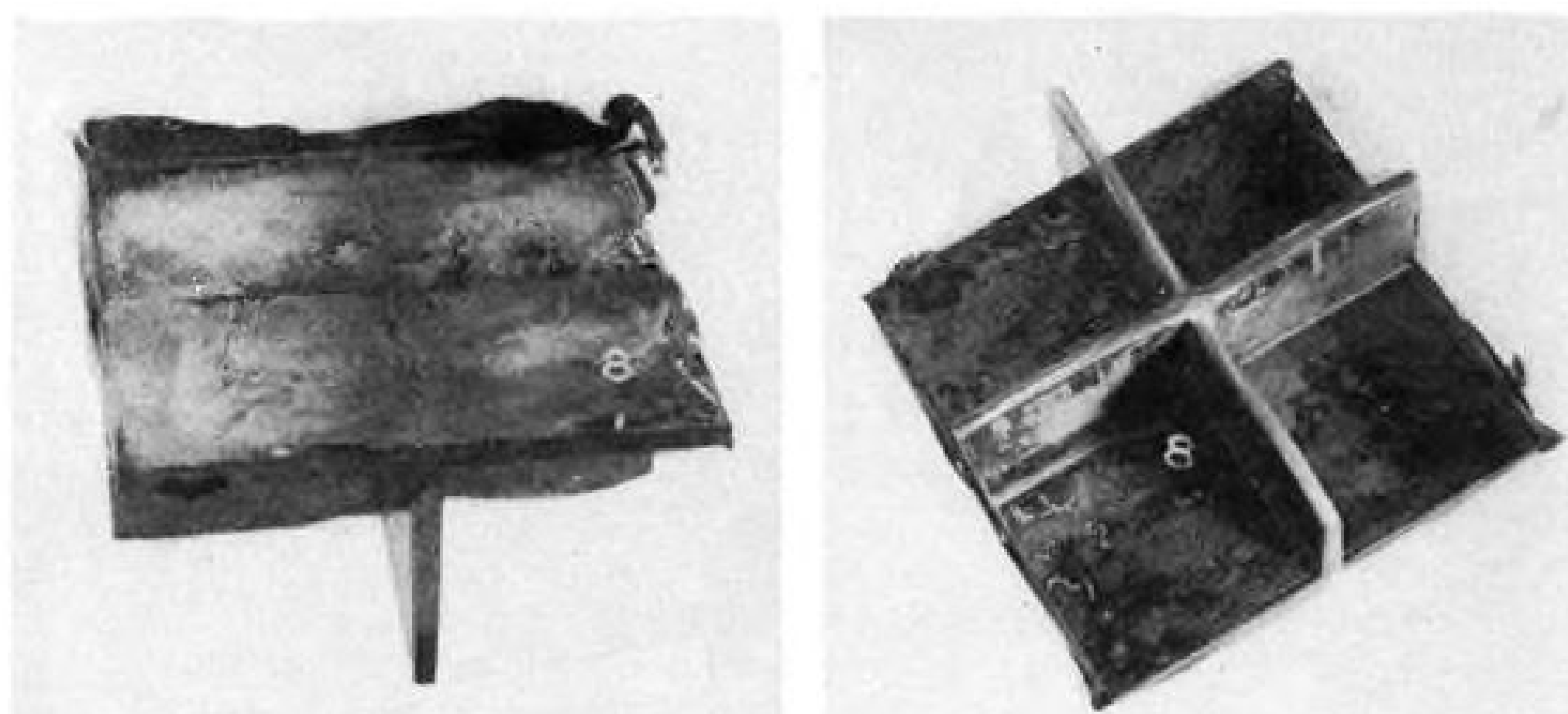
At present, Lockheed production parts have unidirectional integral stiffeners. A more efficient structure could be obtained by incorporating the waffle's additional stiffening elements in the transverse direction, improving the shear-carrying capacity of the panel.

Where the size of the part does not prohibit, the most feasible method for producing this waffle configuration is by press forging.

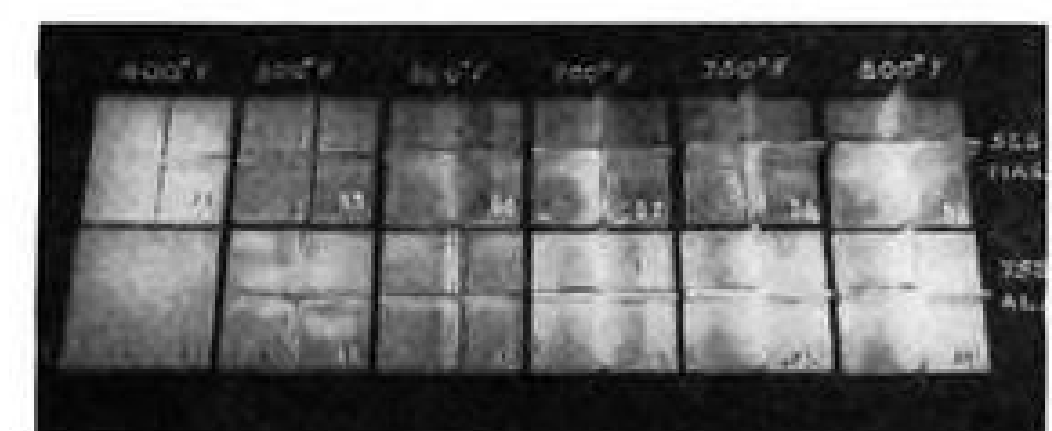
► **Methods Limitations**—In addition to forging integrally stiffened panels gen-



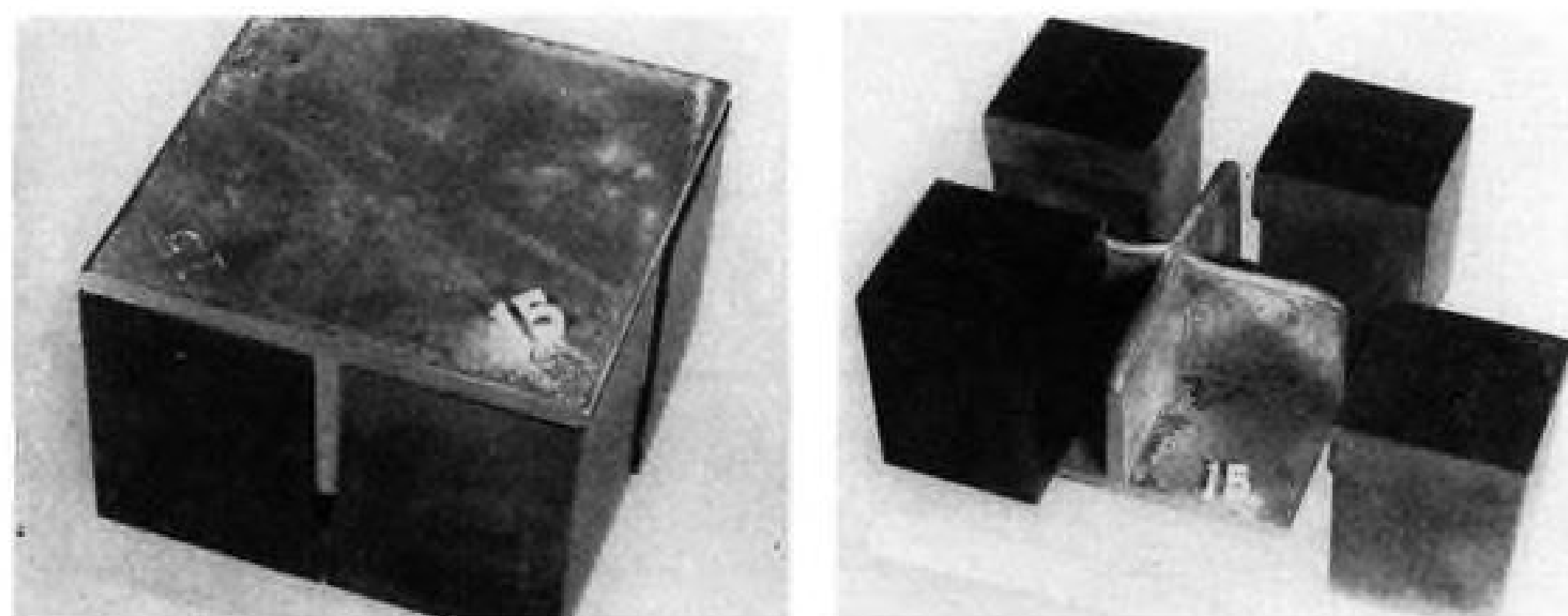
MAKEUP OF WAFFLE-TYPE integrally stiffened panel is illustrated in this drawing. Lockheed has been forging test panels on 300-ton hydraulic press.



TEST SPECIMEN looks like this, from top and bottom, prior to removal of the forging flash. The test piece measures 3.125 in. (see sketch above).



SERIES shows test parts made of 52S magnesium (top) and 75S aluminum.



EXPERIMENTAL FORGING specimen rests on stiffener forming blocks (left); at right, the assembly is turned over and the forming blocks moved out.

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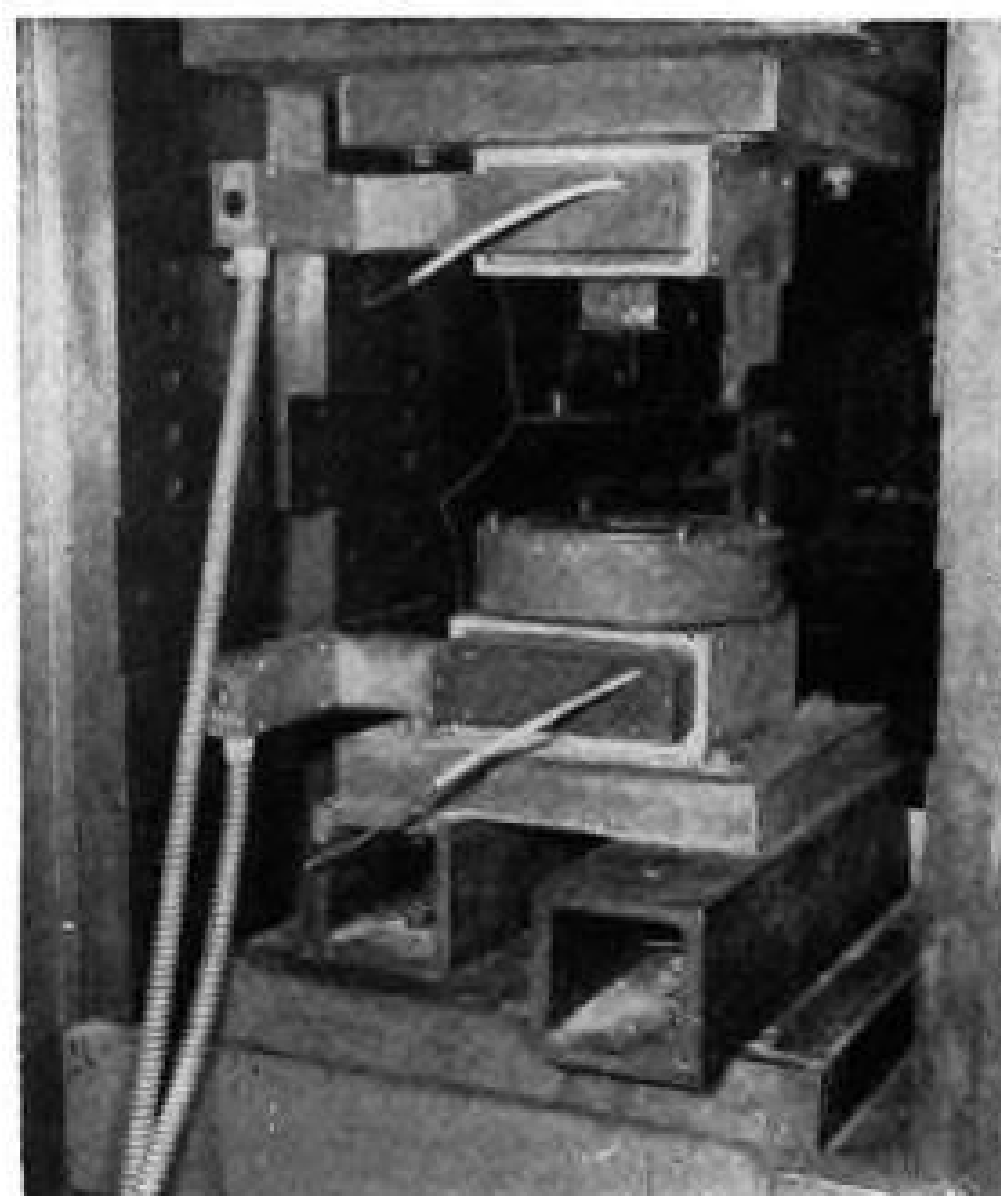
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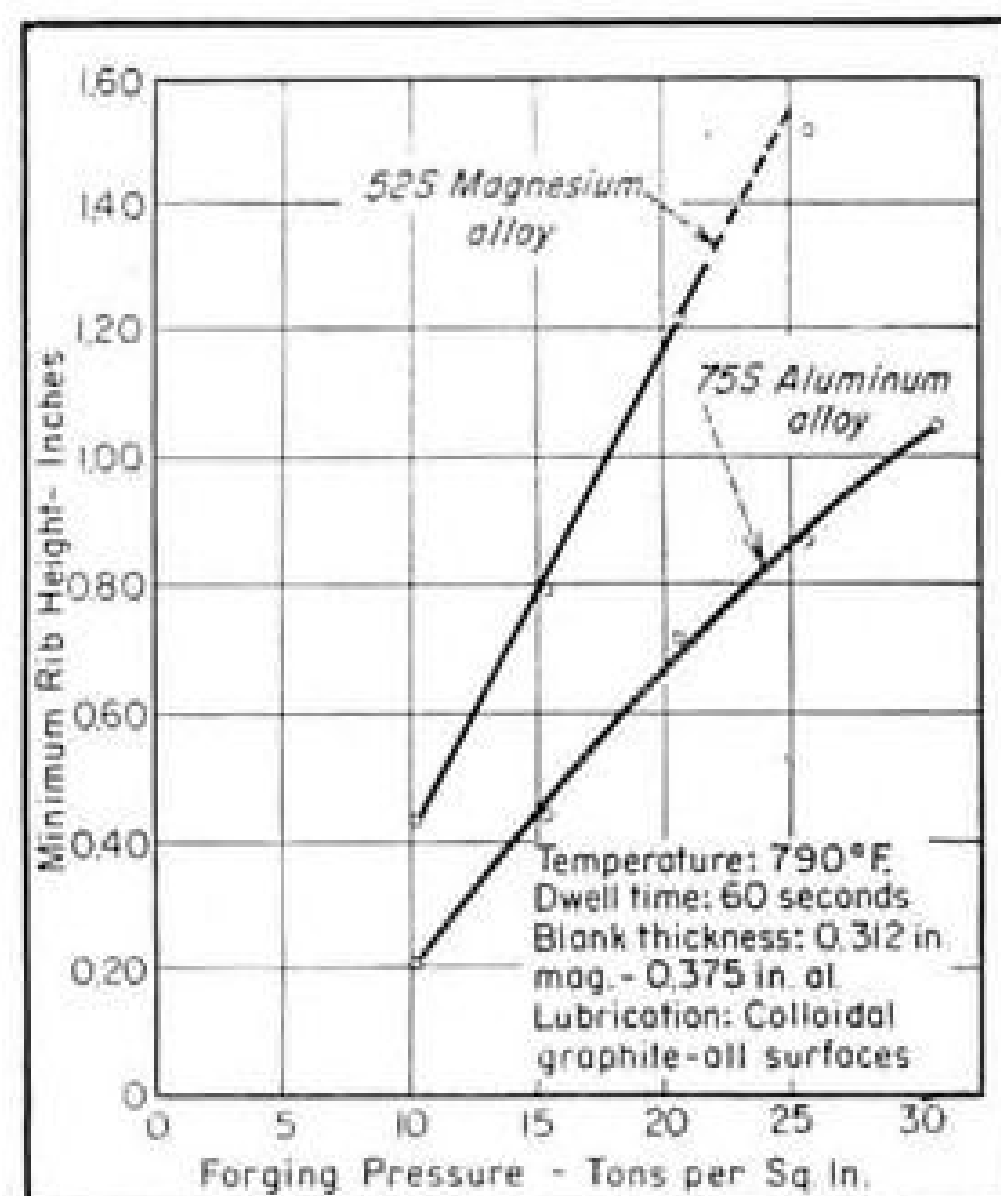
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RESEARCH laboratory's 300-ton hydraulic press with forging dies installed.



JUNCTION boxes extend out from press to prevent overheating power leads.



FORGING PRESSURE vs. Rib Height for 75S aluminum and 52S magnesium.

erally can be produced by casting, extruding and machining.

However, cast makeup in most integrally stiffened designs is prohibited by structural requirements.

The tremendous size of some integrally stiffened panels used on current Lockheed aircraft makes it necessary to machine these parts from plate stock on equipment (Giddings & Lewis skin mill), specially designed for this type of production (AVIATION WEEK Mar. 16, p. 44). These self-stiffened panels are made with unidirectional stiffeners at the present time.

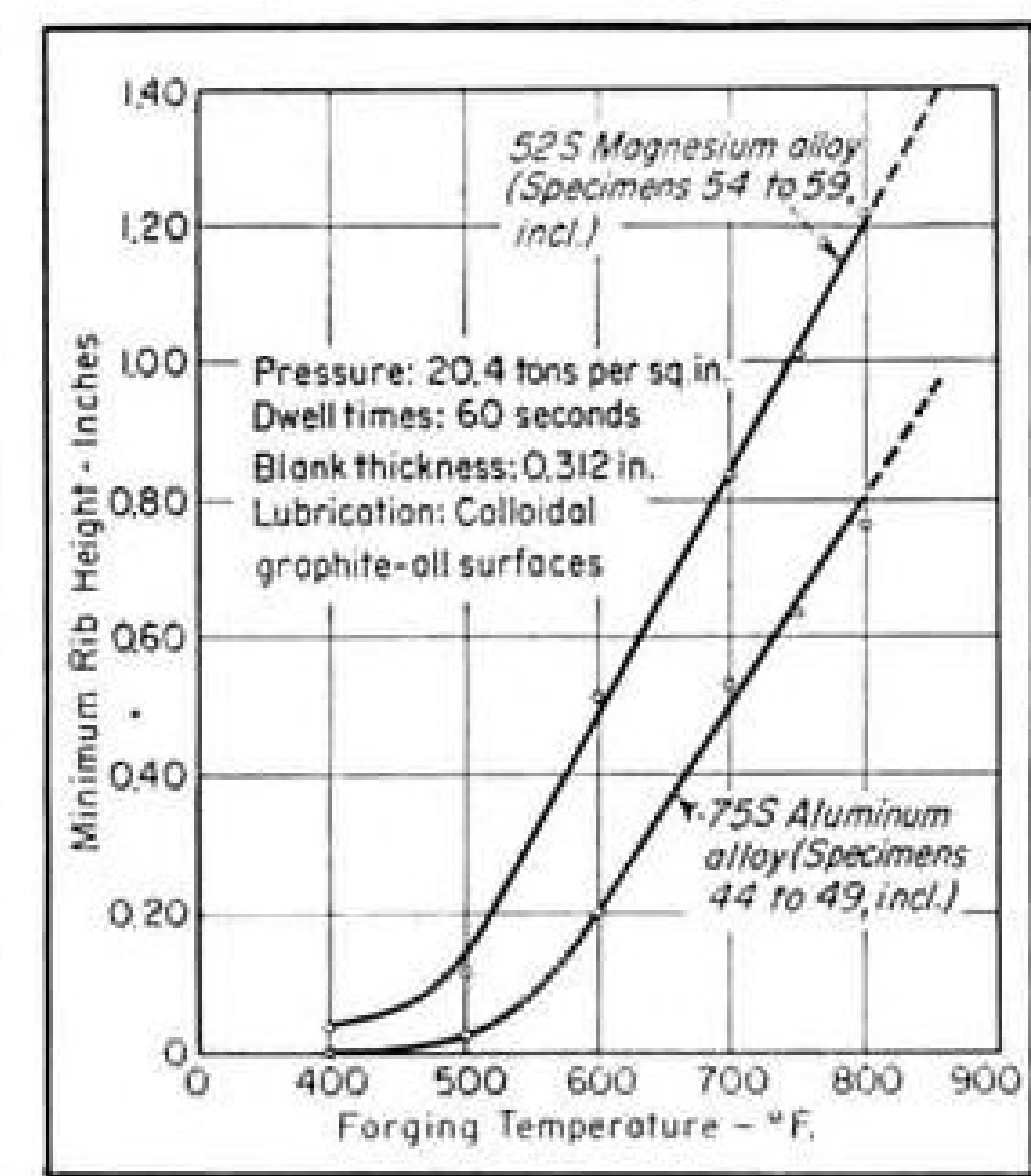
Lockheed also is using extruded integrally stiffened structures. Currently available extruded self-stiffened sheet not only is confined in maximum width by the capacity of the extrusion presses, but also is limited to the parallel stiffener configuration.

► **Small-Scale Work Now**—Lockheed initiated its research program on waffle-stiffened panels in 1952. Purpose of the study was to obtain information on large "precision" press-forgings.

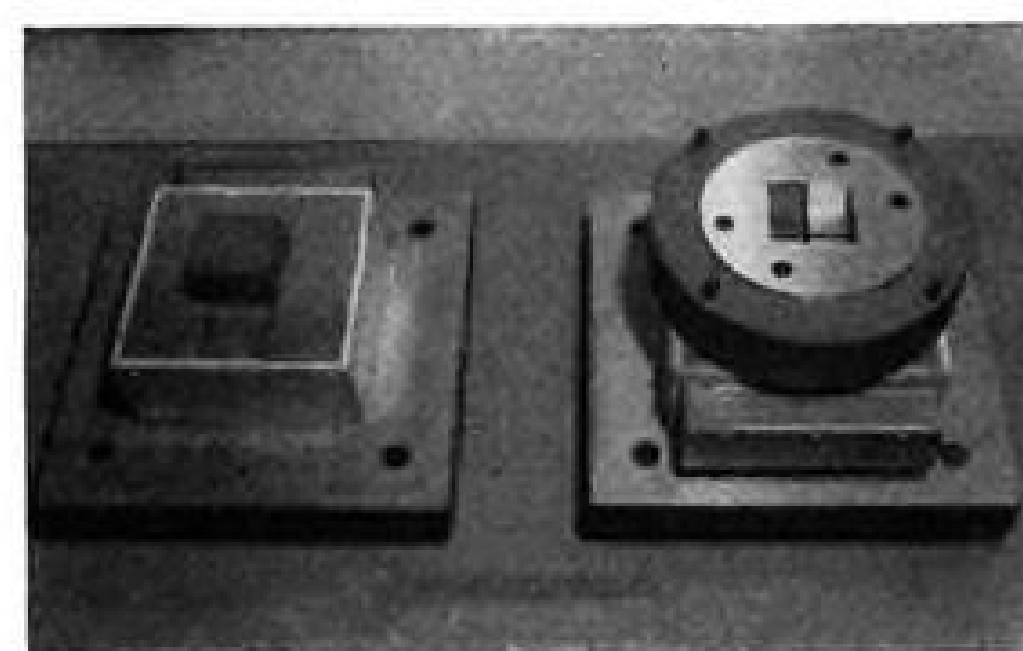
Tests have been run in Lockheed's research laboratories, utilizing a 300-ton hydraulic press, to investigate typical sections from a large waffle-type panel. Relationships observed in these small-scale trials are seen as allowing Lockheed engineers to design full-scale panels embodying proportions that have proven feasible to forge.

It is anticipated that parts desired will require very heavy presses to get close-tolerance panels in sizes large enough efficiently to replace built-up assemblies. First of the giant forge machines should be operating next year, under the Air Force heavy press program. These new machines are expected to turn out work with closer tolerances and thinner sections than is the case now.

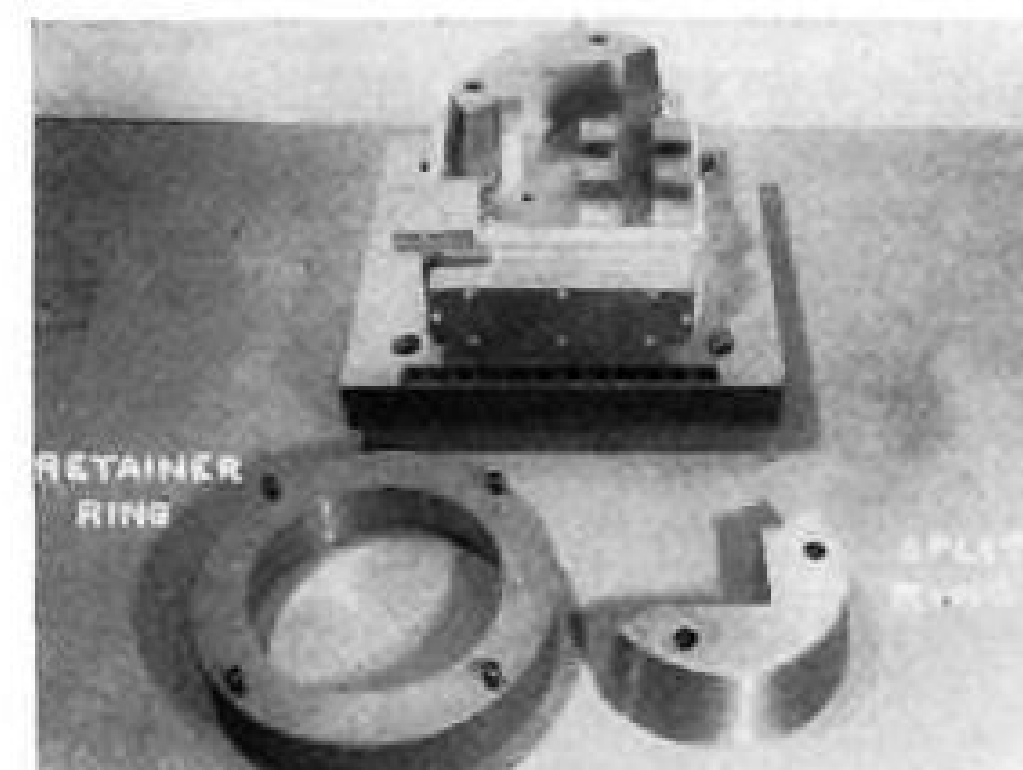
► **Studies and Findings**—In Lockheed's waffle-panel studies, relationship of the following variables to forging character-



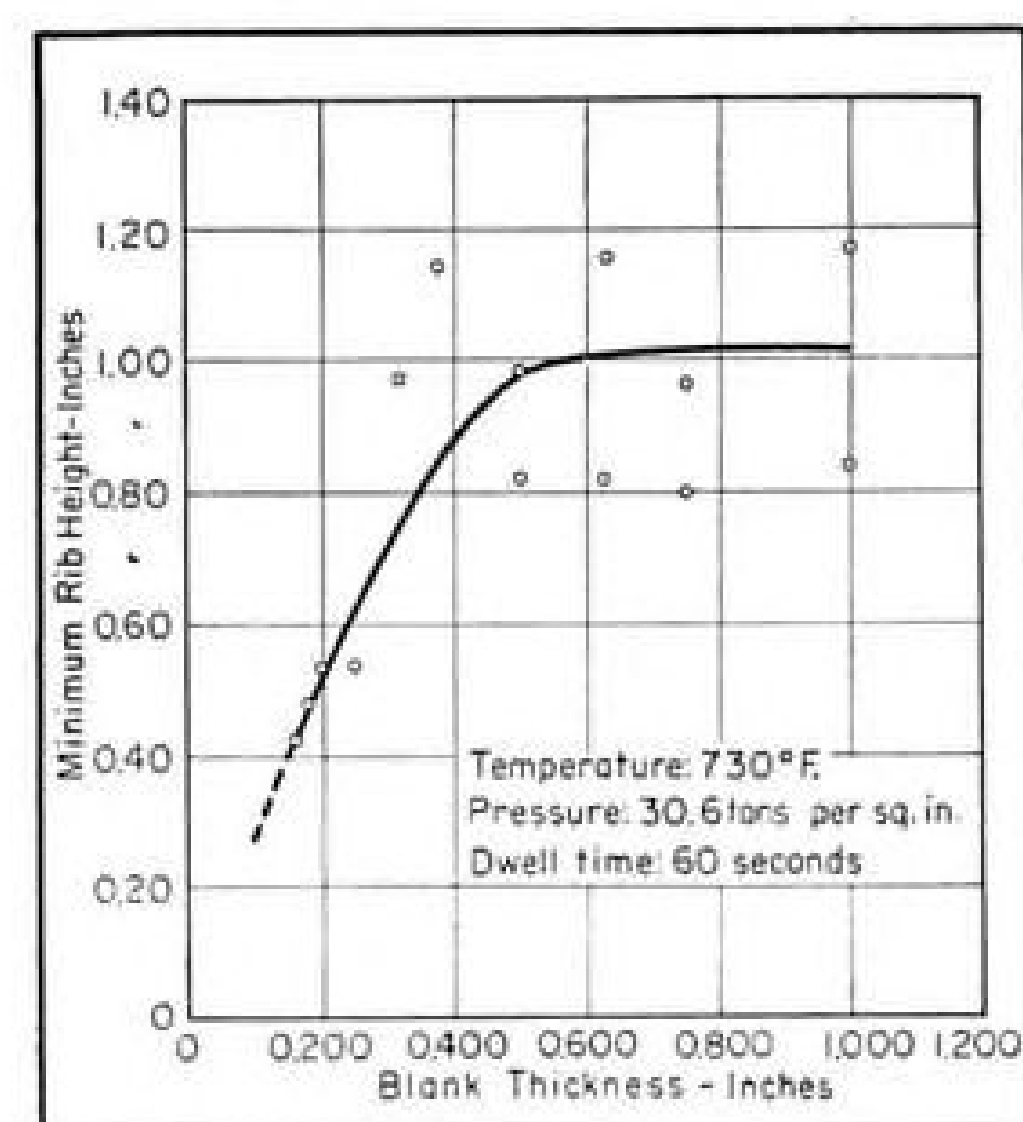
TEMPERATURE vs. Rib Height for 75S aluminum and 52S magnesium.



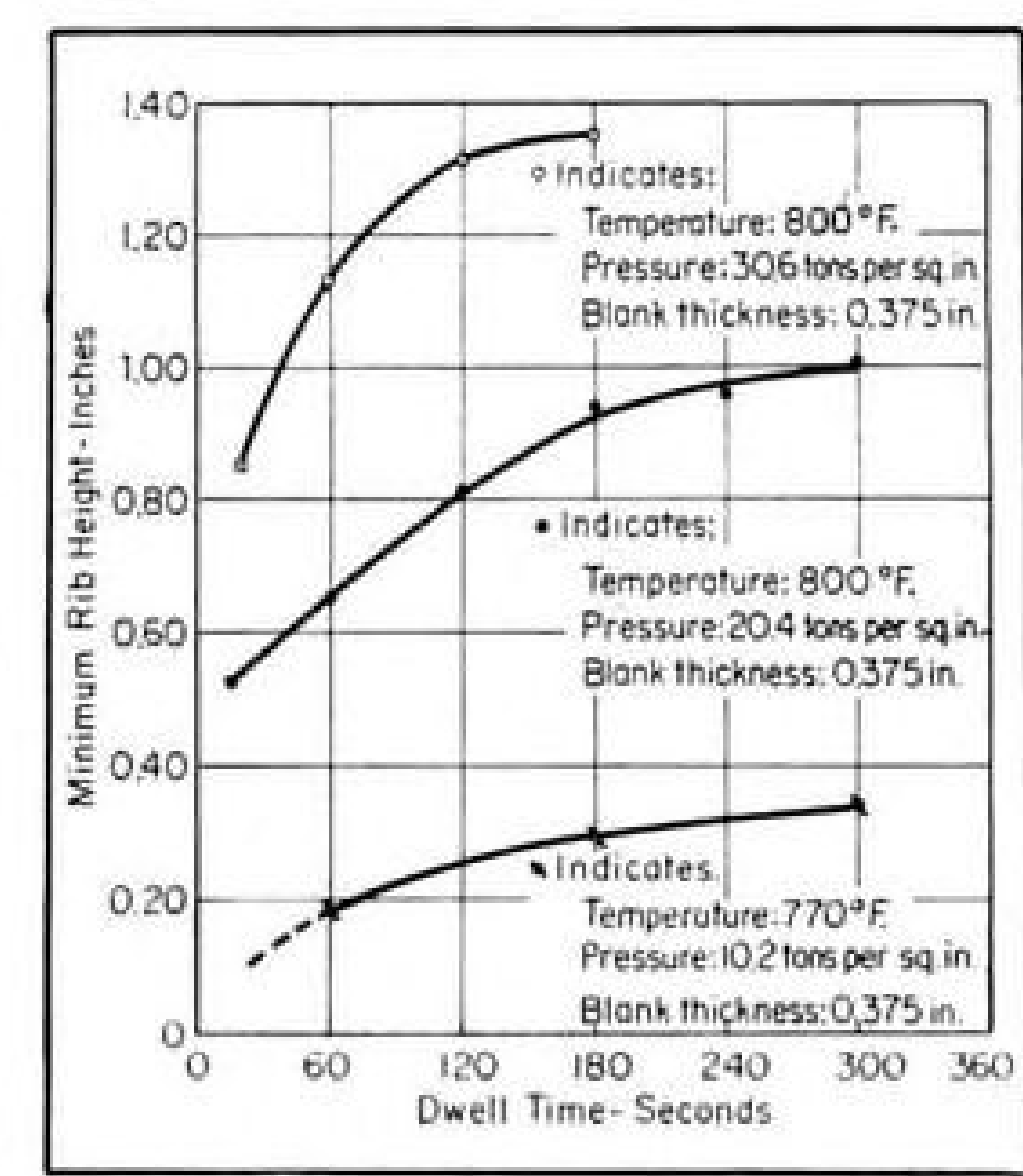
FORGING TOOLING consists of flat punch (l.) and female lower die (r.).



LOWER DIE is disassembled to permit removal of test part after forging.



BLANK THICKNESS vs. Minimum Rib Height for 75S aluminum alloy.



DWELL TIME vs. Minimum Rib Height for 75S aluminum alloy test part.

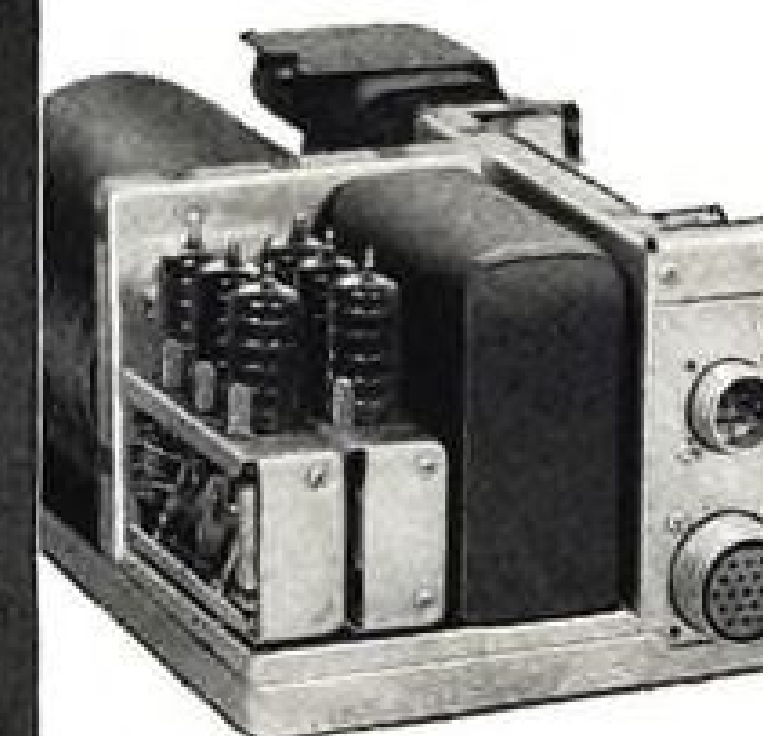
LEAR VGI SYSTEM ...SIXTH SENSE FOR THE BOEING B-47

IN HIGH-SPEED maneuvering hazardous errors are introduced by conventional attitude indicating instruments. For greater safety, the jet plane needs something *special* in the way of an attitude indicator. For the Boeing B-47 and other jet bombers and fighters, this critical function is performed by the Lear Vertical Gyro Indicator System.

Operating as the plane's "sixth sense," the Lear VGI system is designed to measure and display deviation from horizontal flight with near-perfect accuracy and speed. All necessary gyros, amplifiers, and power supplies are contained in one compact unit which is remotely installed, transmitting pitch and roll intelligence electrically to the flight attitude indicator. The Lear VGI may also be used as a master vertical reference for an autopilot, radar, or other equipment.

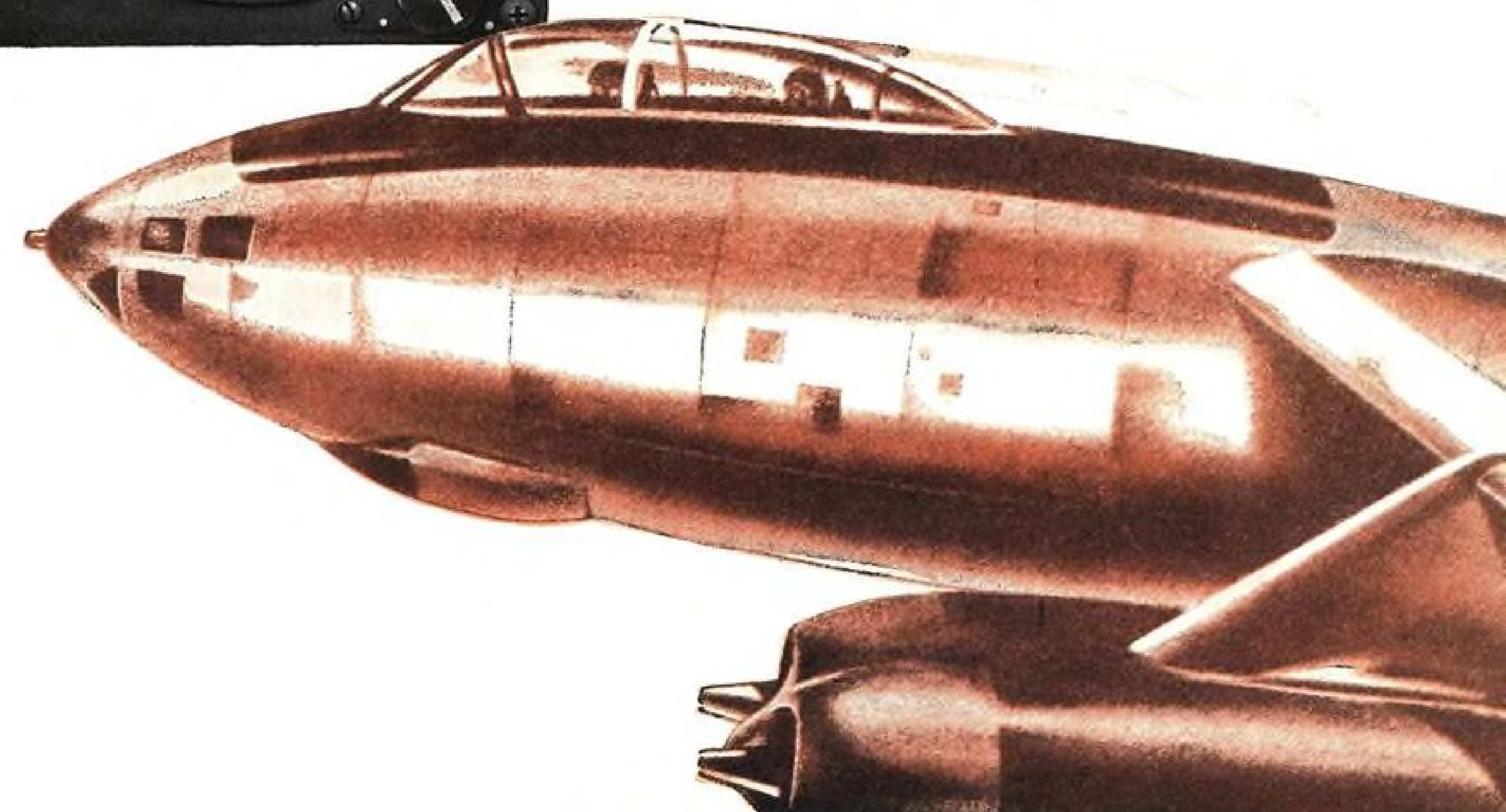
Let us discuss *your* problems in instrumentation. We have been solving the tough ones for almost a quarter of a century.

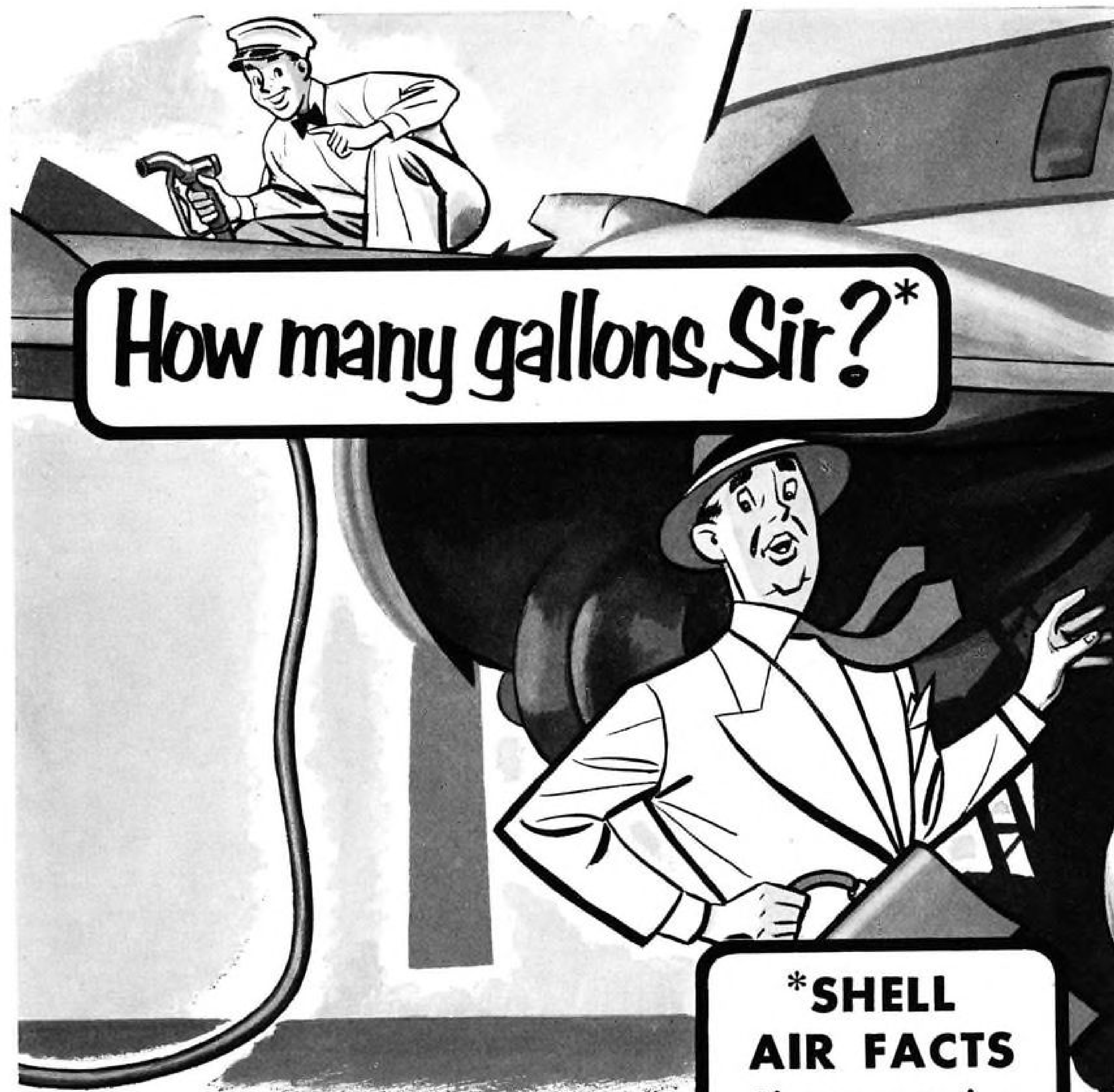
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LEAR VGI SYSTEM Non-tumbling horizon gyro (in roll), provides greatly improved accuracy, reduced turn errors. The system includes 24,000 rpm gyro motor and a highly sensitive Lear electrolytic erection switch.

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istics have been investigated:

- Forging temperature and pressure.
- Duration of pressure (dwell time).
- Original blank thickness.
- Effect of final skin thickness on occurrence of forging defects.
- Stiffener thickness and height.

On the basis of development work completed at Lockheed, the following general conclusions have been made:

- Single-stage press forging is a feasible method for producing waffle-type panels.

- Skin thicknesses as low as 0.250 in. may be forged in 75S aluminum. Thicknesses less than 0.250 may be obtained by subsequent skin milling.

- Nominal forging temperatures for 75S may not exceed 850F.

- Dwell time of from 1 to 5 min. will be required for forging pressures in the range of 10 to 30 tons/sq. in. For higher pressures, shorter dwell times will be required.

- When the ratio of stiffener-thickness to blank-thickness is large, a "buckling" type of defect occurs. When the ratio is intermediate, a "suck-in" type of defect results—caused by vertical shear within the base of the stiffeners. When the ratio is small, sound parts can be forged.

- Thin blanks require higher pressures than thick blanks, to produce stiffeners of similar height and thickness.

- Thin stiffeners require more pressure than thick stiffeners of similar height, from blanks of the same thickness.

► Other Benefits—The research program will advance precision forgings generally, because the close tolerances inherent in waffle-type parts will contribute much additional experience in tooling. While forging dies today generally utilize ordinary die-sinking techniques, precision press forgings will require a higher quality of tooling, comprised of segments and inserts.

Two of the key men in Lockheed's program are research engineer Howard B. Wiley, and production design engineer Fred C. Pipher.—Irving Stone

Wood Laminate Used In Aircraft Tooling

A high-density wood laminate, widely used by the British aircraft industry since the beginning of World War II in such applications as aircraft propeller and helicopter rotor blades, templates, and rubber press, spinning and hand form blocks, is now being made available in this country. At least one major West Coast airframe manufacturer is using the laminate, called Hy-du-lignum. It is also used in the Hawker Hunter.

► U. S. License—U. S. Bobbin & Shuttle Co., Lawrence, Mass., has an exclusive American sales agreement with the



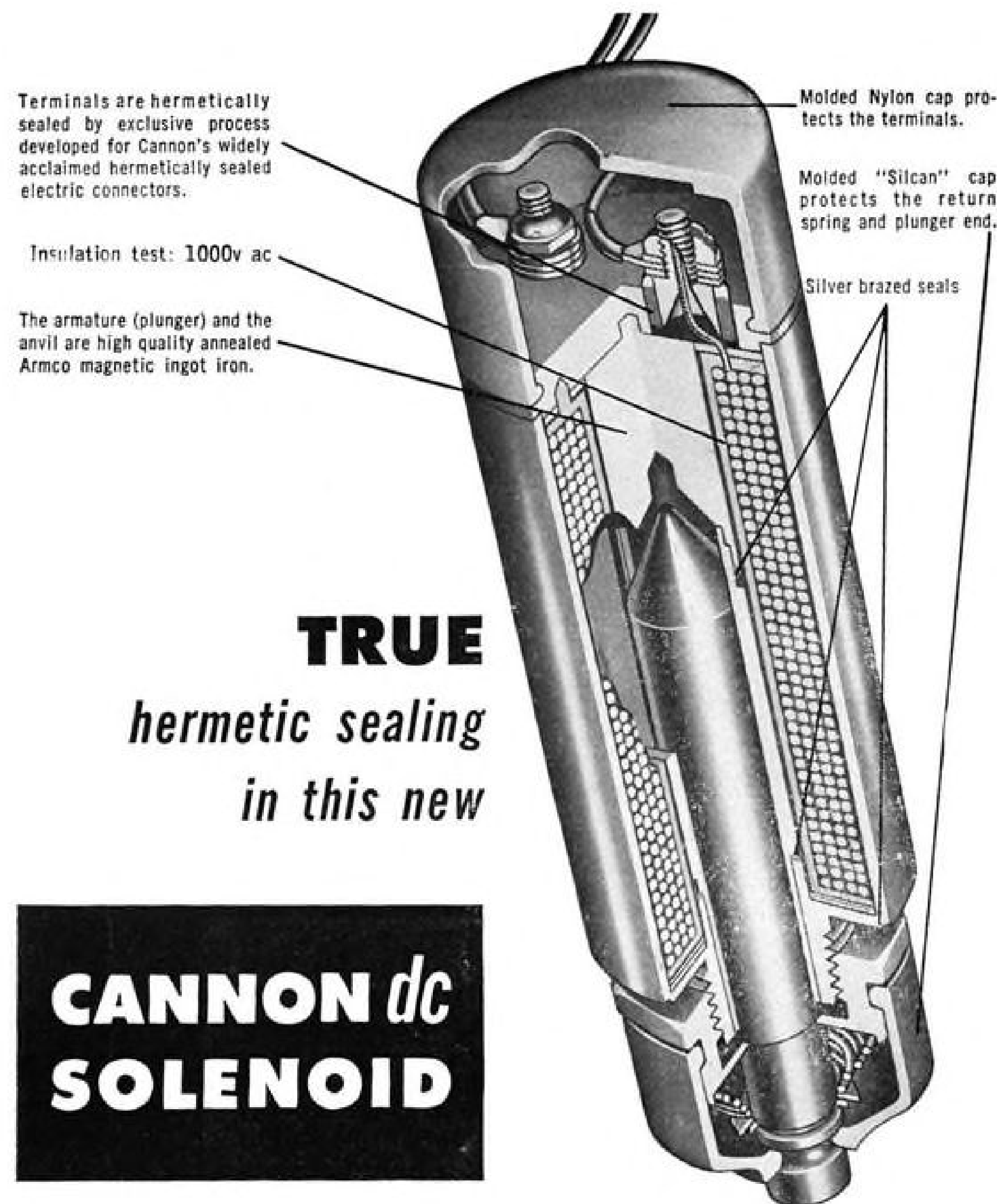
More
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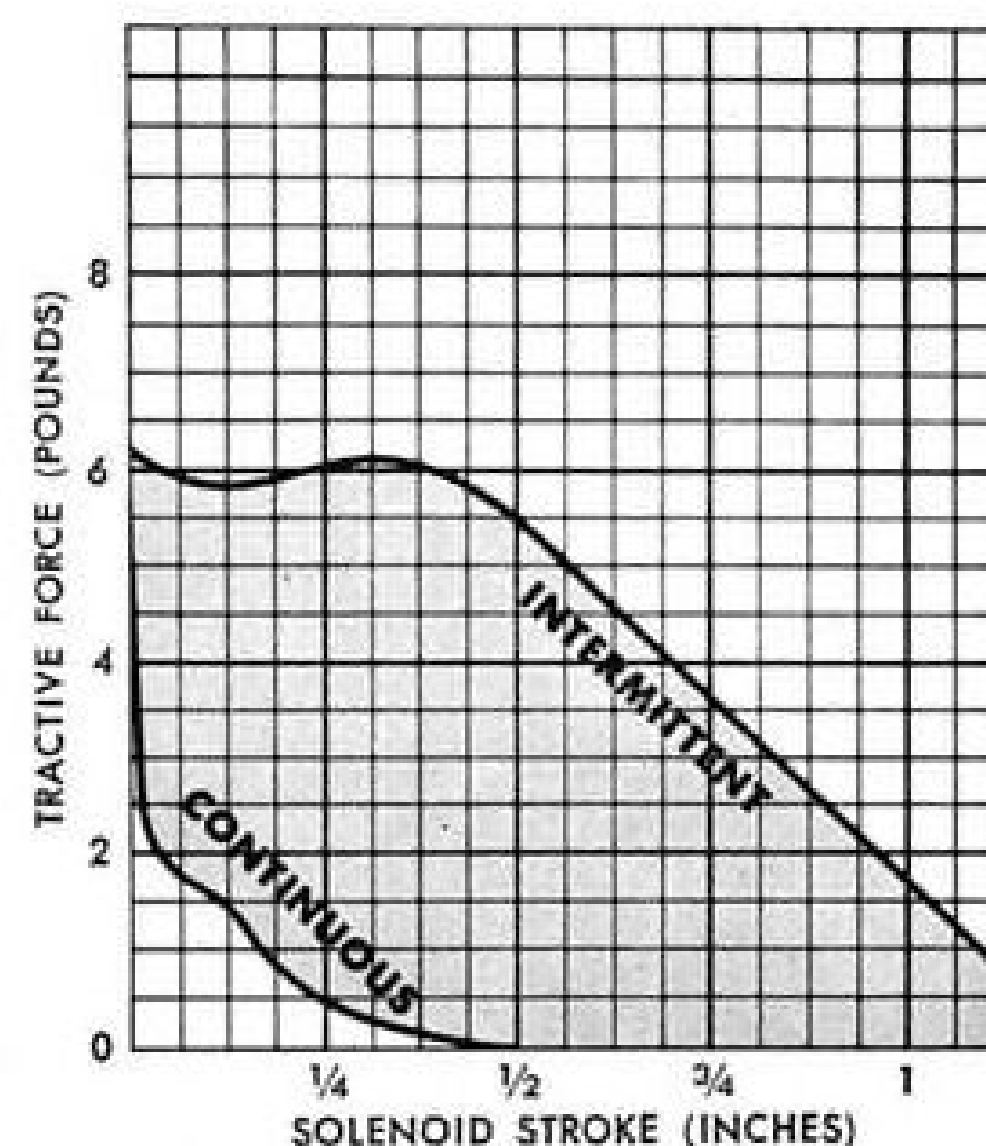
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For pressurized or corrosion resistant service, Cannon's dc Solenoids offer positive hermetic sealing, sound construction, painstaking workmanship and highest quality materials. A vitreous insulating material is heat-fused to shell and contact terminals, creating a perfect seal. Other parts are silver brazed. The entire solenoid is then copper-nickel-chrome plated to insure complete coverage, high corrosion resistance and long, trouble-free service. Solenoid No. 19760, above, the first hermetically sealed product of this type, is built for continuous duty on 28v dc systems. Fitted with other coils, it renders intermittent duty as characterized by the chart at right. Cannon's hermetically sealed solenoid series reflects the same uncompromising attention to details of sound design, engineering and workmanship that has made the name "Cannon" synonymous with "quality" for more than 38 years. For complete information write for new Solenoid Bulletin DCS4-1953 showing 105 different assemblies.

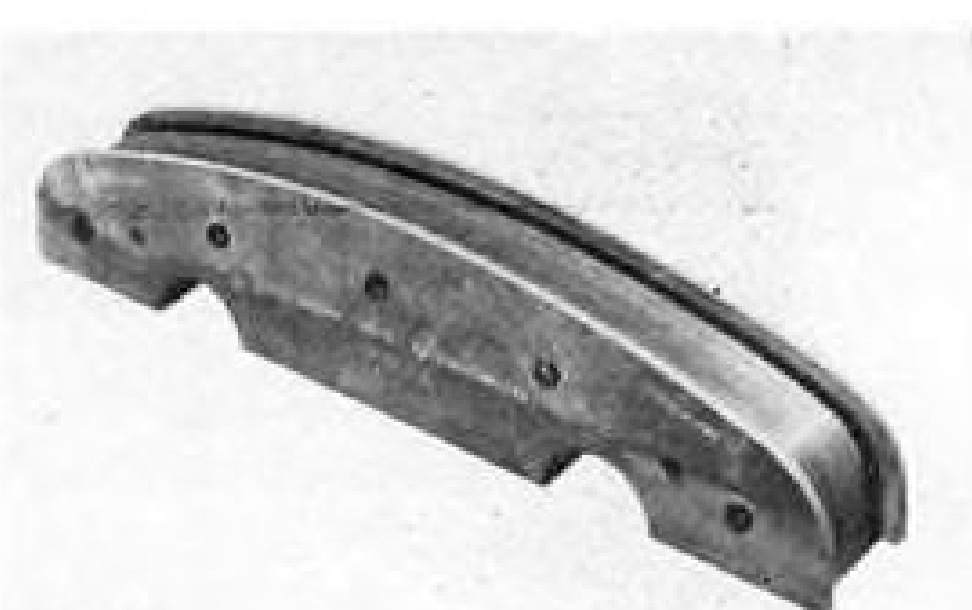


Solenoids of the hermetically sealed 19760 series, through modification of the coil windings, can meet various characteristics and specific applications within the limits indicated above.

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Factories in Los Angeles, Toronto, New Haven. • Representatives in principal cities. Address inquiries to Cannon Electric Company, Dept. L-110 Los Angeles 31, California.



STRETCH-FORM block of Hy-du-lignum high-density wood laminate.

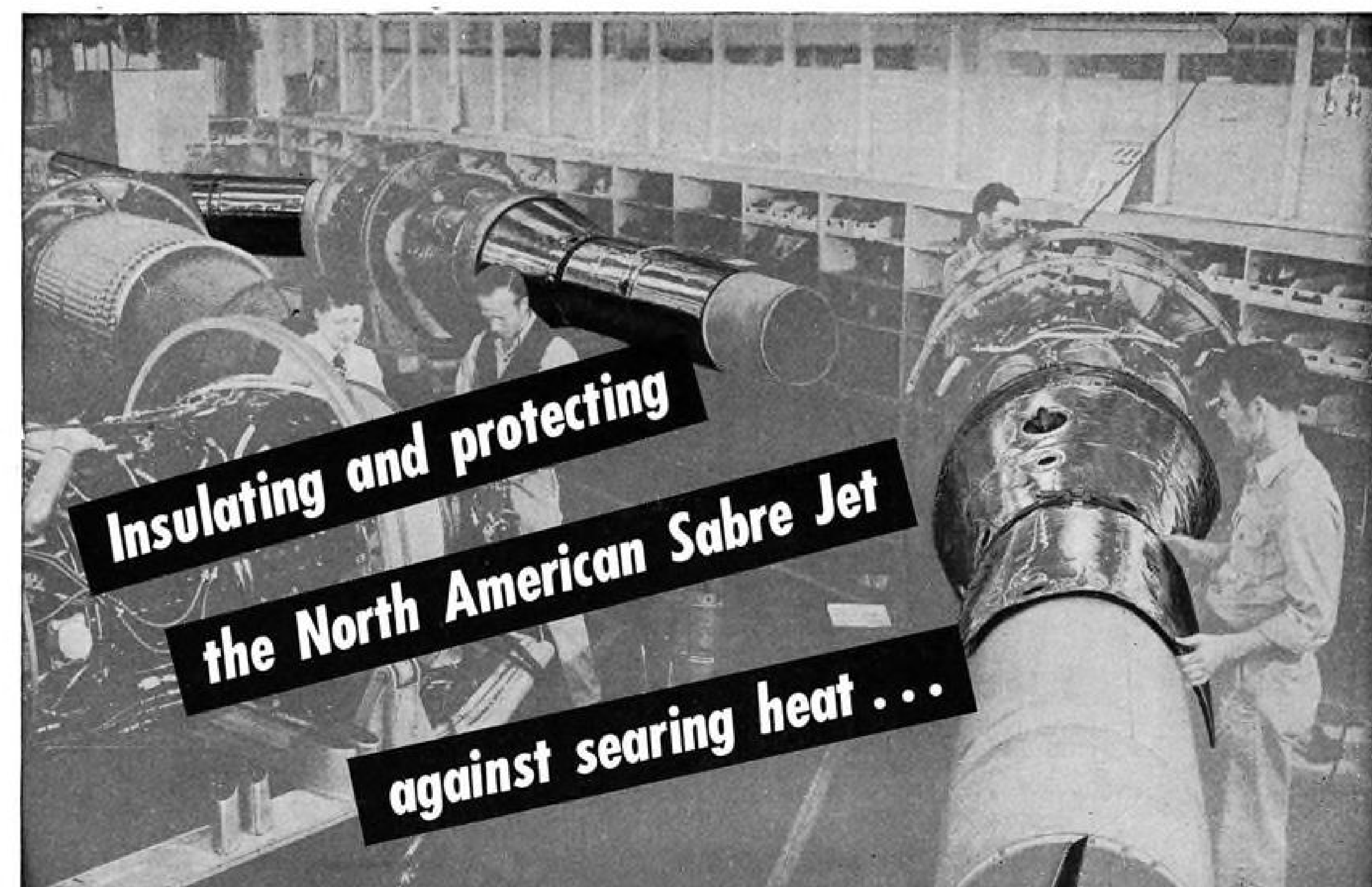
British manufacturers, Hordern-Richmond, Ltd. The American agent cites these features of Hy-du-lignum:

- **Machinability.** The material is easier to handle than many "compregs," is self-lubricating in operation and has a low coefficient of friction.
- **Cost.** Cost savings over comparable steel tools is quoted at 75%; over zinc tools, 50%.
- **Weight.** Hy-du-lignum is 1/6 the weight of steel, 1/5 that of Kirsite and 1/2 that of aluminum. Result is easier handling and more compact storage with ability to use full height of shelving which might not support heavier metal dies.
- **Life.** The material gives long production tool life, and is wear- and shock-resistant and non-brittle.
- **Strength and uniformity.** Compression value of 35,000 psi. provides the strength required to form the heavier-gage metals now used in the manufacture of highspeed aircraft and missiles. Uniformity is assured by using thin, selected, hardwood veneers whose knots and flaws have been eliminated as much as possible through careful inspection.

U. S. Bobbin stresses the fact that Hy-du-lignum is not impregnated—is not a "compreg." It is a laminated wood of hardwood veneers, interleaved with a synthetic plastic resin film sheet and compressed and heat-pressure-bonded to a compression of 35,000 psi. Result is a material which may be treated like hardwood—machined with wood-working tools, sawed, planed, turned, drilled and tapped without cutting lubricant. It may be sanded, scribed, polished, waxed, varnished and painted as desired.

► **British Users—**Hy-du-lignum has been successfully used in such applications as propeller blades for the Spitfire and other British fighter and bomber aircraft. More recently, it has been used for leading edge spars on the main and tail rotors of the Bristol 171 single-rotor and 173 twin-rotor helicopters, U. S. Bobbin says. The firm adds that Hordern-Richmond is currently in production of blades for Bell helicopters and Aeromatic propellers.

► **Availability—**Currently, U. S. Bobbin



... with Johns-Manville THERMOFLEX BLANKETS

THIS PRODUCTION LINE SCENE in the North American Aviation plant at Los Angeles shows Thermoflex* Insulation Blankets being applied to tail pipes of North American Sabre Jets on order for the United States Air Force.

Now standard protection for many Air Force and Navy jet aircraft, these flexible blankets insulate and protect the airframe against searing heat generated by jet power.

Thermoflex Blankets are custom-fabricated with highly stable Thermoflex RF Felt. Developed by Johns-Manville Research and Insulation Engineers, this time-tested refractory fiber felt is sealed between sheets of corrosion-resistant metal foils. In manufacturing Thermoflex Blankets to specification, careful attention is given to the accuracy of cutouts for engine supports, actuator mountings, fuel lines, thermocouple leads



The North American Sabre Jet, powered with the General Electric J47 turbojet engine, has flown through the test of combat with highest honors.

and other controls. The precision-formed grooving and edges of the blanket . . . the close fit at cutouts . . . maintains maximum insulation value for the entire application. Furthermore, edges at cutouts are suitably sealed to prevent fuel penetration into the insulation felt.

In addition to insulating tail pipes, engine cones, turbine casings and afterburners . . . Thermoflex Blankets in special preformed shapes are used to insulate, protect, and fireproof fluid storage tanks, air-conditioning systems, thermal de-icing ducts and many other assemblies in all types of aircraft.

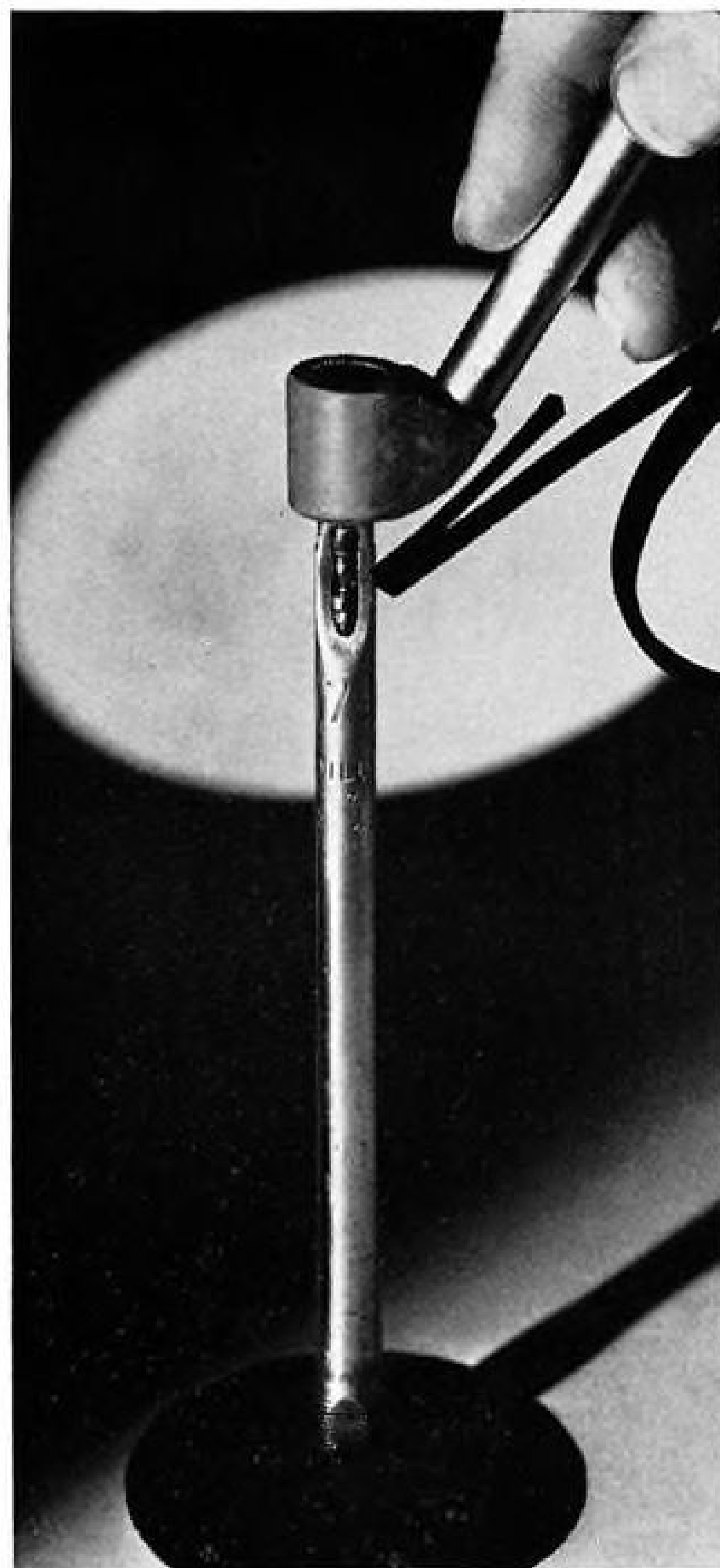
Why not send for your free copy of the illustrated folder IN-136A? It tells the complete story of Thermoflex Blankets for aircraft power plants and airframes. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

*Reg. U.S. Pat. Off.



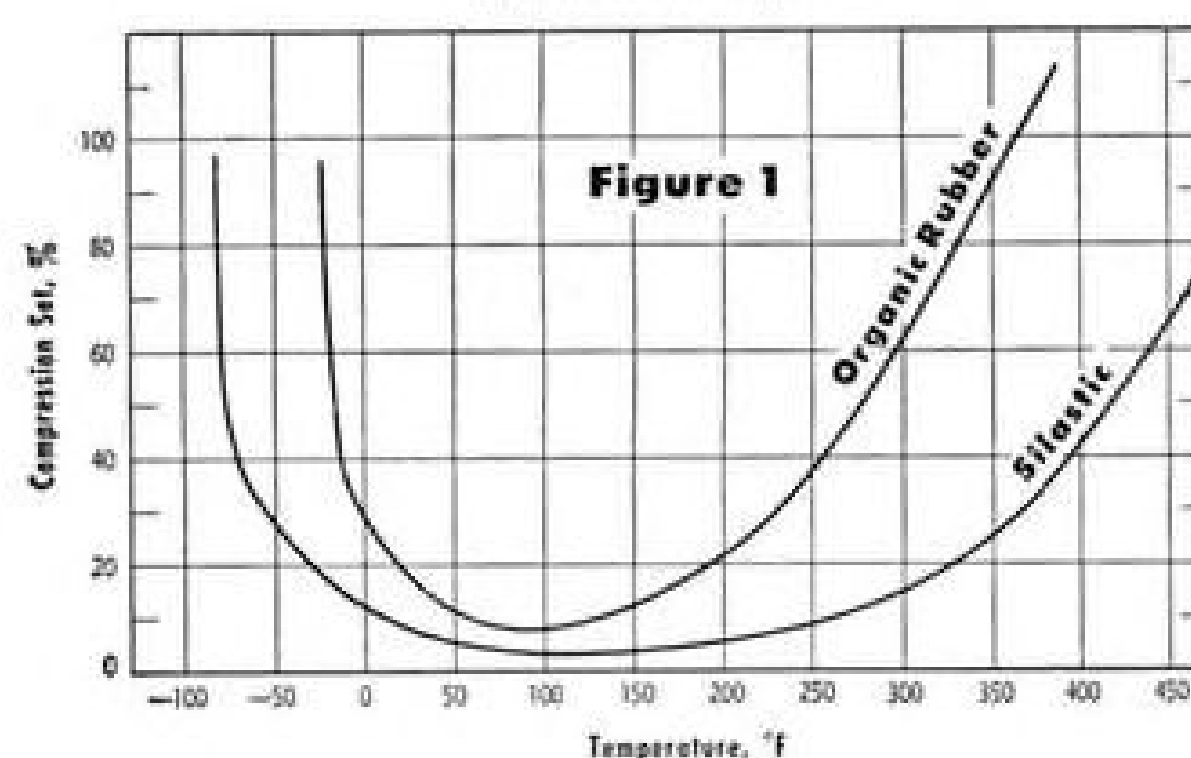
Johns-Manville

PRODUCTS for the
AVIATION INDUSTRY



PHOTOS COURTESY DILL MANUFACTURING CO., CLEVELAND, OHIO

Compression Set vs. Temperature



*T.M. REG. U.S. PAT. OFF.

DOW CORNING CORPORATION
Midland, Michigan

ATLANTA CHICAGO CLEVELAND DALLAS DETROIT
LOS ANGELES NEW YORK WASHINGTON, D. C.
(Silver Spring, Md.)

In Canada: Fiberglas Canada Ltd., Toronto
In England: Midland Silicones Ltd., London

**as a resilient
pressure seal for truck
and bus tire valves...**

SILASTIC works where other materials fail!

High speeds, heavy loads and sustained operation make truck and bus tires the hottest on the road. Temperatures on the rim and in the valve stem are often as high as 300 F. Organic rubber cup gaskets within the valve core rapidly lose their original resilience, become sticky, and fail to maintain proper air pressure.

The Dill Manufacturing Co. of Cleveland eliminates the problem by using Silastic* cup gaskets in their valve cores. The gaskets remain resilient; maintain an airtight but easily opened seal despite high operating temperatures or sub-zero weather. Dill has made over 2 million valve cores with Silastic gaskets since 1949, and the first failure traceable to deterioration of the Silastic seal has yet to be reported.

Further proof of the usefulness of Silastic as a gasket and sealing material is given in Figure 1. Samples of Silastic and a high quality organic rubber were compressed for 22 hours at temperatures ranging from -67 to 480 F. They were then released and measured after 30 minutes at room temperature or at test temperatures where samples were compressed at temperatures below 77 F. Values plotted in Figure 1 show that Silastic retains its resiliency at temperatures far above and below the limits of organic rubber.

If you need a rubbery material that retains its physical and dielectric properties; remains water repellent and nonadhesive to most sticky materials even after long exposure to weather, contact with a variety of hot oils and chemicals, or service at temperatures from below -100 to above 500 F, **TRY SILASTIC.**

MAIL THIS COUPON TODAY for more data on Silastic

DOW CORNING CORPORATION, Dept. DA-11, Midland, Michigan

Please send me: ☐ Silastic Facts; ☐ Sources of Supply; ☐ "Tall Tales and Fabulous Facts"

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

plans to maintain in America complete inventories of British-made Hy-du-lignum.

Later, if demand warrants, the company will undertake to manufacture the material in this country.

Hy-du-lignum is available in two densities:

- **High density**, grade 22/T/82, comes in standard thicknesses of $\frac{1}{8}$ in. to 2 in., in $\frac{1}{8}$ -in. increments; and 2 in. to 4 in. in $\frac{1}{4}$ -in. increments.

- **Medium density**, grade 22/T/60, is available in the same standard thicknesses and increments as the high-density material, except that maximum standard thickness is 3 in. instead of 4 in.

However, boards of both densities may be furnished in specified thicknesses other than standard up to 8 in. for the high-density product and up to 6 in. for medium-density material.

Standard size boards measure 84x32 in. Other sizes, available in various densities, are 82x31 in., and 84x14 in.

Impregnator Seals Porosity in Castings

Impregnators for using styrene-base material to seal micro-porosity in cast electronic and aircraft parts are being introduced by L. O. Koven & Brother,



Inc. Varnish and wax may also be used as sealants.

Castings are placed in baskets which are lowered into vacuum chamber of impregnator. Castings are thoroughly de-aerated prior to impregnating.

Pumping of impregnating solution into tank follows. Then pressure of 100 psi. is applied and held long enough to assure complete penetration. Excess solution is flushed out through piping at bottom of tank upon completion of process.

Impregnator measures 36 in. in diameter, is made of $\frac{3}{4}$ -in. carbon steel with $\frac{1}{4}$ -in. gasketed cover equipped with swingbolts and pivot-mounted with counterweights. Sixteen 1-in. iron plates on bar form counterweights.

L. O. Koven & Brother, Inc., 156 Ogden Ave., Jersey City 7, N. J.

PRODUCTION BRIEFING

► **Republic Aviation Corp.**, Farmingdale, N. Y., has leased a building in Hicksville having 31,500 sq. ft. of floor space, to be used as a tool shop. The facility will be the fourth Republic plant on Long Island, N. Y., and brings the firm's total floor space to more than 2.3 million sq. ft.

► **Arde Associates**, Newark 2, N. J., has formed a Precision Engineering Division with facilities for design and fabrication of tools, jigs, process and production test equipment and to supplement Arde's rocket research.

► **F. S. Stewart Associates**, 10819 Venice Blvd., Los Angeles 34, Calif., has been formed to handle chemical research and engineering services in the plastics and related organic materials fields.

MAKE YOUR AIRPLANE PAY THE YEAR AROUND with EXTRA UTILITY, SAFETY, SERVICE and ECONOMY



Typical Wheel-Ski Installation on De Havilland Otter

SKIS FOR MOST SIZES AND TYPES OF AIRCRAFT—The most complete line in the industry. Skis to fit all popular aircraft from light planes to multi-engined passenger, cargo and military planes.

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Hydraulically Actuated COMBINATION WHEEL-SKIS FOR THESE POPULAR NEW PLANES

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Depend on FEDERAL for the finest and greatest advancements in airplane skis! ALL FEDERAL skis sold will meet C.A.A. and new D.O.T. requirements. Get full year-around use from every plane with safe, dependable approved FEDERAL skis. Take off and land on either deep snow, ice or bare surface at any time.

AIRCRAFT MANUFACTURERS

Under new procurement policies aircraft manufacturers are faced with military requirements for ski-wheel equipment. Federal Aircraft has over 25 years of experience in this specialized field. Contact Federal for experienced engineering service in connection with correct ski design and proto-type or production requirements.

French Copter Lands on Truck



APPROACH to 24-ton truck is made by French S.O.1220 Djinn jet copter during demonstration of its agility to officials.



HOVERING over platforms, 650-lb. two-place Djinn prepares to touch down. S.O.1220 production models will sell for about \$12,000.



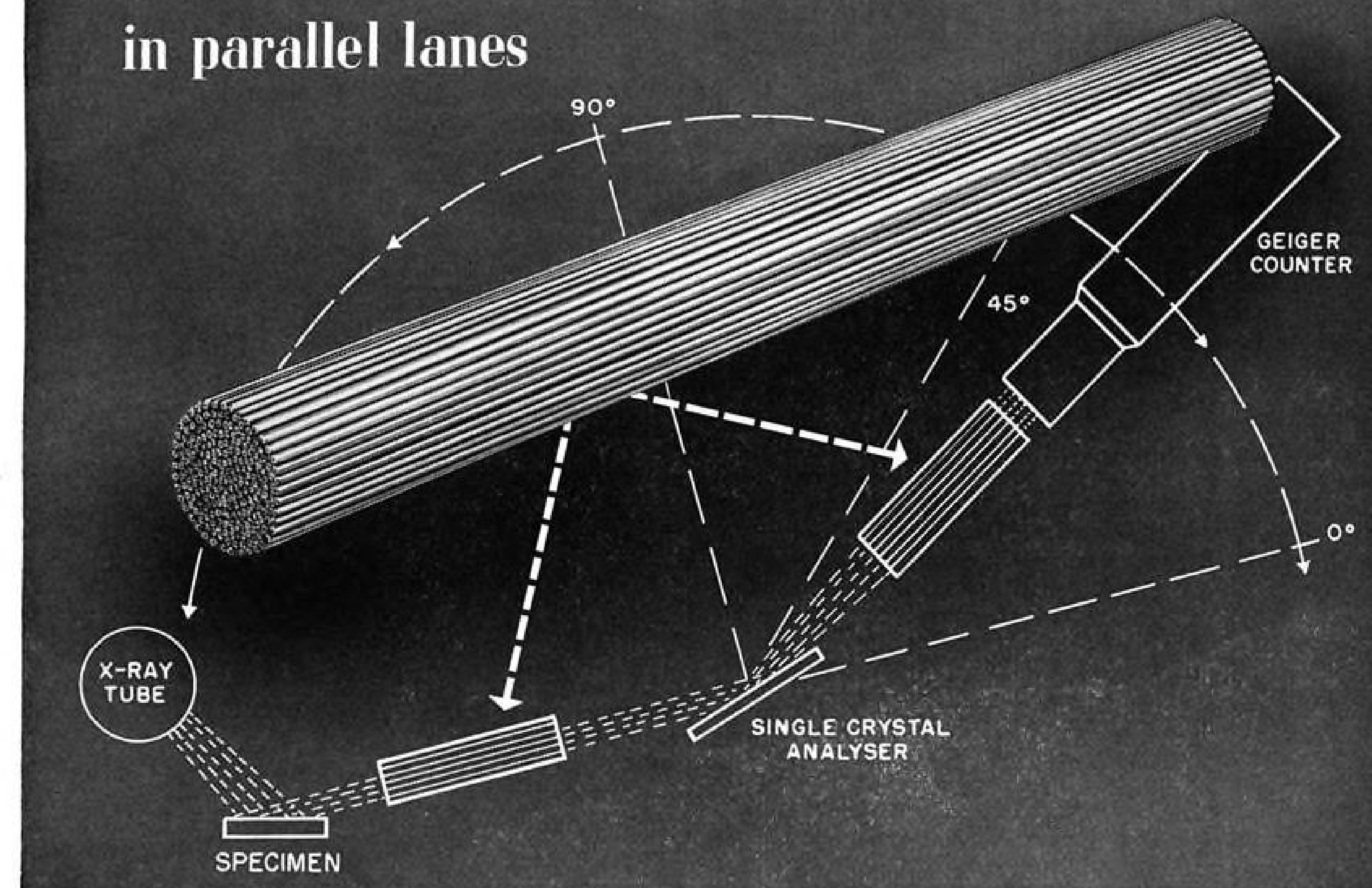
LANDING is nearly completed. Note Turbomeca jet unit behind pilot and angled tubing that feeds compressor gases to rotor head.

Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

- Aerotec Corp.**, Comly Ave. and Pemberwick Road, Greenwich, Conn., pressure switch, \$65,989.
- AlResearch Mfg. Co.**, div. of the Garrett Corp., 9851-9951 Sepulveda Blvd., Los Angeles 45, Calif., oil cooler, 269 ea., \$82,-180; thermostat, turbine, oil cooler, exchanger assys., for various aircraft, \$60,707.
- Aluminum Co. of America**, 1200 Ring Building, Washington 6, D. C., aluminum alloy, \$36,392.
- Aro Equipment Corp.**, Enterprise and Trevitt Sts., Bryan, Ohio, oxygen regulator, 1,947 ea., \$135,823.
- D. L. Auld Co.**, Fifth Ave. & Fifth St., Columbus 1, Ohio, reel, aircraft mooring, \$64,514.
- B. G. Corp.**, 136 W. 52nd St., New York 19, N. Y., spark plugs for engines for various aircraft, 165,200 ea., \$199,066.
- Bendix Products Div.**, Bendix Aviation Corp., 401 Bendix Drive, South Bend 20, Ind., engine parts for R4360 engines, \$81,229; services and material to overhaul jet engine accessories, \$758,500.
- Bethlehem Steel Co.**, Bethlehem, Pa., steel, chrome molybdenum, \$25,491.
- Bristol Co., Aircraft Equipment div.**, Waterbury 20, Conn., controller for use on AJ-1 and AJ-2P aircraft, 204 ea., \$96,812.
- Champion Spark Plug Co.**, 900 Upton Ave., Toledo 1, Ohio, spark plugs, \$63,071.
- Dittmore & Freimuth Co.**, 2517 E. Norwich St., Cudahy, Wis., adapter, Scar Aero 1A, for aviation armament, 4,465 ea., \$75,280.
- Douglas Aircraft Co. Inc.**, El Segundo, Calif., parts for aviation armament, \$41,-958; 3000 Ocean Park Blvd., Santa Monica, Calif., maintenance parts for R5D aircraft, \$96,186.
- Eclipse-Pioneer div.**, Bendix Aviation Corp., Teterboro, N. J., test equipment, \$43,009; anti-friction bearing for use in various aircraft, 8,800 ea., \$28,424.
- Electrical Engr. & Mfg. Corp.**, 4612 West Jefferson Blvd., Los Angeles 16, Calif., motors for various aircraft, 134 ea., \$37,-658.
- Erie Manufacturing Co.**, 300 North 8th Street, Milwaukee 3, Wis., cylinder assy., 3,415 ea., \$68,621.
- General Cable Corp.**, 123 South Broad St., Philadelphia 9, Pa., ignition high-tension cable, \$62,928.
- General Electric Co.**, 1405 Locust St., Philadelphia 2, Pa., indicator, tachometer, 1,533 ea., \$148,088; generator used on auxiliary power unit, 99 ea., \$36,314; maintenance parts used on instruments, 323 ea., \$55,680.
- B. F. Goodrich Co.**, 500 S. Main St., Akron 18, Ohio, wheel assys. and abrasive type shoe for various aircraft, \$53,091.
- Goodyear Tire & Rubber Co., Inc.**, 1144 E. Market St., Akron 16, Ohio, hose, aircraft hydraulic, \$58,370.
- Harley Soap Co.**, Pearce & Orthodox Sts., Philadelphia 27, Pa., compounds, grease cleaning, \$69,905.
- Hoover Electric Co.**, 2100 S. Stoner Ave., Los Angeles 25, Calif., motor for use on various aircraft, 119 ea., \$25,317.
- Walter Kidde & Co., Inc.**, 675 Main St., Belleville 9, N. J., oxygen recharge equipment, \$124,700.
- Leece-Neville Co.**, 5109 Hamilton Ave., Cleveland 14, Ohio, voltage regulator and a.c. generator for P4M aircraft, \$58,613.
- Lite Mfg. Co.**, 101 West 21st St., New York 11, N. Y., tow target, 2,234 ea., \$59,268.
- Manley div. of American Chain & Cable Co., Inc.**, 1100 E. Princess St., York, Pa., bomb hoist, 187 ea., \$49,976.
- W. L. Maxson Corp.**, 460 W. 35th St., New York 1, N. Y., spare parts for electric-drive aviation armament, \$101,479.
- Parsons Corp.**, P. O. Box 112, Traverse City, Mich., services and material to overhaul rotor blades, \$62,320.
- Permotlux Corp.**, 4900 West Grand Ave., Chicago 39, Ill., electrical equipment for use on various aircraft, 9,000 ea., \$85,950.

The cop who keeps x-ray traffic moving in parallel lanes



Fluorescence analysis is the new, fast way to find out which elements and how much of each are in alloys—without destroying the sample of the alloy.

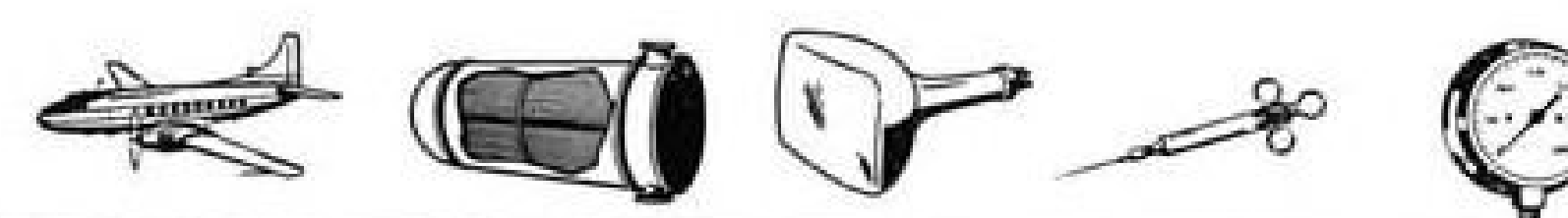
This trick is accomplished by bombarding the alloy specimen with X-rays using a Fluorescence Analysis Unit produced by North American Philips, Inc. The x-radiations of each element bounce off the specimen only to be separated according to wavelength and measured.

As the x-radiations leave the specimen they shoot through bundles of fine tubes known as "collimators". The collimator acts as a kind of traffic cop, keeps the rays moving in parallel lanes, reduces divergence. This is an interesting

job, and we're pleased that North American Philips chose Superior fine nickel tubing for it on the basis of its uniformity in diameter, wall thickness and finish.

Undoubtedly you have opportunities where tubing could be helpful—as a carrier, a weight-saving structural member, or as a shape that saves machining time. Look into the variety of forms, sizes, and analyses Superior produces to tight specifications. Take advantage of the experience and testing facilities that Superior brings to focus on your problem. Tell us the nature of your application and we'll send you information and a Data Memo by return mail. Superior Tube Company, 2040 Germantown Ave., Norristown, Pa.

Round and Shaped Tubing available in Carbon, Alloy, and Stainless Steels, Nickel Alloys, Beryllium Copper, Titanium and Zirconium.



West Coast: Pacific Tube Company, 5710 Smithway St., Los Angeles 22, Calif. UNderhill 0-1331

Superior
THE BIG NAME IN SMALL TUBING

All analyses .010" to 5/8" O.D.
Certain analyses (.035" Max. wall) up to 1 1/4" O.D.

How Parker tank-mounted valves save weight by allowing 25% smaller fuel line sizes

"When you specify fueling equipment, you've got many problems to consider. We believe the best solution is offered by tank-mounted diaphragm valves like these", reports Everett Badger, shown at the right. He is Chief Engineer of the Fuel Division at Parker Aircraft Co.

"You can save weight", Badger adds, "because the lower pressure drop of tank-mounted valves allows you to use about 25 per cent smaller line sizes. Their pressure drop of about 6 psi at 200 gpm is roughly one-half the loss through a similar valve mounted in the fuel line (including exit losses where fuel enters the tank). These savings let you use smaller, lighter lines without reducing the rate of flow to the tank. In addition, tank-mounted valves weigh about 40 per cent less.

"In the nearly ten years since Parker first started making diaphragm valves, we've never had one rupture in service.

"As for contaminant resistance, there are simply no close fits in this valve or the pilot valve where contaminant might jam.

"The same basic diaphragm valve can easily include a second operating diaphragm unit to perform various functions such as flow proportioning or secondary fuel shutoff protection. Pilot line ports can be located on either the tube-inlet side or on top of the valve.

"Parker's pilot valves, like the one shown at the right, are available in single or dual styles with many auxiliaries. Because these valves are essentially pressure closed, there's no chance for 'hang-up' or faulty operation.

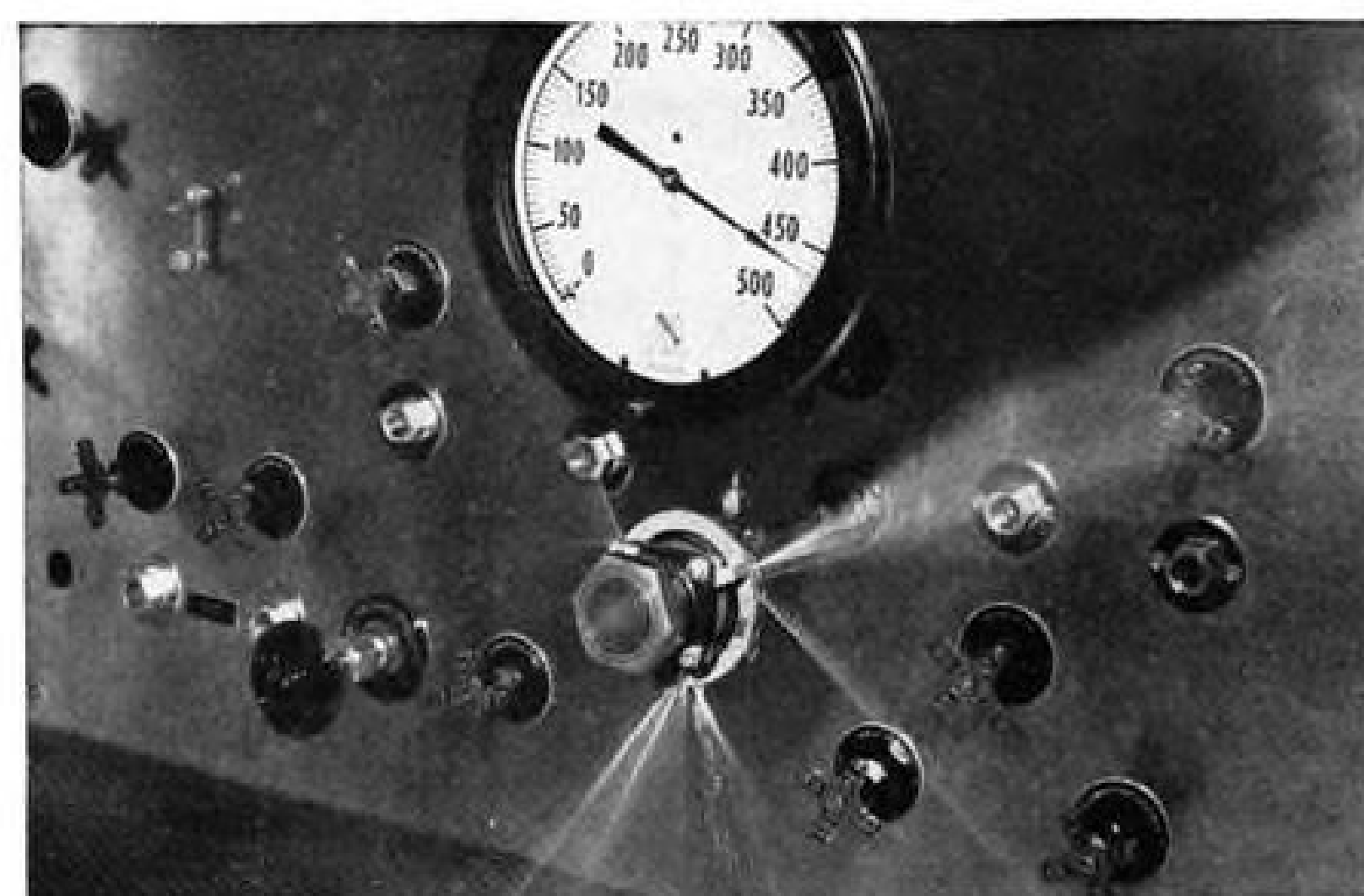
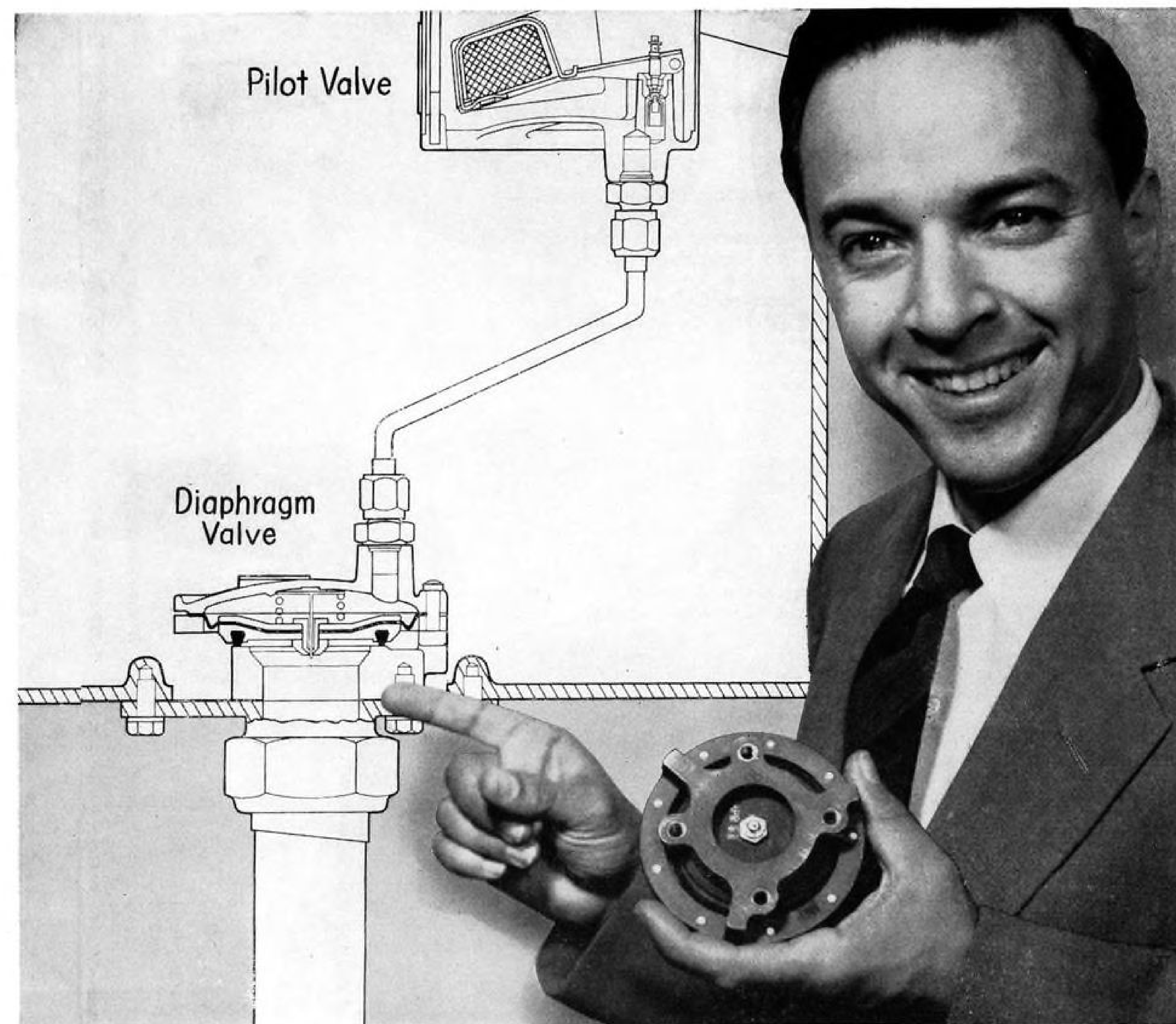
"A brand-new Parker booklet, 'Design Hints for Aircraft Fueling Systems', is just off the press. Send for your copy today."

PARKER AIRCRAFT CO.

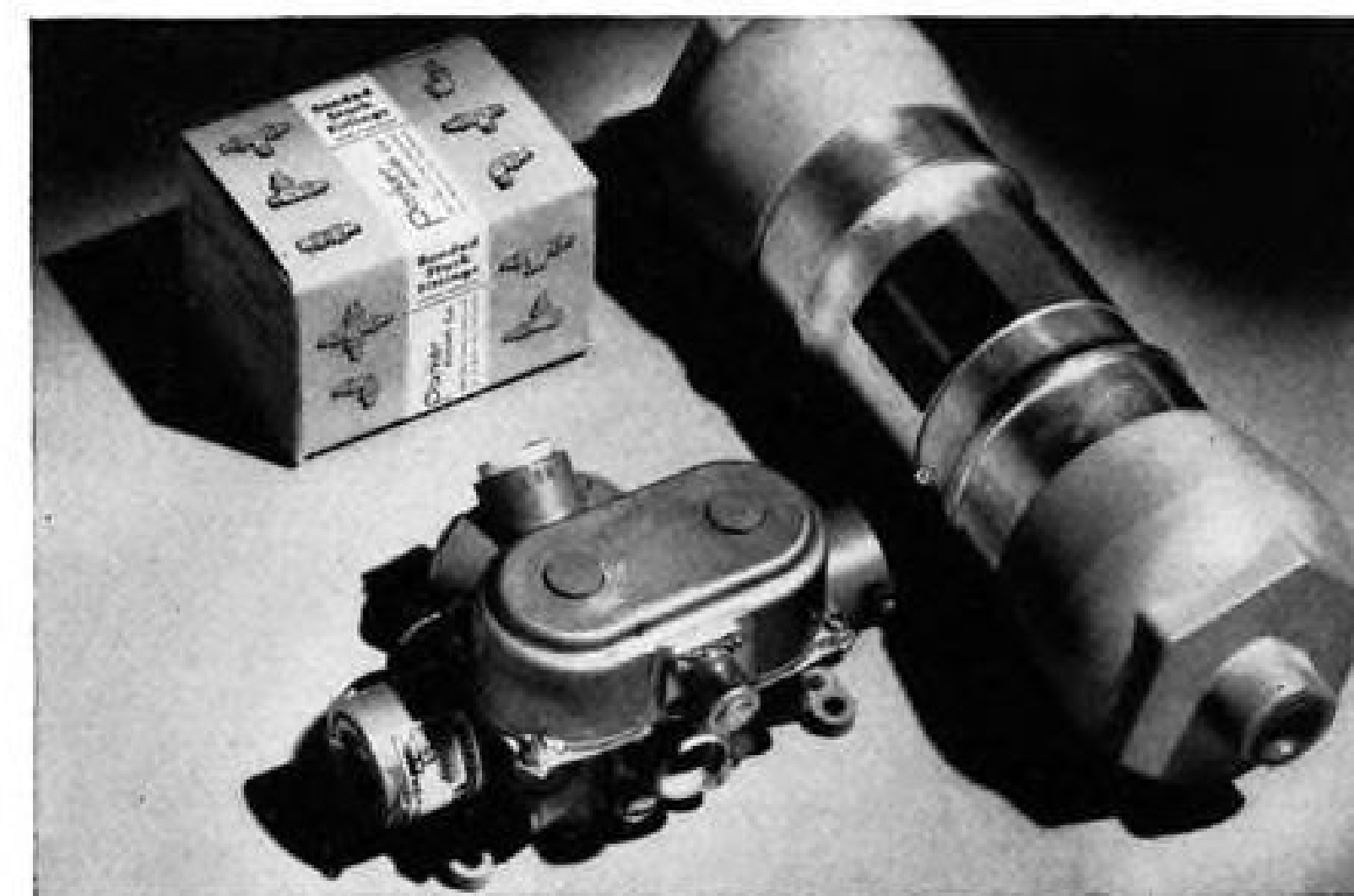
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Subsidiary of The Parker Appliance Company

Parker

Hydraulic and fluid
system components



Destruction test proves casting defects far below 950 psi burst pressure of diaphragm. We've run millions of test cycles without failure of diaphragms.



What other components for hydraulic and fuel systems interest you? Parker Aircraft Co. builds a wide variety of engineered products for many different applications.



Speed your inquiries for aircraft valves and fittings by addressing everything to Parker Aircraft Co. Both sales and engineering are now at this one location.

PARKER AIRCRAFT CO.
Section 801-C
5827 W. Century Boulevard, Los Angeles 45, California

Please send me information about the following:

- ☐ "Design Hints for Aircraft Fueling Systems"
☐ Information about these specific aircraft fuel or hydraulic products: _____

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
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Mail this coupon today. Be sure to check the information desired. If you have any other questions, please write to Parker at the address shown above.



ENGINEERS AND SCIENTISTS

You are invited to write regarding long-range projects at Northrop Aircraft, Inc. Exceptional opportunities now exist to join the company's engineering and scientific staff. If qualified, you may select important developmental work, or equally vital production engineering.

Examples of positions open:

BOUNDARY LAYER RESEARCH
SCIENTISTS
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ELECTRONIC INSTRUMENTATION
ENGINEERS
RADAR ENGINEERS
FLIGHT-TEST ENGINEERS
STRESS ENGINEERS
AERO- AND THERMODYNAMICISTS
SERVO-MECHANISTS
POWER-PLANT INSTALLATION
DESIGNERS
STRUCTURAL DESIGNERS
ELECTRO-MECHANICAL DESIGNERS
ELECTRICAL INSTALLATION
DESIGNERS
ENGINEERING DRAWING CHECKERS

Qualified engineers and scientists who wish to locate permanently in Southern California are invited to write for further information regarding these interesting, long-range positions. Include an outline of your experience and training. Allowance for travel expenses.

Address correspondence to
Engineering Personnel Manager
Northrop Aircraft, Inc.
1003 Broadway, Hawthorne, Calif.

FINANCIAL

Collins Typifies Avionics Growth

Sales increase 25% to more than \$80.2 million in a year; backlog reaches new peak of \$255 million.

Rapid growth of the avionic market is illustrated by the new peaks in sales, earnings and backlogs listed in the annual report of Collins Radio Co., a leading producer of avionics equipment.

Sales reached more than \$80.2 million in the year ended July 31, 1953, up some 25% from the \$64.3 million of the 1952 period. Net profit after taxes was up 15%, to \$1,953,613, for the 1953 period, compared with \$1,685,651 for 1952. Giving effect to the stock dividends of 25% in 1952 and 10% in 1953, a total of 426,409 shares of common stock were outstanding at July 31, 1953. Earnings, on this basis, aggregated \$4.50 per common share for the 1953 fiscal year, compared with \$3.87 on the adjusted capitalization for the 1952 period.

► **Tax Toll**—The report shows that taxes took more than double the residual earnings for the stockholders in 1953. Collins paid heavily in excess profits taxes. Without regard to other adjustments, which are unknown, influencing tax liabilities, the excess profits taxes paid by the company last fiscal year appear to be \$1,285,569, equivalent to about \$3.30 per common share. Total taxes were \$4,732,465.

The lapse of EPT this calendar year-end will prove beneficial, but only for the seven months of the current fiscal year. However, these benefits may be offset in the future by renegotiation on available earnings, although the company is optimistic.

Study of the report indicates that Collins has been able to obtain improved prices on its contract price determination processes. This may further lend substance to the management's expectation that renegotiation for the 1951, 1952, and 1953 fiscal years will result in "no significant changes." The company shows in its balance sheet as of July 31, 1953, an item for \$233,068, representing "unbilled price revisions." Last year (for 1952) a similar item was shown at \$2,469,786.

► **Profit Margin Drops**—Net profit margins on sales shows a continuing decline, being 2.4% for 1953, 2.6% for 1952, and 3.8% in 1951.

But net worth was at a new high at July 31, 1953, aggregating \$9.2 million, equivalent to \$19.96 per common share, and comparing with \$7.5 million a year

earlier, or \$15.93 per share on the adjusted capitalization.

Unfilled orders at July 31, 1953, were also at a new high (\$255 million compared with \$250 million a year earlier) despite heavy deliveries. To finance its requirements the management reported drawing down \$13.7 million of its \$15-million V-loan credit. Working capital of more than \$5.9 million was shown as of July 31, 1953, an increase of \$900,000 during the year.

► **The Intangibles**—As with all leading engineering and development companies, considerable values of an intangible nature are inherent in the financial statements but not always clearly indicated.

Significantly, the company's annual report observed:

"Our production programs are founded entirely upon the developments of our engineering and research laboratories and represent improvements in the communication and navigation arts. These are of such magnitude that it has been found necessary to develop some dozen 'second source' contractors on the military side to meet requirements beyond the capacity of your company."

► **Diverse Operations**—Still another section of the report reveals the diversity of the company's programs and its various government customers.

These agencies include the Navy, Air Force, Army Signal Corps, Justice, Treasury, State, Commerce, Interior Departments and the Atomic Energy Commission. Some 75 different equipment or equipment systems—all developed by Collins—were being produced by the company and a dozen other major electronic subcontractors for these various government departments, the report shows.

► **Commercial Business**—While the government is Collins' chief customer, commercial sales are also reported to be in a strong uptrend. Management estimates that about 75% of all air transport communications and navigation equipment purchases during the year were of Collins manufacture. The aviation industry has developed into the largest single commercial market for the company's equipment.

New products in other fields are also becoming more prominent. For example, a stronger market for replace-

ment broadcast equipment is developing as that industry is forced to compete with television. Sales in 1953 increased materially over those of the previous year with a substantial volume of transmitter business booked for delivery in the current year.

Research and engineering development expenditures remain high, being almost \$10 million in the 1953 fiscal year. But it is this research effort and application which is primarily responsible for management's assertion that more than \$600 million of Collins-designed equipment has been manufactured or put on order since World War II.

—Selig Altschul

Northrop Net Rises While Sales Drop

Net profits rose while sales dropped in the fiscal year ended July 31, 1953, Northrop Aircraft, Inc., reveals. The apparent contradiction is the result of a special tax credit.

Total sales for the 1953 period amounted to \$184.2 million, contrasted to \$187.5 million indicated for 1952. Net income before federal taxes was \$6,953,359 for fiscal 1953, against \$7,485,440 in 1952. In other words, operating earnings were somewhat lower this past period.

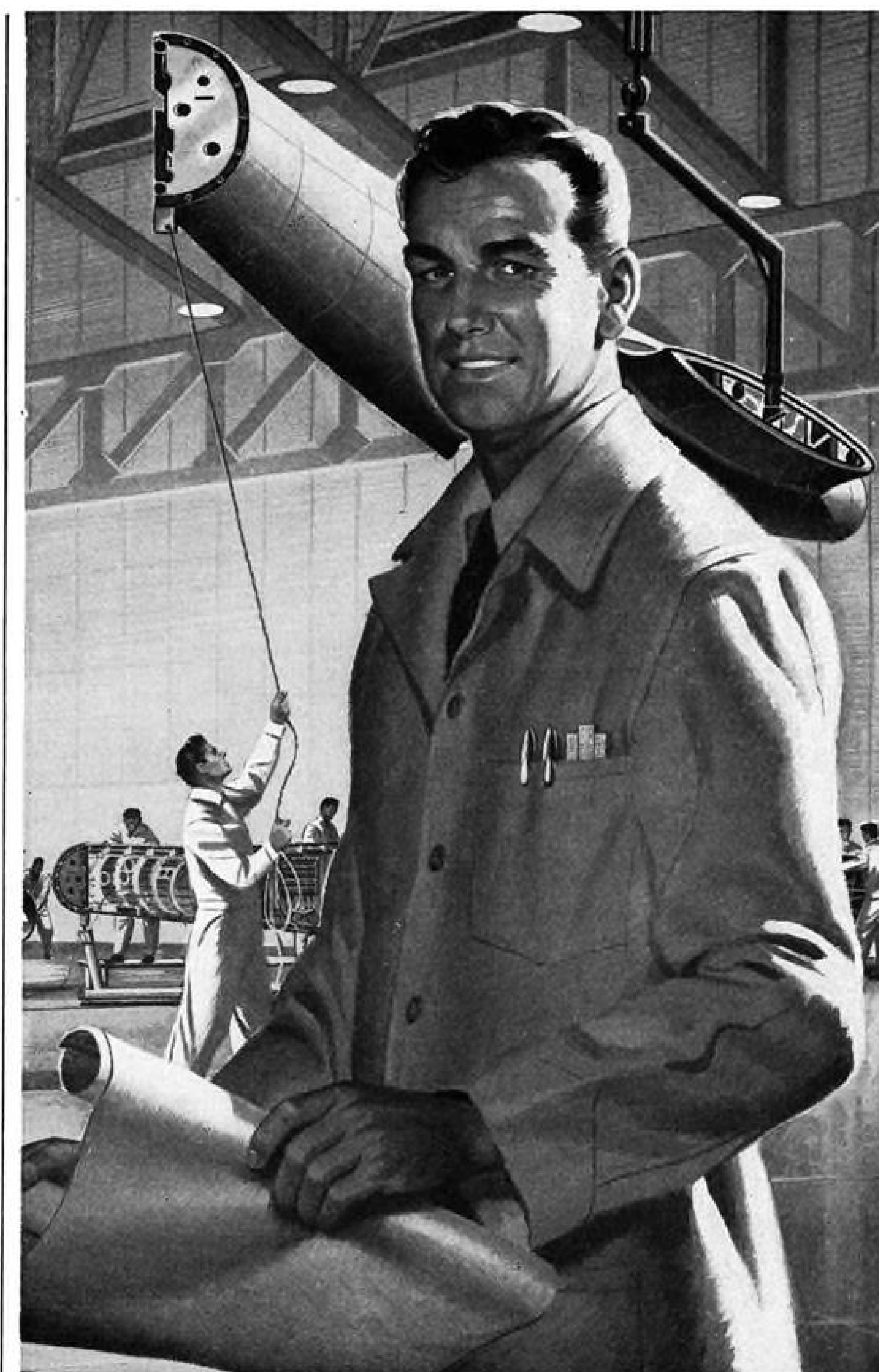
Net income after taxes amounted to \$2,338,359 or \$3.64 per share in 1953 compared with \$4.22 the year earlier. However, special tax credits resulting from adjustments of prior years' operations were included in 1953 accounts and amounted to \$1,022,157, or \$1.59 per share additional.

The Northrop management revealed a backlog of \$508 million at July 31, 1953, with additional contracts of about \$167 million in the process of negotiation.

Net worth of the company improved to more than \$12.4 million, or \$19.36 per share at the 1953 fiscal year-end, up from the \$9.6 million, or \$16.65 per share a year earlier.

► **Credit Arrangements**—To help finance its requirements, Northrop has a \$13-million credit agreement under which it has agreed to assign all claims for government contracts. Of this credit, \$10 million was drawn down. Also outstanding were obligations of \$2.8 million due the Reconstruction Finance Corp. and about \$420,000 notes payable incurred on the acquisition of its subsidiary, the Radioplane Co.

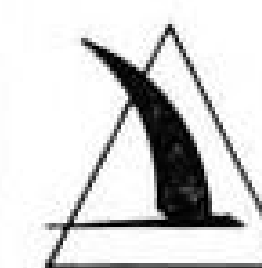
The company's annual report asserts that its principal "item," the F-89 Scorpion, "is expected to remain standard Air Force equipment for some time." Also, management expresses considerable hope for its guided missile development and production.—SA



Northrop's Prime Equation

Northrop Aircraft production specialists initiate and install time-saving, cost-saving methods. The "half-shell" assembly technique, illustrated above, permits free installation of equipment in Scorpion F-89 interceptors now in production.

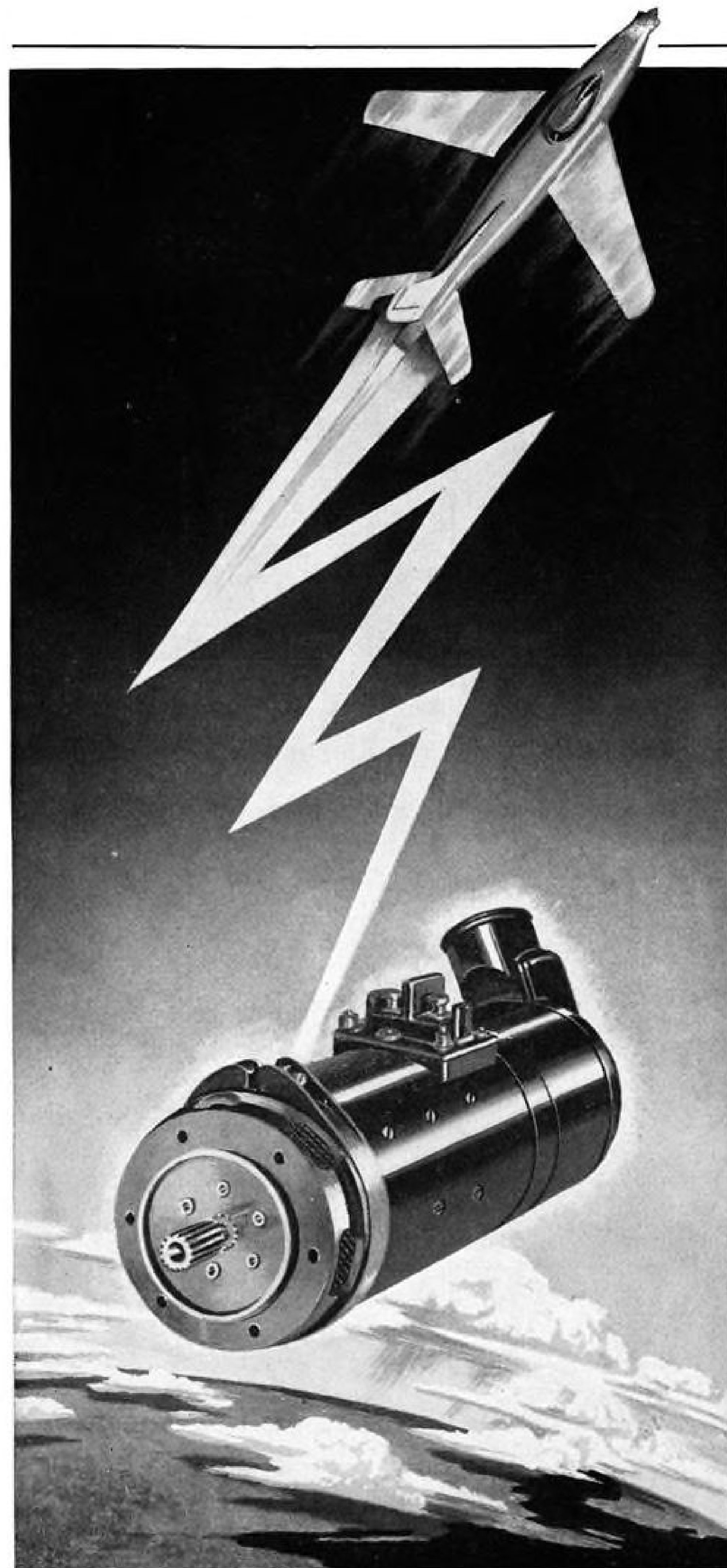
Equations are used to solve problems. At Northrop Aircraft, the prime equation combines teams of administrators, outstanding scientists, and production specialists with modern industrial and research facilities. The combination efficiently converts imagination and knowledge into actual matériel of advanced design and incalculable value.



NORTHROP AIRCRAFT, INC.

HAWTHORNE, CALIFORNIA
Pioneer Builders of Night and All Weather Fighters

What JACK & HEINTZ is doing about...



J&H announces development of three new 8000-rpm, continuous-duty, d-c generators for jet aircraft—unique “straight-through” air path design provides maximum cooling.

High-speed accessory pads on current jet engines create the need for a generator which can operate continuously and efficiently at 8000 rpm. Present generators, designed primarily for use on reciprocating engines, do not meet that demand—high temperatures and stresses greatly reduce service life of bearings, commutators, brushes and insulation—making new generator developments a vital necessity.

Responding to this need, and nearing production on three models, J&H is the first manufacturer to announce development of essential high-speed, d-c generators for use with jet aircraft engines. All models are “true” 8000-rpm, continuous-duty, d-c generators.

J&H engineers, in developing the new units, have refined conventional aircraft generator design to include:

1. Elements capable of withstanding higher operating temperatures
2. Greater heat transfer areas to reduce heat flow resistance
3. Design changes to reduce heat losses

Maximum cooling is provided through one of the most unique features of the new units, a “straight-through” air path that allows free air passage under the commutator and through the armature.

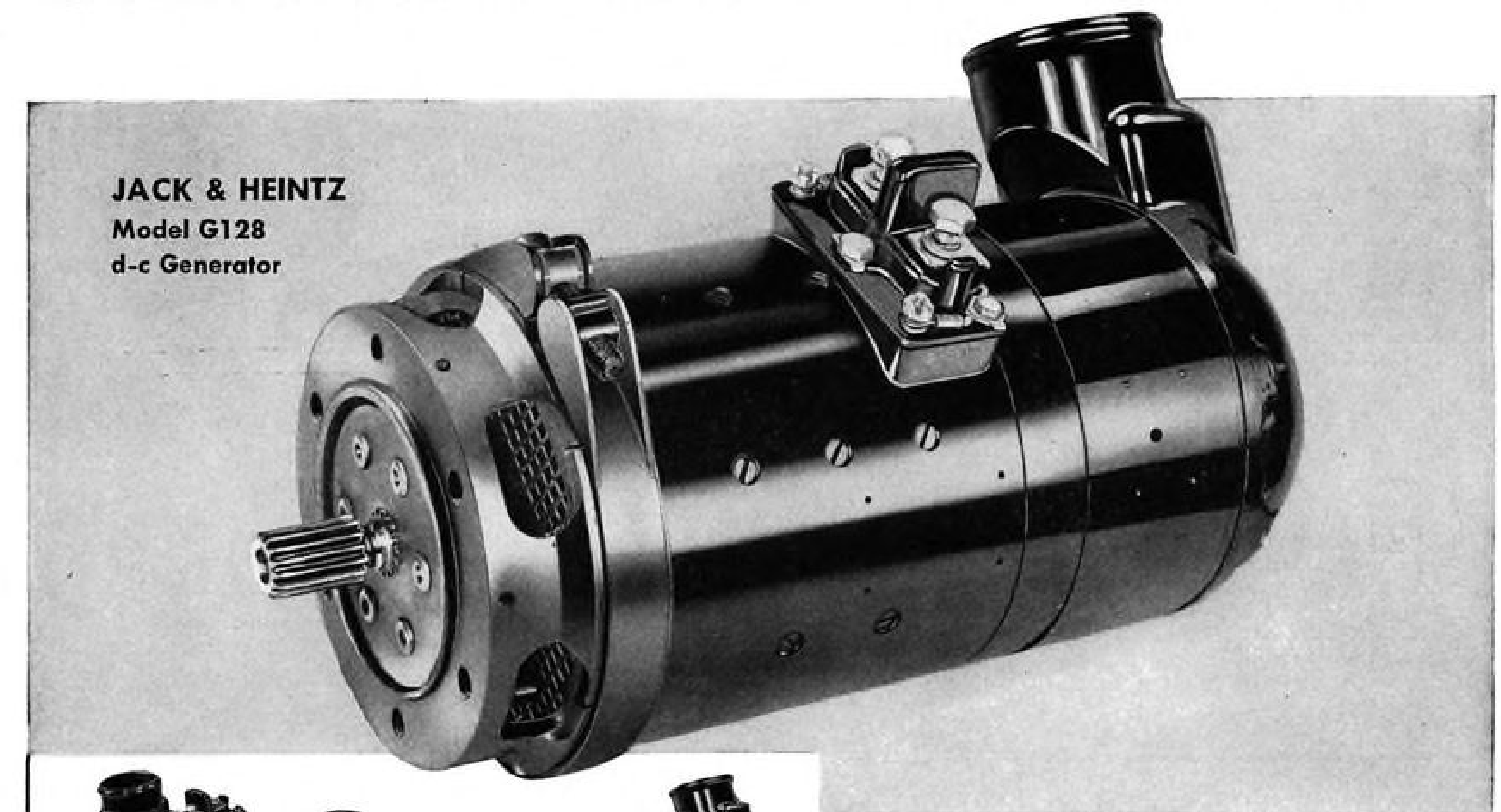
Specially designed blast caps are available to meet specific airframe requirements or to effect reduction in over-all generator dimensions.

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JACK & HEINTZ
Model G128
d-c Generator



JACK & HEINTZ
Model G124
d-c Generator

JACK & HEINTZ
Model G123
d-c Generator

DESCRIPTION	MODEL G123	MODEL G124	MODEL G128
Basic specifications*	MIL-G-6162	MIL-G-6162	MIL-G-6162
Ampere rating at 30 v	300	400	400
Speed range (rpm)	3000-8000	3000-8000	3100-8000
Cooling air pressure (in. of water)	6	6	12
Engine mounting pad	AND-20002	AND-20006	AND-20002†
Length (in.)	13 3/4	13 3/4	14 3/4
Diameter (in.)	6 1/2	8	6 1/2
Weight (lb)	64	81	68
Overhung moment (in.-lb)	360	430	450

*Equipped with Quick-Attach-Detach mounting flange.

J&H looks to the Future

In addition to the d-c generators described, several new a-c generators will be available soon. This group of alternators includes:

G181-1—a 30-kva, 4800 to 7200-rpm air-cooled unit

G281—a 40-kva, 6000-rpm air-cooled unit

G186—a thermal-lag unit with a magnetic amplifier regulator

G190—an oil-cooled unit

G180—an air-cooled 6000-rpm unit developing 120 kva with air pressure of 6" water, 160 kva with 12" water.

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*Military specification numbers as used herein are for purposes of product identification only and do not necessarily imply specification conformity.



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'Vibragyro' Takes Cue From Housefly

- Like a fly's halteres, vibrating tuning fork in Sperry gyro helps sense changes in direction.

By Philip Klass

A radically different type of rate gyroscope, which uses a tuning fork (vibrating mass) instead of the familiar rotating mass, to measure angular velocity was shown to industry and military engineers for the first time during a recent closed meeting sponsored by the Navy Bureau of Aeronautics and Sperry Gyroscope Co. (AVIATION WEEK Nov. 9, p. 7).

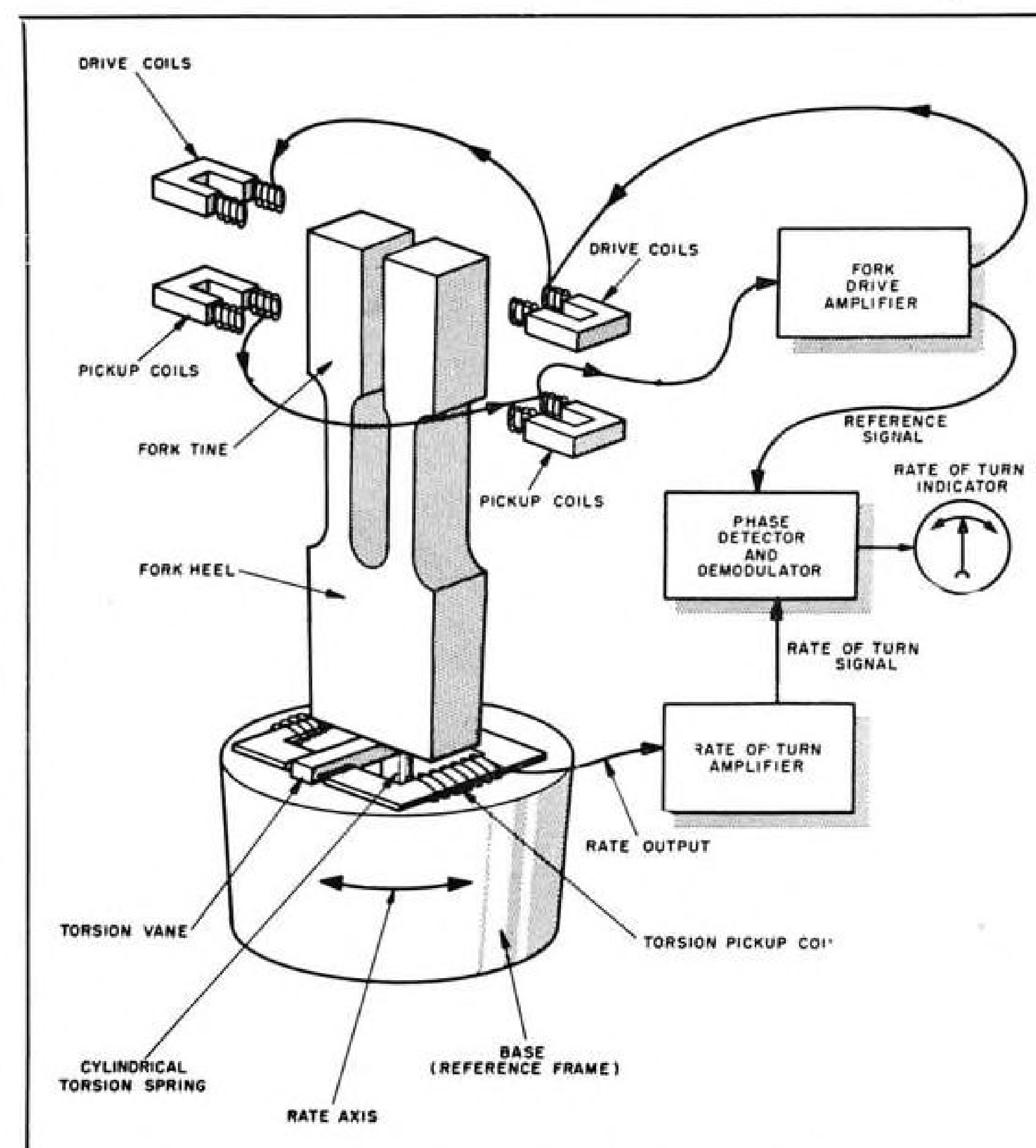
In principle, the new "vibragyro" resembles the vibrating organs (known as halteres) on the household fly which enable it to sense changes in direction.

Purpose of the meeting was to to arouse industry interest in applying the Sperry development to a variety of aircraft and missile stabilization, navigation, and fire control systems where conventional rate gyros are now used. Another objective was to spark further developments in vibrating gyros by other gyro manufacturers.

The 30 engineers who attended the symposium included representatives from such companies as General Electric, Westinghouse, North American Aviation, Bendix Aviation, and Bell Aircraft, as well as Massachusetts Institute of Technology, John Hopkins University, and the Army, Air Force, Navy, and National Advisory Committee for Aeronautics.

► **Testing in Autopilot**—Sperry revealed that it is currently testing the new type gyro, which it has trade-named the "Gyrotron," in an experimental Navy automatic pilot. (Smiths Aircraft Instruments Ltd., British automatic pilot manufacturer, originally tried using vibrating gyros in its SEP-1 autopilot, but switched to conventional rate gyros.) From Canada, the recent quarterly bulletin of the National Aeronautical Establishment reports experiments with the vibrating reed type of gyro.

► **Detailed Analysis**—A detailed theoretical analysis and description of the vibrating gyro are contained in two articles appearing in the November issue of Aeronautical Engineering Review, publication of the Institute of the Aeronautical Sciences. One of the articles is written by Joseph Lyman, a



SPERRY GYRATRON is shown in schematic form (above) and cutaway (below).



former Sperry engineer who is now with Aeronautical Instruments Laboratory of Mineola. The other is a joint paper by R. E. Barnaby and J. B. Chatterton of Sperry and F. H. Gerring of BuAer's electronics division.

Lyman told AVIATION WEEK that his paper had been written almost three years ago but that the Navy had, until recently, declined to approve its publication, for security reasons. It is reasonable to assume that work on vibragyros has progressed considerably since then.

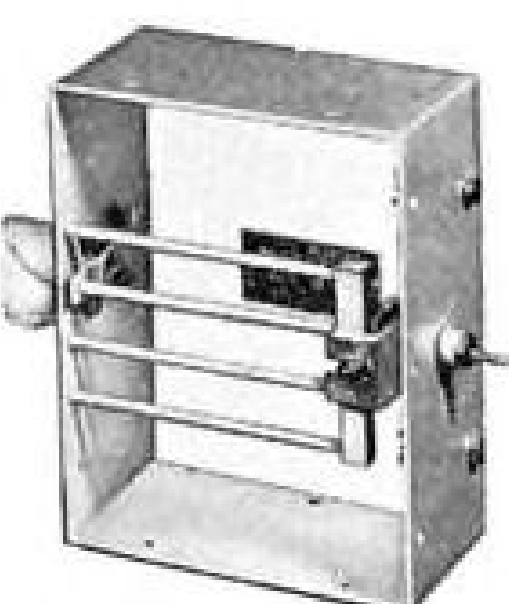
► **Began in 1937**—Sperry's work with vibrating gyros, which began in 1937, was first disclosed in Life magazine in 1946 in a story comparing the device to the fly's halteres. Some observers interpreted this disclosure to mean that Sperry did not intend to pursue the work further, else it would not have tipped its hand so early.

Lack of further announcements on the subject, which appeared to confirm

MN-97B—The Bendix Omni-Mag gives immediate visual indication of glide slope information, as well as VOR, localizer, and magnetic heading information.



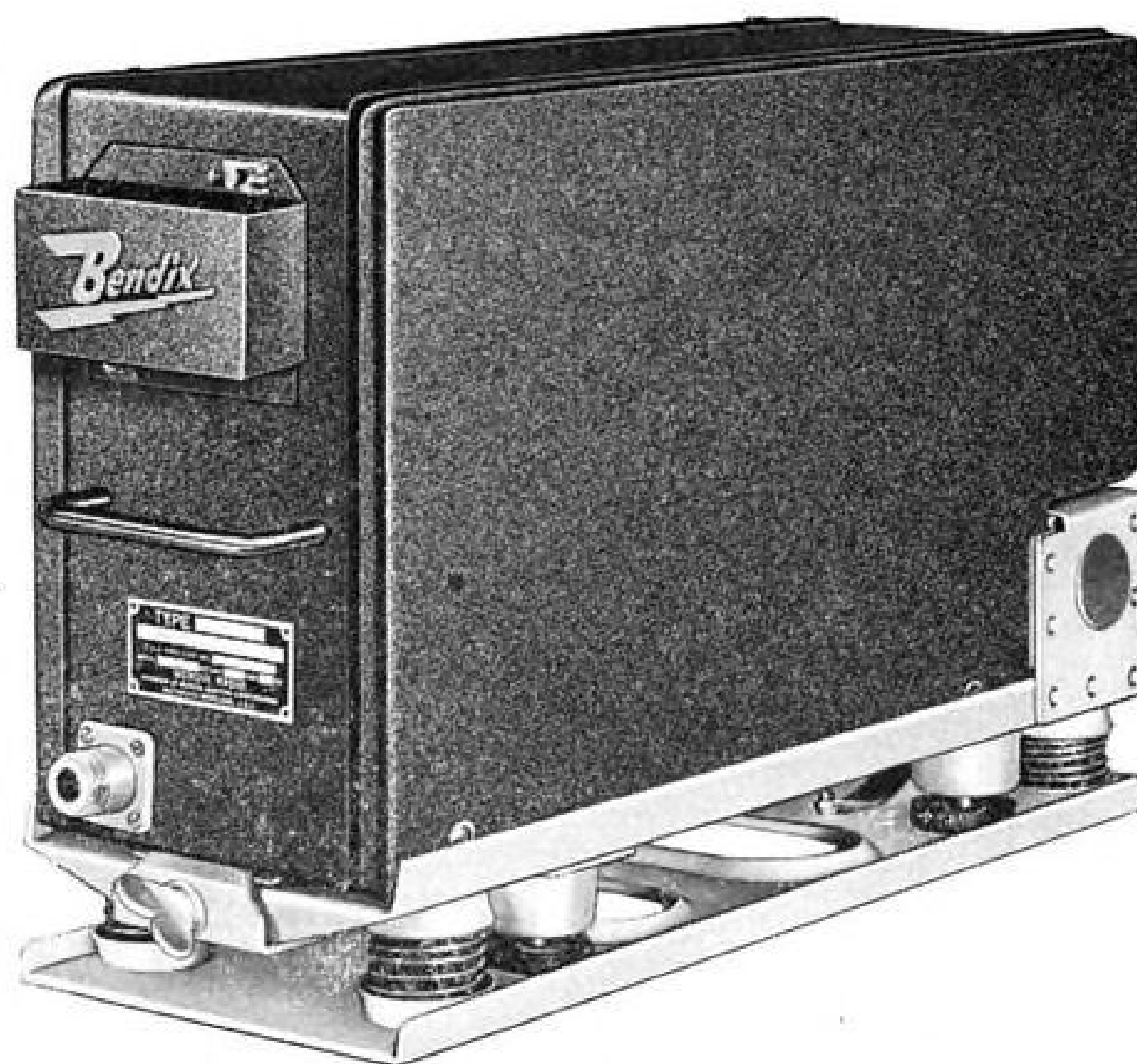
MN-92A—This is the glide slope antenna. It can be mounted flush with the skin of the aircraft. Eliminates drag. Deterioration due to weathering, a common deficiency of external antennas, completely eliminated.



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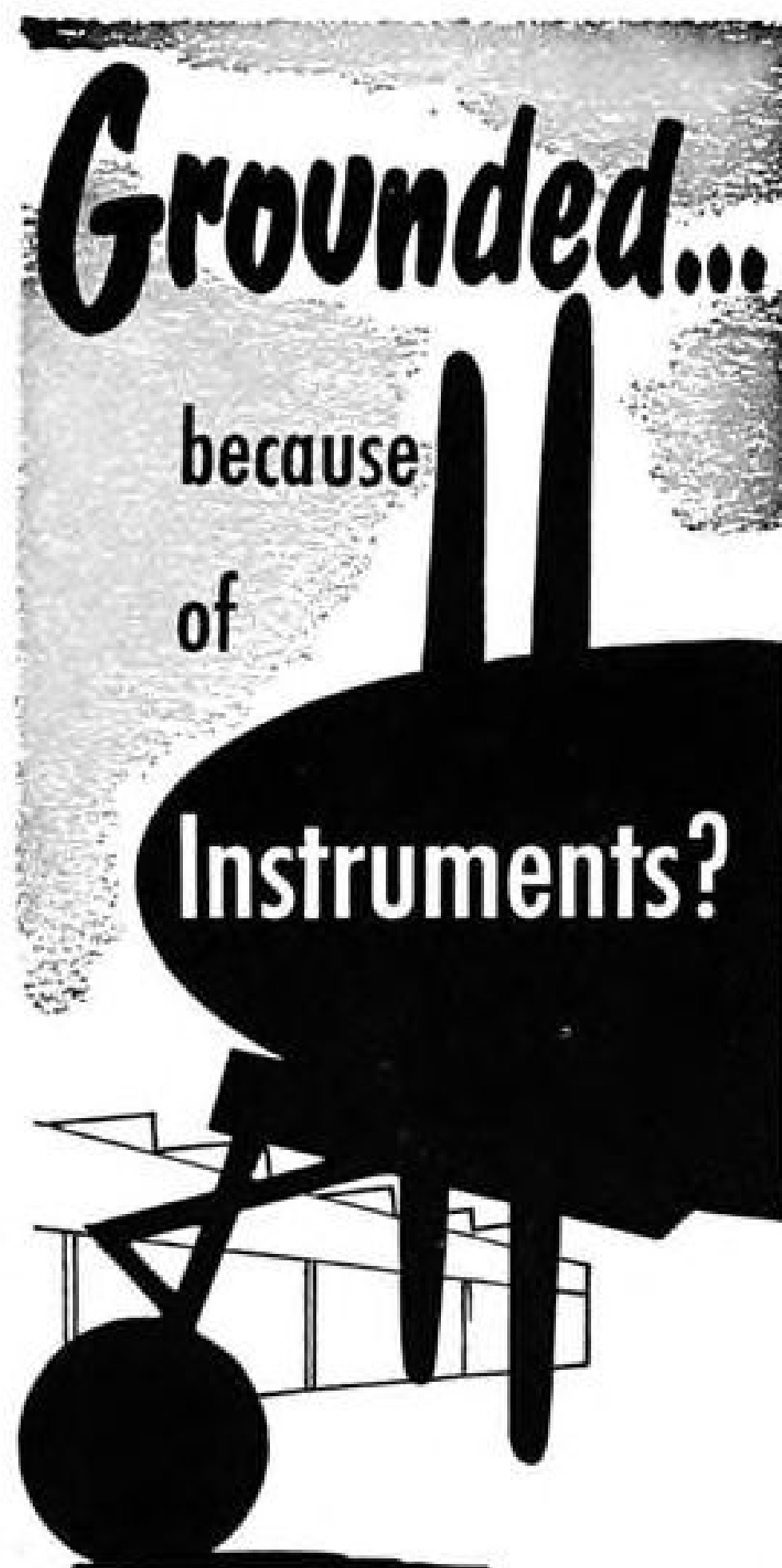
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VIBRATING like a tuning fork, vibragyro does work of a gyroscope. Capt A. C. Packard of BuAer shows unit to F. H. Gerring (center), BuAer, and R. E. Barnaby, Sperry.

this observation, was actually due to company and military secrecy.

► **Vibragyro Advantages**—Here are some of the advantages which Sperry and the Navy see for the new device:

• **High sensitivity.** Lack of bearings used in conventional gyros, and associated coulomb friction, gives the vibrating gyro an extremely high sensitivity. Response times in the order of 0.005 second or lower can be achieved, Sperry engineers report.

• **Wide range.** The vibragyro can measure both extremely small and large angular rates, varying over a range of more than one million to one, with good linearity, Sperry says.

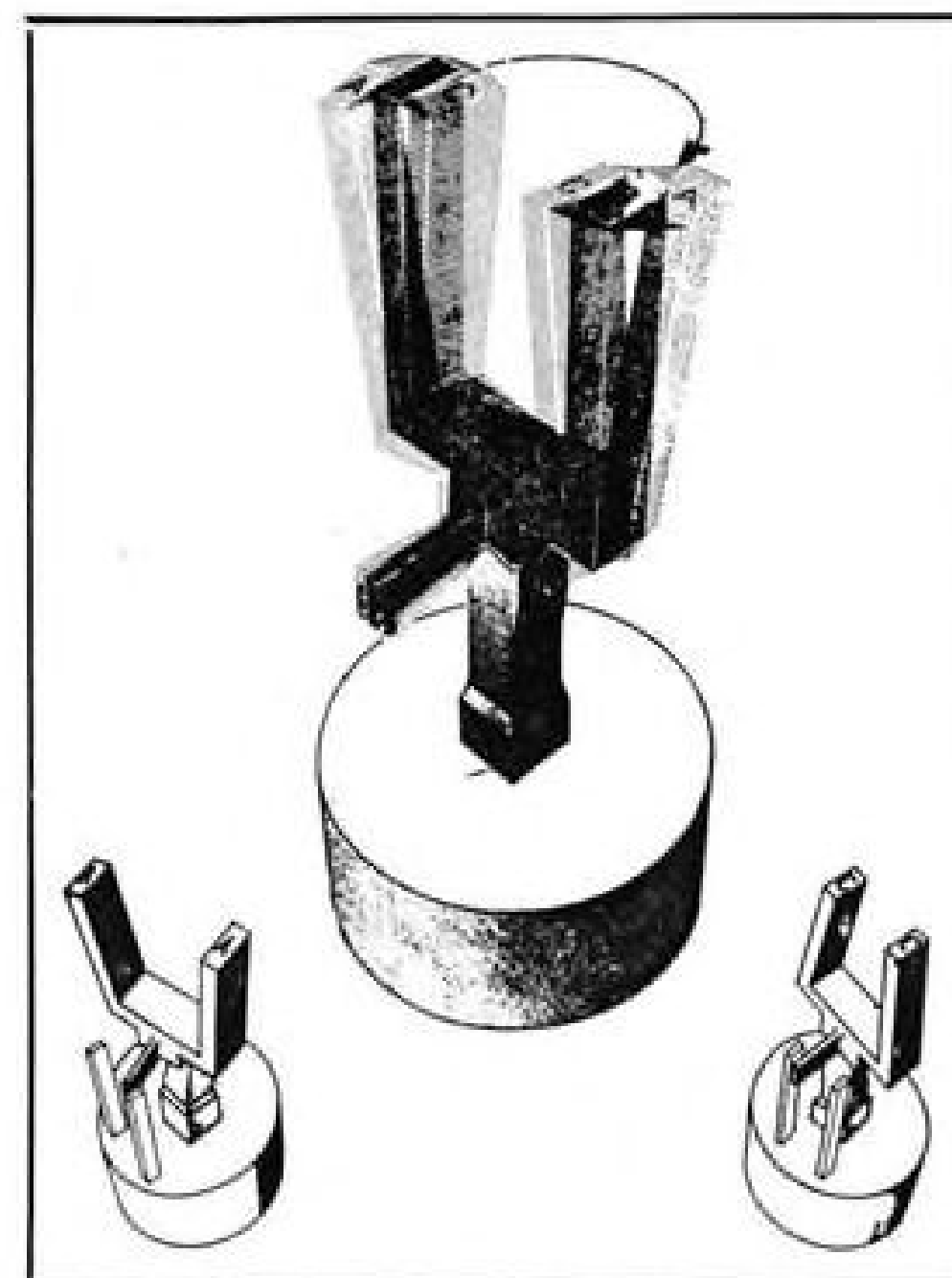
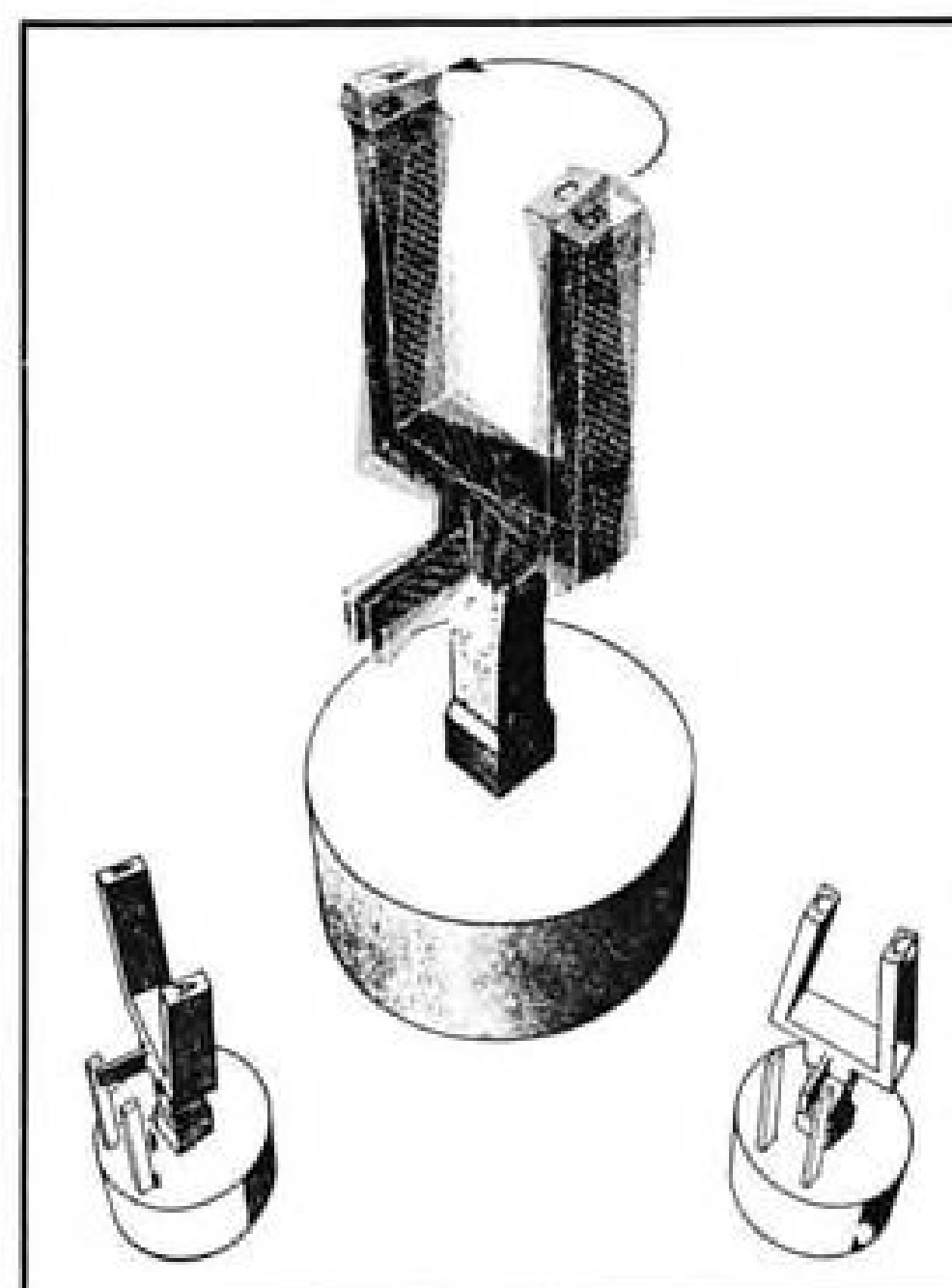
• **Ruggedness.** Absence of bearings and

dynamic balance problems makes device extremely rugged and able to withstand high Gs.

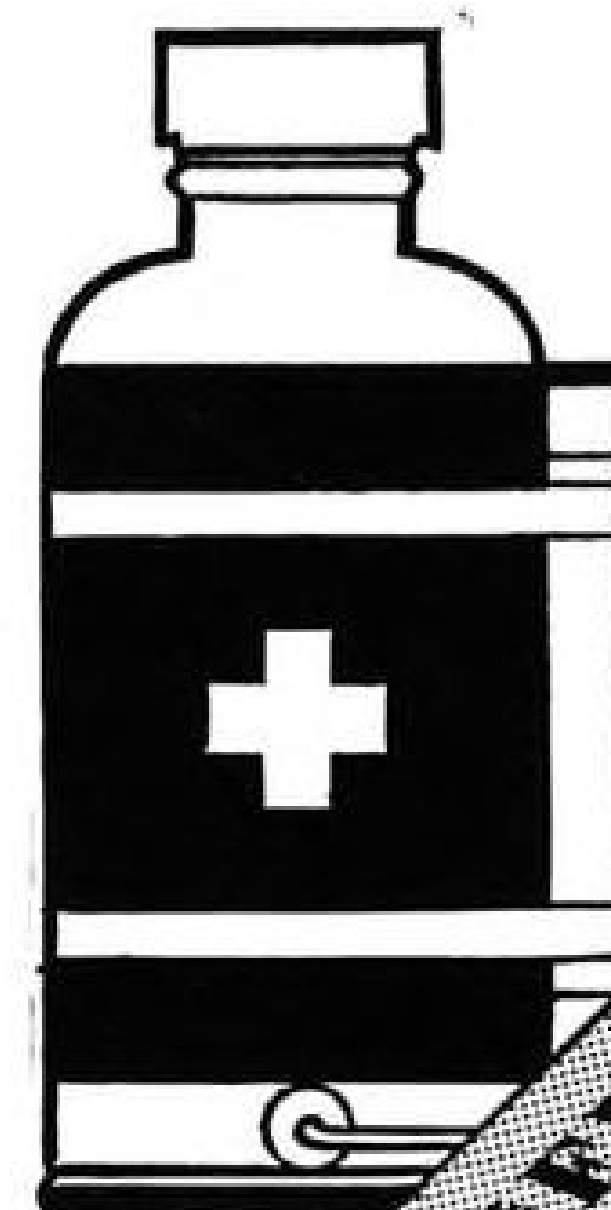
• **Single-axis sensitivity.** The vibragyro is sensitive only to angular velocity about a single axis; accelerations about any axis do not introduce steady state errors.

• **Subminiaturization.** The vibrating gyro can be subminiaturized without corresponding loss of sensitivity experienced in conventional rate gyros.

One strike against the vibragyro is that, unlike conventional rate gyros, it requires the use of a small amplifier. However, Sperry engineers point out that the amplifier can be designed to use rugged magnetic amplifiers, to make



INSTANTANEOUS relation between position of vibrating tines and lower handle (shown by sketches, left) reverses when vibragyro rotates in opposite direction (right).



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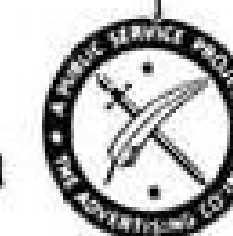
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America must give. America is you. Won't you call your Red Cross, Armed Forces or Community Blood Donor Center right now, for an appointment?

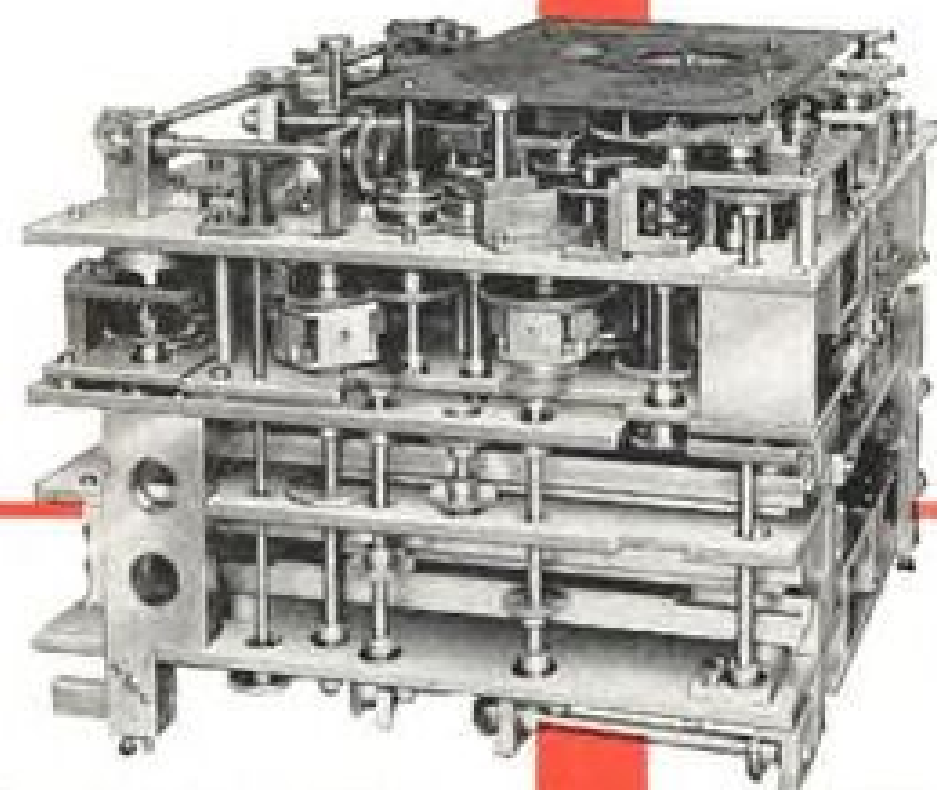
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EXPERIMENTAL AUTOPILOT using Sperry vibragyro is tested in Navy F6F.

the device extremely reliable.
► **Principle of Operation**—The vibragyro, like its rotating counterpart, owes its operation to the principle set forth in Newton's first law of motion: a body in motion will move uniformly in a straight line until acted upon by some external force. This vibragyro principle can be demonstrated by grasping the handle of a vibrating tuning fork and rotating the fork about its vertical axis (running through the handle).

As the fork is rotated, its handle exerts a small torque (against the fingers) which oscillates at the same frequency at which the fork is vibrating. The faster the fork is rotated, the greater will be the torque. Thus the magnitude of this torque is a measure of the angular velocity at which the fork is being rotated.

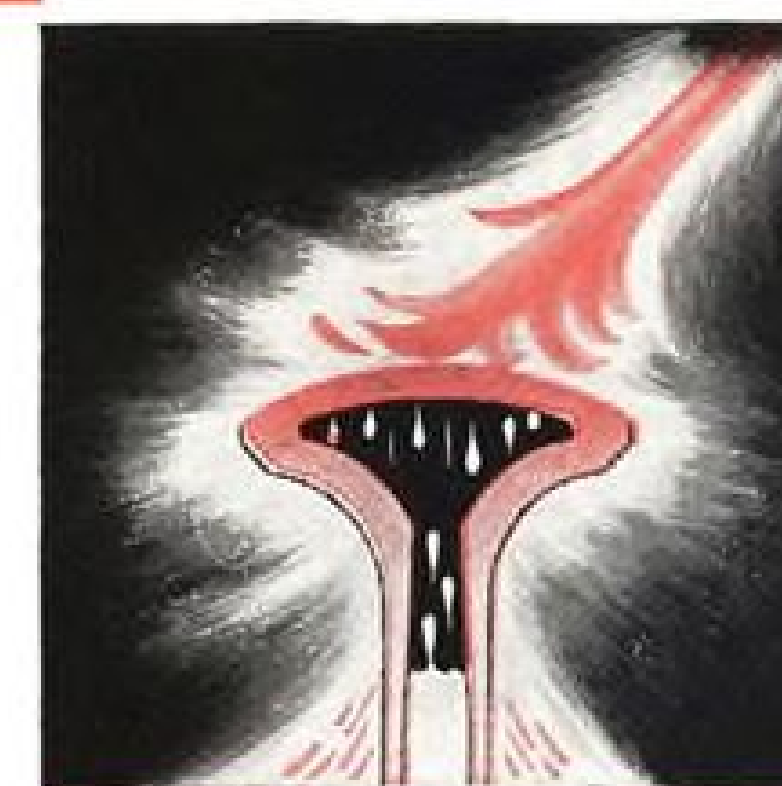
► **Magnitude Plus Sense**—If human perception were fast enough, it would be observed as the unit is being rotated that when the tuning fork tines (vibrating elements) are at one extreme of their travel, the direction of torque exerted by the fork handle is in a clockwise direction; at another instant, when the tines are at the other extreme of travel, the relation between torque and rotation direction is reversed. Again, if the direction of rotation of the unit is reversed, the relation between the tine positions and direction of torque is reversed.

► **Getting a Signal**—An arrangement is needed which measures the handle torque and establishes its direction relative to the position of the vibrating tines at any instant. In practice, the tuning fork handle is designed as a torsion bar so that it will resonate at the same frequency at which the fork vibrates.

When the vibragyro unit is rotated, the oscillating torques generated will



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cause the torsion bar to oscillate through an amplitude proportional to the angular velocity at which the unit is being rotated. To measure this torsion bar rotation, a small metal vane is attached to the torsion bar, and electrical pick-offs are located on either side of the vane and fixed to the gyro frame (see sketch, p. 57). When the gyro is stationary, the vane is centered between the two pick-offs and their net output signal is zero. When the vibragyro is rotated, the torsion bar and vane oscillate, generating in the pick-offs an oscillating signal whose peak amplitude is proportional to the amplitude of vane rotation, and hence to the angu-

lar velocity of the gyroscope itself. In order to establish whether the gyro's angular movement is in a clockwise or counter-clockwise direction, another set of electrical pick-offs is mounted near the vibrating tines. These pick-offs generate a reference signal indicating whether the tines are at one or the other extreme of their travel.

Demodulation of the torsion pick-off signal relative to the tine pick-off signal produces a d.c. output signal whose amplitude is proportional to the vibragyro's angular velocity and whose polarity is determined by its direction of rotation.

► **Driving the Fork**—The signal from

the tine pick-offs, in addition to serving as a reference, is amplified and used to power a set of drive coils which keep the tuning fork in a continuous state of constant-amplitude vibration. The drive coils serve only to supply energy lost during each cycle of fork vibration and torsion bar oscillation; (tuning fork frequency is established by its physical dimensions, type of material, etc.).

The response time of the vibrating gyro (to a change in angular velocity) is inversely proportional to the oscillation frequency of the torsion bar, and hence to the tuning fork vibrating frequency. To get fast response, the tuning fork frequency is normally selected in the upper audio range. This also provides greater isolation from aircraft or missile vibrations which are of lower frequency.

Tuning fork frequency, and torsion bar damping, are selected to give the vibragyro the response time and sensitivity required for any specific application. To maintain the device's linearity, the drive amplifier must be designed to maintain fork vibration at constant amplitude.

► **New Design Problems**—Although the vibragyro eliminates some of the design problems associated with conventional rate gyros, it imposes some new ones. For example:

- **Linear fork drive.** Electromagnets which drive the tuning fork must be carefully aligned to prevent imparting any turning couple to the fork tines. Any such couple would create spurious torque on the torsion bar.

- **Tine balance.** Tuning fork tines must be dynamically balanced to prevent vibrations at right angles to the main vibration mode.

- **Rigid structure.** Assembly must be designed to prevent distortion due to temperature change or aging.

- **Shielding.** If tuning fork assembly is constructed entirely from magnetic material, and is to be used in the presence of stray magnetic fields, it must be suitably shielded.

► **Considerable Promise**—If the foregoing conditions are met, the vibragyro shows considerable promise. It is relatively resistant to shock and vibration damage. Sperry engineers say. Once assembled in a hermetic enclosure, it should be set for a long life since mechanical elements are operated well below the value of their fatigue endurance limits.

The vibragyro's extreme sensitivity and high signal-to-noise ratio make it possible to obtain a derivative rate-of-change of angular velocity, or acceleration, signal. This in turn should make it possible to use the vibragyro as a displacement-type reference by using a high-gain servo system to drive the instrument so as to maintain it at essentially zero rate of rotation.

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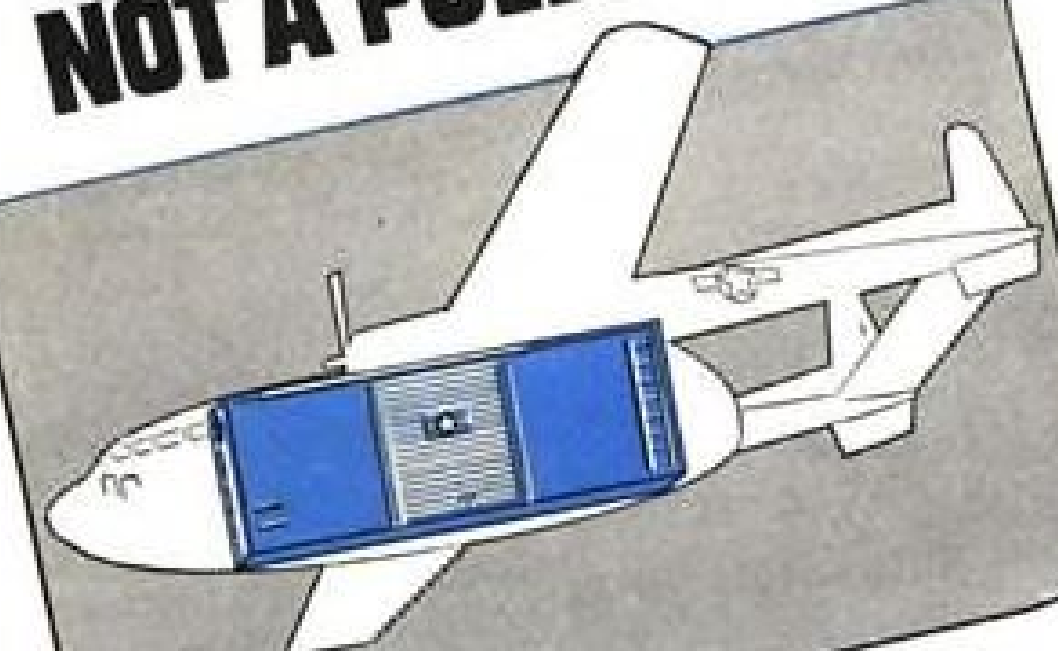
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► **New Flow Meter**—Hydro-Aire is developing a new type of fuel flow meter in which it hopes to employ transistors of its own manufacture.

► **NBS Continues Tinkertoy Work**—National Bureau of Standards engineers are working to extend the range of resistance and capacitance values which can be fabricated on Project Tinkertoy machines for manufacturing of electronic equipment (AVIATION WEEK Sept. 28, p. 17, Oct. 12, p. 72). Present

range of tape resistors is 10 ohms to 10 megohms and capacitor range is 7 mmfd. to 0.01 mfd.

► **New Premium Tube**—General Electric's Tube department has added a new medium-mu, twin-triode to its line of Five Star high-reliability miniature tubes. The new GL-6386 exhibits remote cutoff characteristics in each section and can be used as a cascode RF amplifier to minimize cross modulation, or as an IF amplifier or mixer.

► **Broader Avionics Group Sought**—There is a move afoot to try to get more airline people to join the Institute of

Radio Engineers professional group on airborne electronics (PGAE) in order to broaden the group's civil aviation interests. E. A. Post of United Air Lines and B. M. Meador of Trans World Airlines, both on the PGAE administrative committee, are spearheading the movement. PGAE membership is nearing 1,400.

► **High-Power Transistor**—Minneapolis-Honeywell's new high-power transistor, capable of handling 20 watts (AVIATION WEEK Oct. 26, p. 16), is expected to expand range of transistor applications to include servo systems and control of valves, relays, and motors. New M-H technique for removing heat from the germanium-alloy junction is responsible for 100-fold increase in transistor power handling capabilities, company says.

► **British Avionics Growth**—Evidence that avionics equipment is playing a greatly increased role in British military aircraft is the statement by Lord Brabazon during a recent debate in the House of Lords: "At the beginning of the last war, the Hampden . . . one of our representative bombers . . . had 56 lb. weight of electronics in it, which carried eight valves (tubes). The Valiant now carries 3½ tons of electronics, with 1,000 valves and 13 miles of wiring," Lord Brabazon said.

► **Recently announced design manuals and product bulletins describing components and devices which have application to the avionics field include the following:**

• **Thermistor Data Book.** A 40-page brochure describing a variety of different applications for thermistors (resistors with negative temperature coefficients), is available from Victory Engineering Corp. Thermistor uses cited include temperature measurement, compensation, and control. (VECO thermistors are currently used in a new control device for aircraft cabin heating and wing de-icing.) The booklet lists the engineering characteristics of VECO's line of thermistors as well as a long bibliography on thermistor art. (Victory Engineering Corp., Springfield Road, Union, N. J.)

• **Multiplex Telemetering.** New multiplexing transmit-receive system capable of providing up to 15 pressure, temperature, flow, or other measurements which can be converted to voltages, over a single circuit is described in bulletin by The Bristol Co., Waterbury, Conn.

• **Dual-Beam CRT.** DuMont's new Type 332-A dual-beam cathode ray oscillograph with built-in independent voltage calibration for both beams is described in a new bulletin available from the technical sales dept., Allen B. DuMont Laboratories, Inc., 760 Bloomfield Ave., Clifton, N. J.

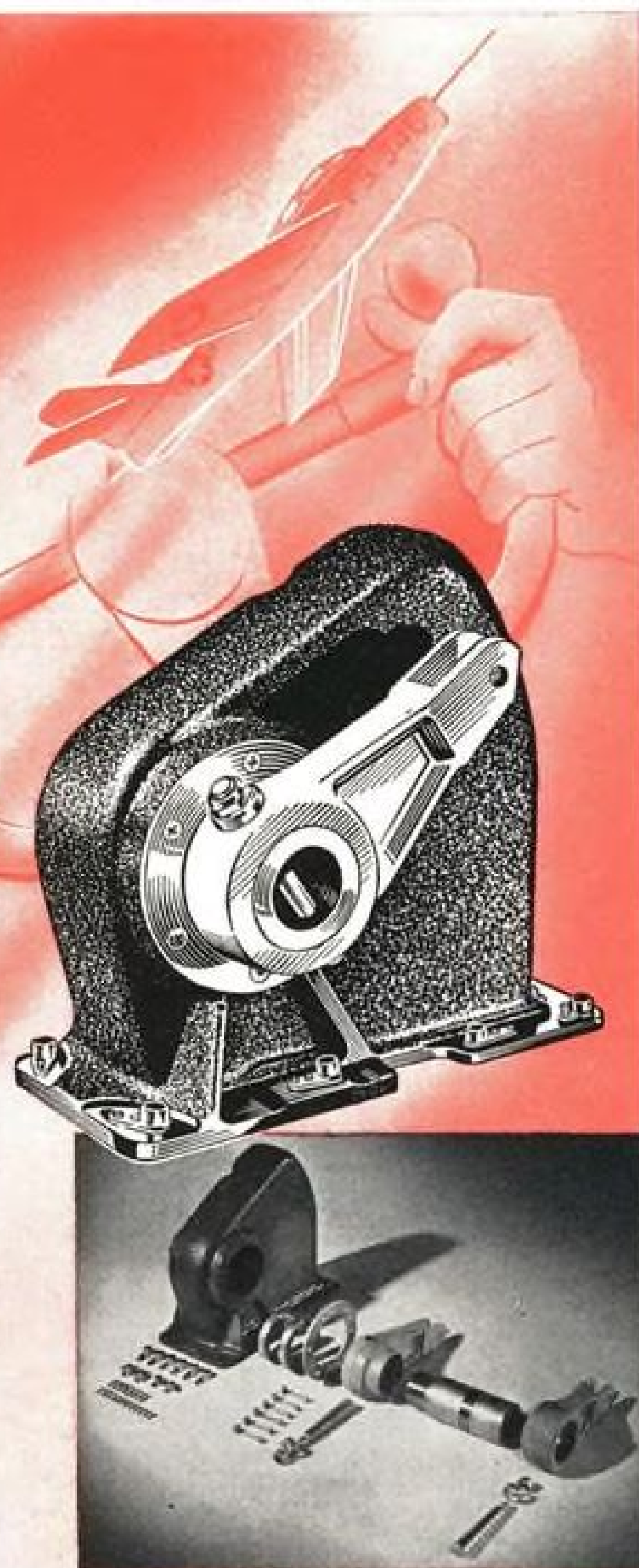
• **Precision Potentiometers.** The Gamewell Co. has issued a booklet describing its line of linear and non-linear precision potentiometers and types of windings which are available. Copies may be obtained from: The Gamewell Co., Special Products div., Newton Upper Falls 64, Mass. —PK

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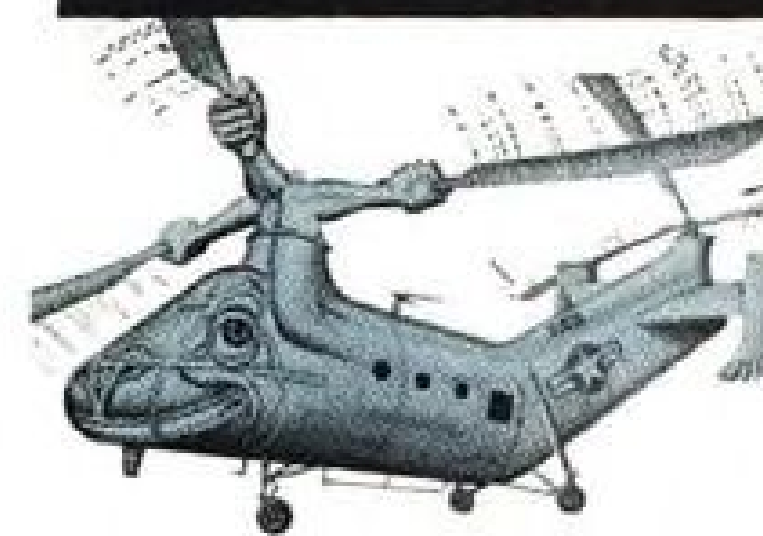
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How a helicopter hangs by its "elbows"

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How a jet engine runs on its "nerves"

To produce the auxiliary "nerve center" for its J-40 jet engine—a complex gearbox that transmits power to vital accessories—WESTINGHOUSE looks to Lycoming.



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EQUIPMENT



NORTHEAST'S CONVAIR FLEET averages 1.25 landings and takeoffs per hour.

NEA Solves Shorthaul Problems

Carrier must put special emphasis on tire and brake care as a result of frequent landings and takeoffs.

By George L. Christian

Boston—Northeast Airlines' officials sometimes refer affectionately to their company as the "Streetcar Airline." Takeoffs and landings on NEA's fleet average 1.52 per hour for its 12 DC-3s and 1.25 per hour for its six Convair 240s. This includes relatively long hauls, such as non-stop flights between New York and Boston, and New York and Martha's Vineyard, which take an hour or more each. NEA probably averages the shortest hauls of any U. S. scheduled carrier.

► **Shorthaul Problems**—The inherently shorthaul character of its operation makes Northeast particularly performance-conscious of its planes' tires and brakes.

Here is a summary of the company's experience with these components:
• **Tires.** NEA is very pleased with Goodrich's dimple tread tires. These units "extend tire use considerably—possibly doubling tire life," says D. W. H. MacKinnon, the carriers' director-engineering and maintenance. The airline is currently testing U. S. Rubber's "Texturized" aircraft tire. The units look good, but tests are not yet conclusive.

The Goodrich dimple treads have lasted an average of 900 landings, compared with 600 for conventional treads.

NEA has set a limit of four retreads on the main gear tires of its 240s and DC-3s and six retreads for the Convair nose tires. Retreading is done by the manufacturer, independent jobbers and by Thompson Aircraft Tire Corp., San Francisco.

• **Brakes.** Goodyear single-disk brakes on the Convairst work well, according

to airline spokesmen. The carrier is in the process of testing new keystone-shaped spots on inner (anvil) side of the brake, which is the stationary brake lining. Previous spots had been round and wore faster than the corresponding lining on the opposite (piston) side. The keystone spot, by increasing brake lining area on the inner side, is expected to equalize this wear.

The Goodrich expander tube brakes on the DC-3s take quite a licking since the -3s are used on the shortest of NEA's flights. But they stand up to the strain. Brake blocks are good for 1,000 hr., equal to about two tire runs.

► **Tire Remover**—Like so many airlines, NEA devised its own, home-made machine to ease the tough job of breaking tire beads away from wheel rims. This unit is particularly simple, effective and quick. It breaks tires away from both wheel rims cleanly, with little effort on the part of the operator, in less than a minute.

Operator places wheel with tire on a horizontal, movable platform which is easily rolled onto the machine's bed. A circular metal cage is placed on the tire's bead. Bead on underside of tire is also braced. Throw of a switch starts an electrically driven hydraulic pump which extends an ex-landing gear actuating cylinder to push down cage and break tire bead away from wheel. An integral limit switch bypasses hydraulic fluid around the actuating cylinder when it reaches full travel. Throwing switch the other way reverses procedures to set machine up for next wheel.

► **Fix-It Shop**—In a small airline, where the number of shops is held to a minimum, there are always items coming



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Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.



Flying faster than sound is nothing, they say... And I can assure you they're right—in retrospect. But it's far from nothing when you're screaming down out of the stratosphere in a vertical dive at 777.7 m.p.h. with your imagination scaring hell out of you.

Even worse, perhaps, is the tension that coils within you like a steel spring as you climb to altitude. It doesn't take long, say eight minutes, but there's time to think, time to remember all the grim warnings of the past, the gargantuan pressures, the planes that have disintegrated at "the barrier."

I rode the radar-observer's seat in a Lockheed F-94C Starfire for my first supersonic dive—and probably my last.

They bundled me into a G-suit, flight suit, Mae West, parachute, crash helmet and oxygen mask. Then they buckled me in with safety belt and shoulder harness. Finally they explained the emergency bail-out procedure:

"If you have to bail, the pilot will jettison the canopy... First you pull the left handle, next the right handle. Then squeeze the trigger and blam! Out you go! Simple... After you're clear, slip the seat belt, slide out of the chair, free-fall down to 15,000 feet or so and pull the ripcord..."

Simple!

We taxied out, turned upwind and started the takeoff roll. My pilot flipped on the afterburner to boot us off the runway like a football through the uprights.

On the way up he talked to me casually through the intercom, pointing out spots of interest in the flattening terrain below. But I'm afraid my answers were monosyllables, for I was watching the altimeter needle wind up past 20,000, past 25,000, on up to 30,000, as high as I'd ever been before.

Now and then I'd sneak a glance at the wings, riding foreshortened on either side of me with their big tip tanks like formation-flying missiles. It was foolish, I know, but I kept wondering if they'd stay with us through the next few minutes. Then I'd count the bail-out procedure again: Left, right, trigger, wham! Belt, fall, pull!

Meanwhile the altimeter needle kept turning, past 35,000 on up to 40,000, the lower fringe of the stratosphere. I thought of pressure differentials and explosive decompression and minus fifty-degree temperatures. What if...?

"We'll take her up another thousand just for sure," the pilot said.

Overhead the sky was bright blue. Below, the earth spread out to far horizons, softened by altitude, dotted here and there with creampuff clouds that seemed to be hugging the deck.

"Ready? Here we go... Watch the needles..."

In an instant we were inverted in the beginning of a Split-S. The earth danced a half-pirouette above my head as the pilot pulled her nose under and headed her down at 85 degrees—a whisper off vertical—accepting the silent tug of gravity, joining it with the bellow of jet and afterburner.

The rest are just flashes in the tension and the fear that gripped me.

The altimeter needle unwinding like a berserk Big Ben... the eerie semi-silence in the cockpit... the sweat streaming into the tight confines of my oxygen mask... the earth dead ahead, soft no longer, but hard and menacing, reaching up for us... the Mach needle inching down toward the airspeed needle... the wings rock-steady, holding... the pounding of my heart... my breath in quick gulps of pure oxygen... the empty feeling of fright...

"NOW!"

At the instant of the pilot's word I felt a quick and gentle shudder. Nothing more. That was it... Unbelievable...

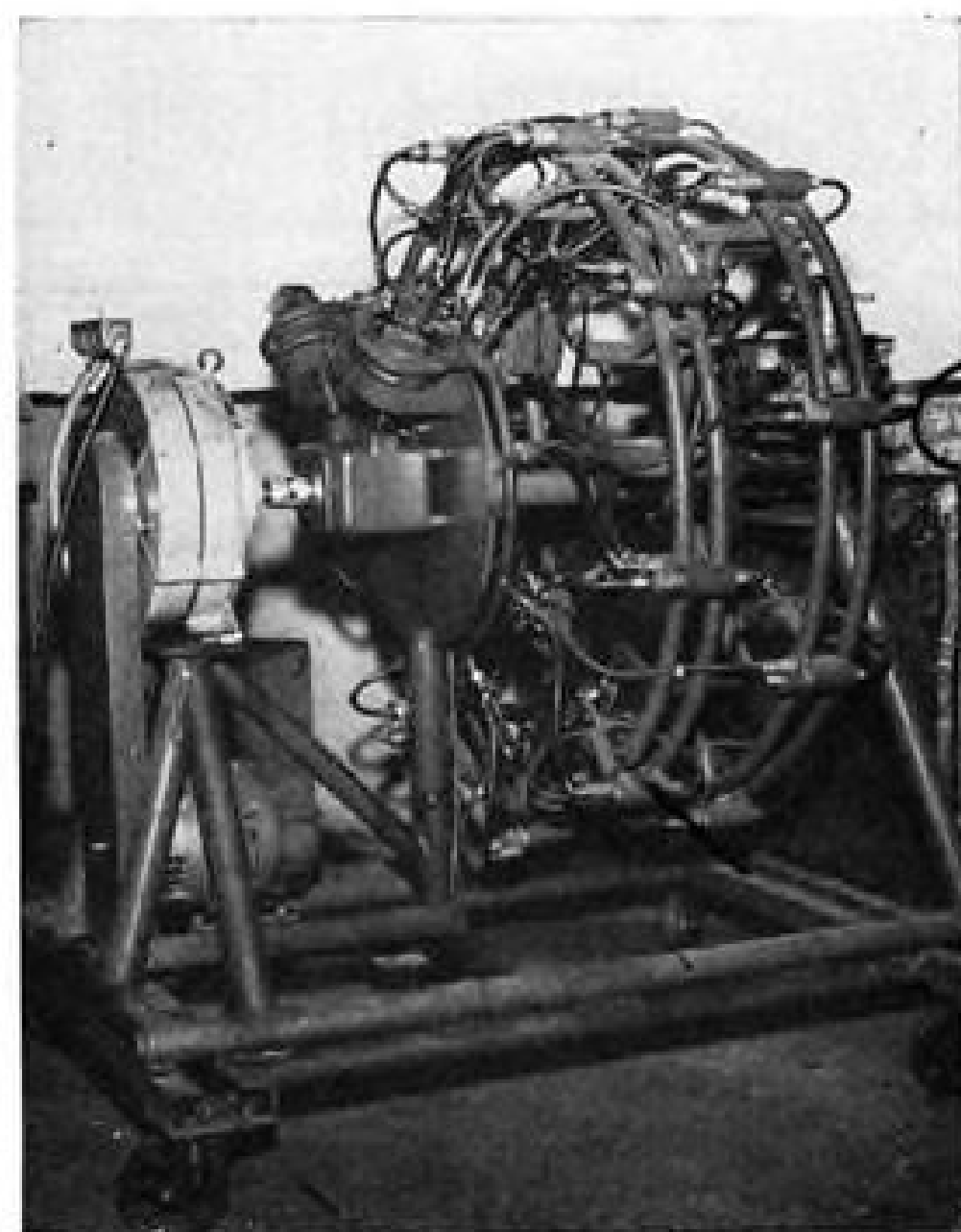
We were through and nothing had happened... like a knife through custard. Still the Starfire flashed downward. The needles met (a theoretical Mach 1.2), crossed and moved apart.

Then, suddenly, the crushing weight of the pull-out, six-fold gravity squashing me down in the seat, the balloons of the G-suit jamming into me to prevent blackout...

Lockheed slipstick artists figured it out for me later on the basis of temperatures, instrument readings and max corrections. We'd hit sound at 35,000 feet (minus 58 degrees F) 669 m.p.h., reached our top speed at 25,000 (minus 11 degrees F) Mach 1.1 or... oddly enough... 777.7 m.p.h., with sound racing at 707 m.p.h. to catch up.

Nothing, they say.

Yet for me, really something.



IGNITION TESTER for Scintilla system.

off an airplane in need of repair which do not fall logically into any of the standard departments such as hydraulic, electric or engine. So Northeast established a "Fix-It Shop," where all of these homeless items could be funneled for repair. Now, such units as ash trays, door locks, vacuum jugs, commissary equipment, DC-3 bungee cords, etc., are sent to this shop-of-all-trades, placed in serviceable condition (or junked) and returned to stock.

► **Complete Ignition Tester**—NEA personnel have devised an ignition tester which, although designed primarily as a distributor checker, can test any other component in the ignition system. It is used for the Scintilla low-tension system on the R2800 powerplant.

The unit was built of tubular framework formed to the same diameter as the engine. Arrangement is such that distributors and coils are mounted in exactly the same positions on the stand as they occupy on the engine, and ignition leads are of the same length. A variable-speed drive permits duplicating any engine rpm. from idle to take-off. MacKinnon says the stand is very useful to troubleshoot ignition problems.

► **More Water**—NEA discovered that

Double-Duty Pilots

Northeast Airlines employs an unusual system for keeping its pilots busy during the slack winter season.

When flying operations are curtailed, about a half-dozen NEA pilots doff their flight uniforms and slip into coveralls. Then they work as mechanics until the flying season picks up again.

This second job not only keeps the pilots busy during the off-season but results in a well-rounded roster of flying personnel.



TIRE REMOVER made by Northeast.

the capacity of the ADI pumps in the R2800 water injection system tended to be critical when putting out at maximum capacity, especially if pump's efficiency was not up to scratch.

So the airline is rewinding the armatures on the pump drive motors to increase their horsepower rating from $\frac{1}{2}$ to $\frac{3}{4}$ hp. This will increase ADI fluid flow by 400 lb./hr., giving a margin of safety to take care of pump efficiencies dropping due to wear.

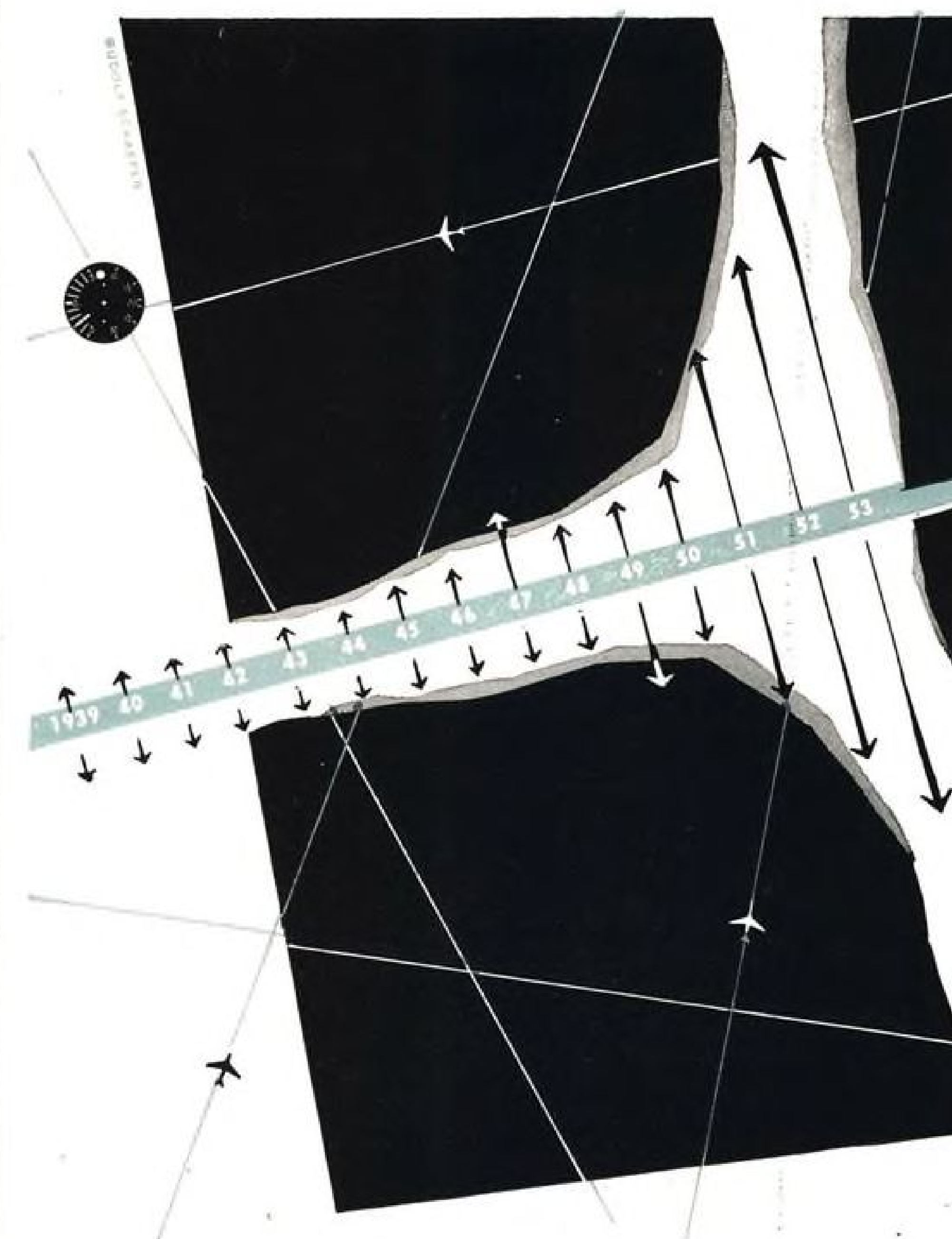
► **Supercharger Drive**—The AiResearch cabin superchargers installed on NEA's Convairs are driven by Pesco hydraulic pumps. At first, the pumps gave trouble and failure rate was high. Practically all breakdowns were caused by bearing failure. As soon as this happened, the pump seized and the driveshaft sheared. But since the pump did not chew itself up, the hydraulic system remained clean and uncontaminated with chips.

The pump failure problem has been pretty well licked. Pesco has installed more rugged bearings which hold up much better. And NEA bleeds the hydraulic supercharger drive system daily as a preflight item to get all the air out.

► **Supercharger Test Stand**—Unusually enough for such a relatively small airline, NEA has two supercharger test stands. One, in the shop, is driven by a 50-hp. electric motor. It is equipped with standard manometers and other measuring devices.

The second stand is a mobile, wheel-mounted unit powered by an eight-cylinder Nash engine, driving hydraulic pumps. This stand is wheeled to a Convair and hooked to the cabin supercharger hydraulic drive system, through taps. The stand tests the blower without removing it from the plane.

► **Pilot's Check List**—NEA has devised



growth

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Need low cost, quick assembly, long bearing life?

here's how manufacturers of automotive components

get them with **NEEDLE BEARINGS**

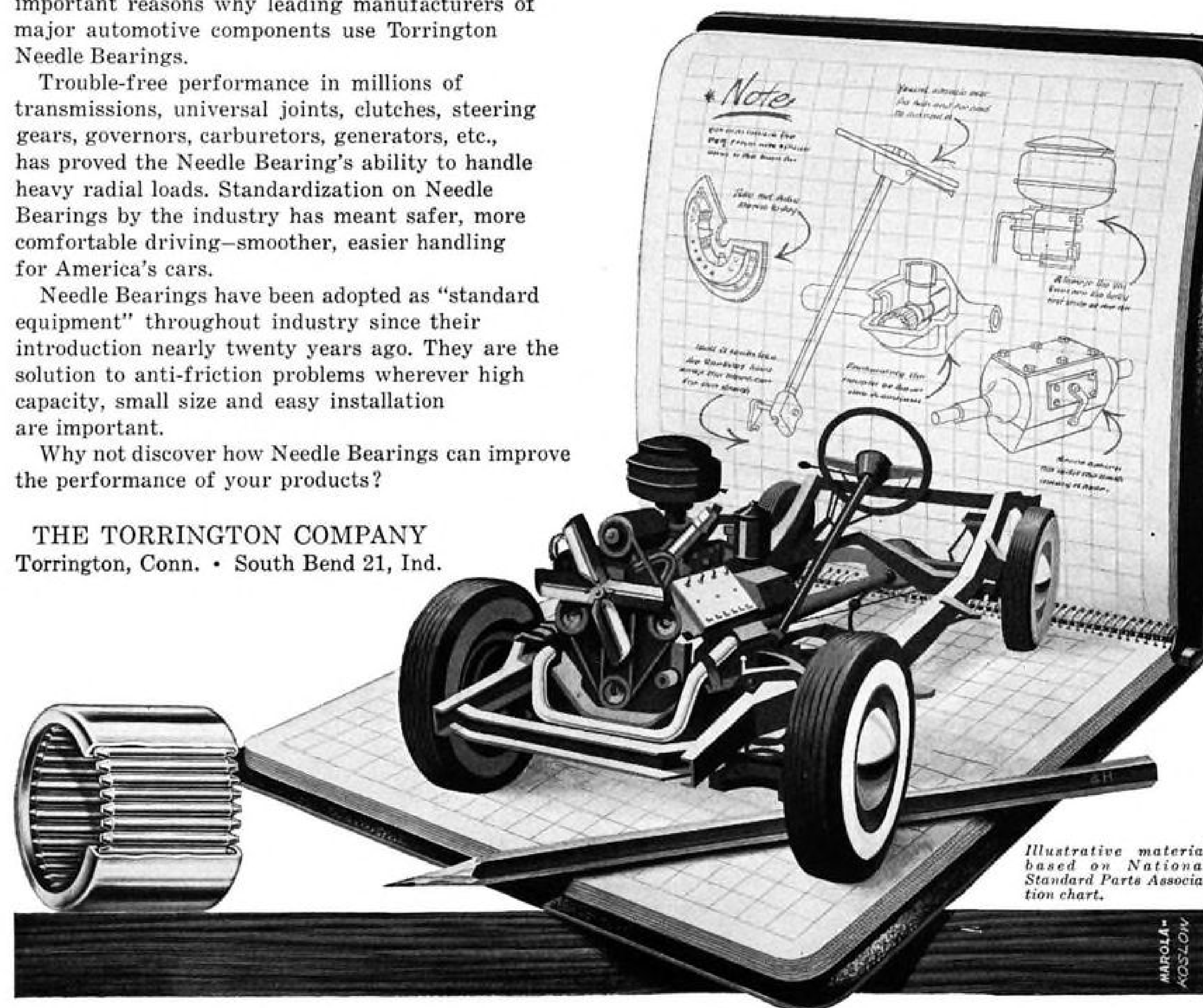
Low initial cost and ease of installation are two important reasons why leading manufacturers of major automotive components use Torrington Needle Bearings.

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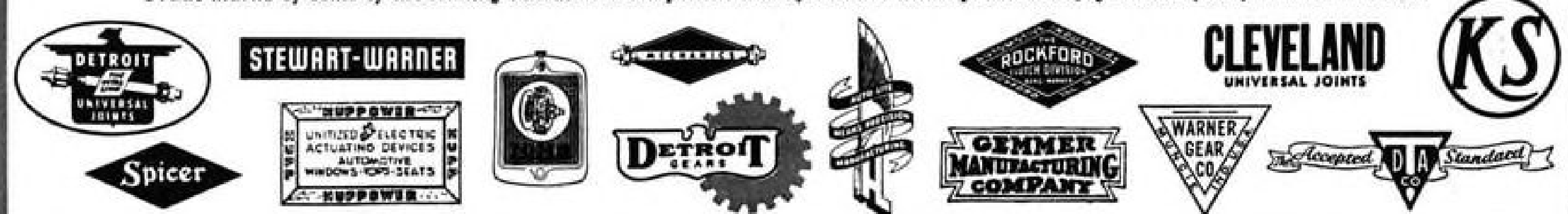
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a takeoff and landing check list made of Lamicoid for its crews. The check list is a panel with a black face, white center and red backing. The lettering, cut through the black, shows up white during the day. At night, lettering color may be varied from pure white to brilliant red by changing intensity of lighting on the back of the panel.

To check off items, co-pilot pushes a slide from one side of the unit to another to indicate that an item has been checked. Pilots say this is much better than the roll-type of check list commonly used. With the slide type, items may be taken in any sequence; check list is complete when all slides are on one side or the other of the panel. With a roll type, the list has to be rolled back to pick up any item called

► **Around the Shop**—A tour of NEA's neat shops here brought out these items:

- **Exhaust stack jig.** NEA has a good solution to the often vexing problem of assembling exhaust stacks accurately. It constructed a jig of a discarded engine crankcase and installed discarded cylinders. Here, for practically nothing, was an accurate jig on which the mechanics could build up exhaust stacks which would fit on engines the first time.

- **Heater conversion.** Northeast's fleet of 24-passenger DC-3s are being converted from the old boiler heating sys-



Lightweight Ramp

New-style, lightweight, passenger loading ramps being put into service by Western Air Lines feature all-aluminum fabrication for lightness and semi-monocoque construction for strength. They incorporate battery-powered lighting systems, permanently lubricated wheels and casters, and a special foot brake to lock the unit in position. The ramps may be disassembled to simplify shipping. Made by Tobey Manufacturing Corp., El Segundo, Calif.



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tem to Janitrol heaters.

• **Engine overhaul time.** The R1830 engines on NEA's DC-3s have a 1,200-hr. overhaul period; its Convair R2800s go 1,100 hr.

• **Plug overhaul time.** The airline uses Champion R37S-1 plugs in all its engines. Plugs are pulled at 350 hr., and are normally useable for two runs.

• **Analyzers.** NEA uses two Scintilla portable analyzers and all of its 240s are wired for the units. Analyzers are used on condition and at each No. 1 (75 hr.) check.

• **Turnaround service.** To keep its mechanics busy, Northeast performs turnaround service on a regular basis

for these carriers that come in to Boston: Trans World Airlines, British Overseas Airways Corp., and Mohawk Airlines. It performs on-call service for Slick and others.

• **Owned and leased.** Of its fleet of six Convair 240s, NEA owns three and leases three from Pan American World Airways.

NWA Finds Fix for Wing Bolt Corrosion

Northwest Orient Airlines' airframe engineers have found a quick, relatively easy way of controlling a problem that



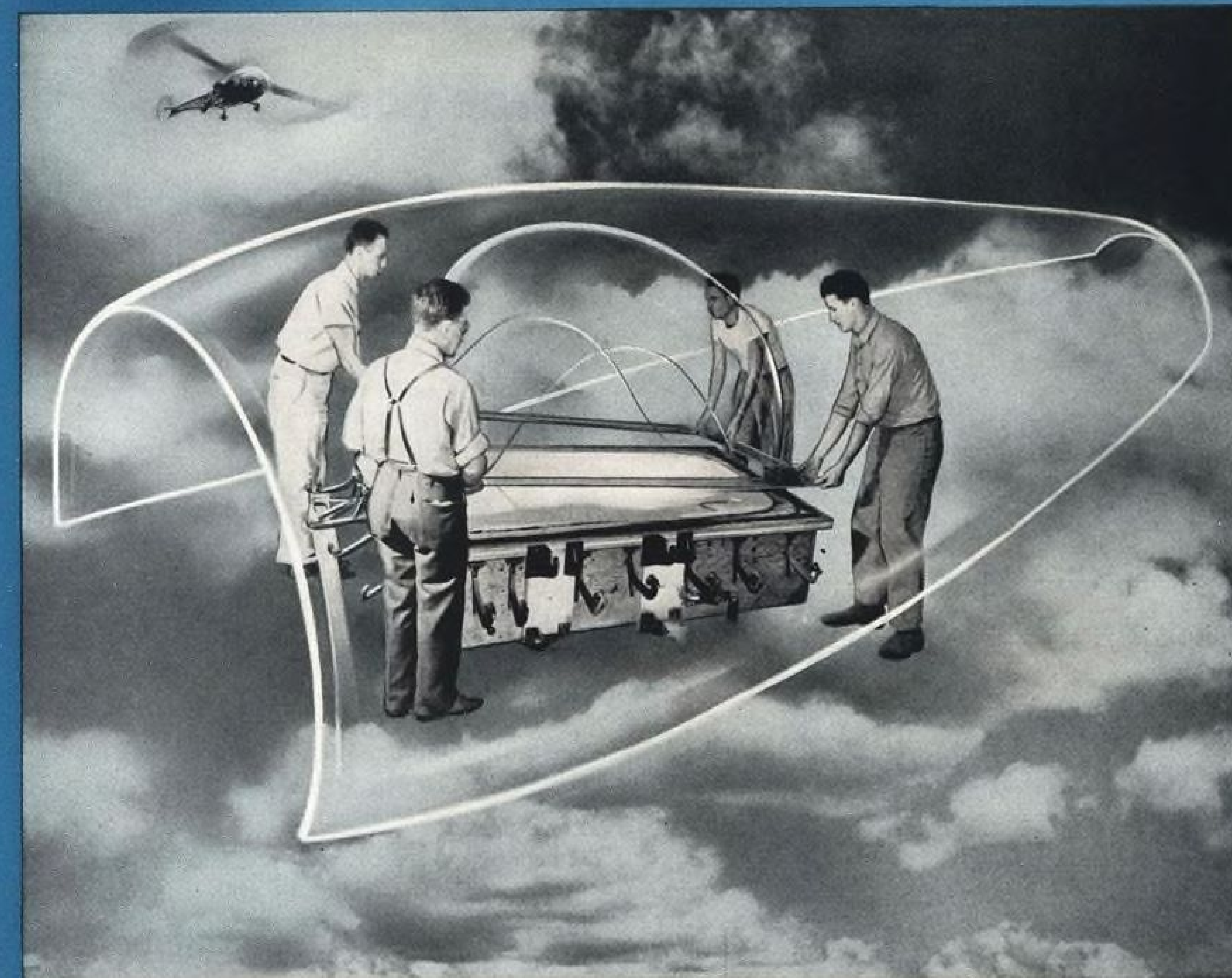
BOROSCOPE is used to examine wing spar splice bolt hole for corrosion.

has bothered airlines ever since the inception of the metal airplane—galvanic corrosion.

In this case, the corrosion was occurring between the aluminum main wing spars and high-strength steel splice bolts of NWA's Boeing Stratocruisers. Corrosion resulted from electrolytic action set up between the two dissimilar metals.

Northwest Orient's solution:

- Inspect wing spar splice hole with a "boroscope" (an optical instrument



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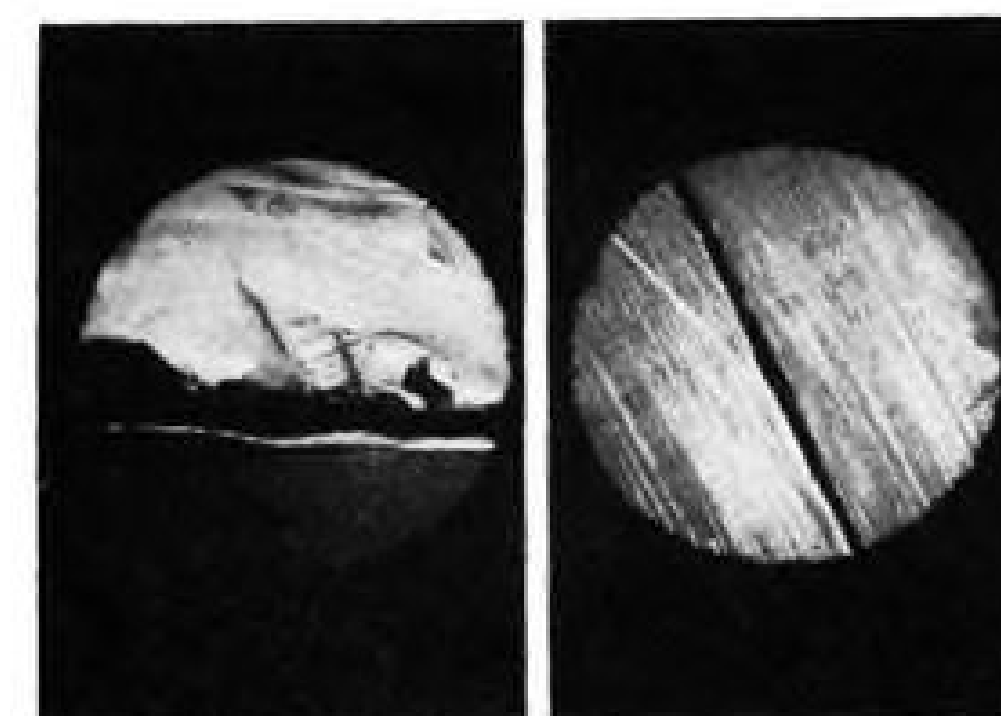
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Aerosol Hose Clamps



Actuators



CORROSION in bolt holes is revealed by penetrant dye (left). Reaming and chromic acid washing clear up corrosion (right).

made by an NWA employee).

- Ream the spar splice bolt holes to remove corrosion and give from .0011 to .0015 in. clearance to the bolts. Wash bolt holes with chromic acid.

- Cadmium-plate the splice bolts.

NWA is using this technique on rear spar stations 47.75, 246 and 510 and on front spar stations 47.75, 210 and 510. Since bolts which have received this treatment showed no corrosion after 3,000 hr. of service, NWA engineers term their technique "completely successful."

OFF THE LINE

Emergency cabin lighting systems, to be installed in Northwest Airline's Super Connies and DC-6Bs, will keep 12 lamps going for about 30 minutes. Emergency power will come from dry cells located in a protected area of the aircraft ceiling, and will be switched on automatically in case of main system failure. NWA is also experimenting with a deceleration switch to turn on the emergency system on sudden impact. Lockheed Aircraft Corp. is installing the light systems on the six 1049E Super Connies that are on order; Grand Central Aircraft Co., Glendale, Calif., is handling the work on the four DC-6Bs. (NWA is getting the DC-6Bs on long-term lease from Flying Tiger Line, which originally ordered them in the airfreight DC-6A Liftmaster configuration.)

Pacific Airmotive Corp. has signed reciprocal contracts and licenses with the British firm, Sir George Godfrey & Partners, Ltd., which give PAC exclusive rights to manufacture and distribute Godfrey aircraft pressurization equipment in the U.S. PAC plans to combine Godfrey units with pressurization and temperature control equipment currently manufactured by PAC into complete air conditioning systems for U.S.-manufactured aircraft. The complete systems will include approximately 20% Godfrey equipment and 80% PAC-made items.

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COPPER-CONSTANTAN—Figure B, lead-wire used with chromel-alumel indicators, effects considerable saving in weight over chromel-alumel leads of same resistance. Available in AWG sizes or with special stranding to seven ohms per 200 feet.

CHROMEL-ALUMEL—Figure C, lead-wire to specification AN-W-29. Available in types I, II or III class A or B. Available with stainless steel overbraid. Thermocouple wire available in AWG sizes 16 to 24.

Write for data on any of above or wire to new MIL specifications.

ACCESSORIES FOR TEMPERATURE INDICATORS



Developed by Lewis, the AN5534-1 resistor block is used to adjust the overall external resistance of the indicator to eight ohms.

Another Lewis development, the AN5537-1 Firewall Connector Block provides a quick disconnect for thermocouple engine leads. Available with angle plugs as part AN5537-2.

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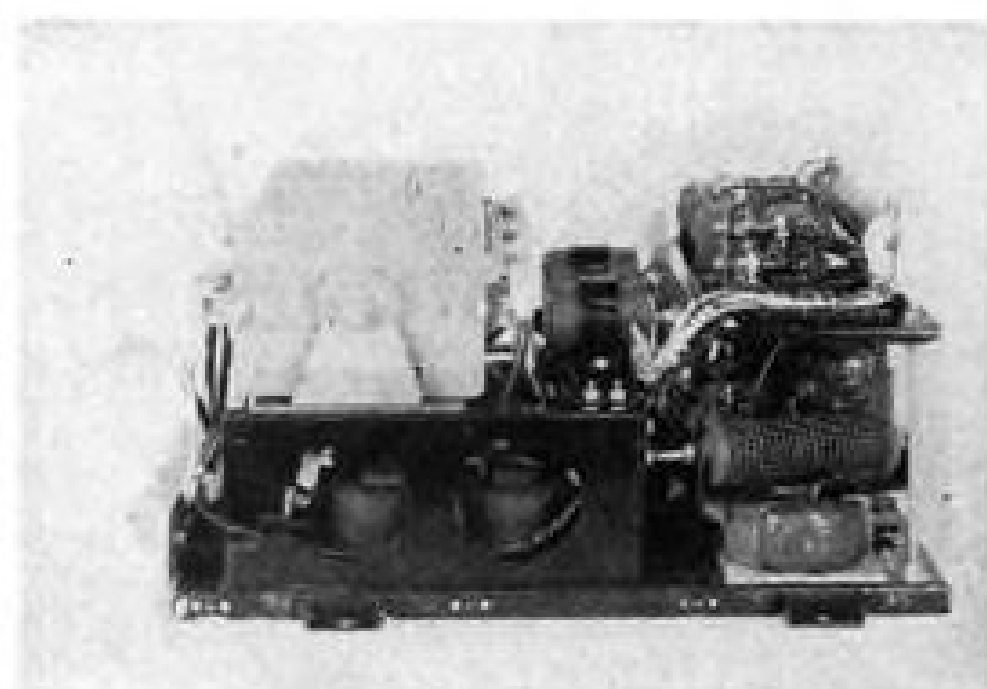
A new passenger loading ramp, designed for use on Lockheed Super Constellations, Boeing Strato-cruisers and Douglas DC-4s, DC-6s and DC-7s, is being marketed by Texas Metal and Manufacturing Co., Inc.

The unit is 221 in. long, 93 in. wide, has a maximum overall height of 175 in. and a minimum overall height of 119 in. It weighs 2,500 lb. Price is \$4,500.

Height of upper platform is adjusted by means of hand-operated hydraulic pump and a 2½-in. hydraulic ram to accommodate aircraft with entrances varying from 80 in. to 130 in. from ground. Accurate location of platform is assured by hardened steel ratchets located on either side of hydraulic ram. Cam-actuated brakes lock it in position.

The steps and platform are covered with safety tread and illuminated by 15-w. lights. Ground is illuminated by two lights under first step. Lights on under side of platform aid in positioning at night. They can be operated from wet cell battery in the frame or from aircraft power outlet.

Texas Metal and Manufacturing Co., Inc., Dallas, Tex.



Transformer-Rectifier Is Airborne D. C. Source

General Electric Co.'s Lighting and Rectifier department is marketing a new line of airborne transformer-recti-

fiers for aircraft electrical systems.

Described as a lightweight means for obtaining instant current for d.c. equipment, the transformer-rectifier is said to eliminate necessity of d.c. bus bars.

Equipment for unit consists of selenium cells, transformer, saturable-reactor regulating network, cooling fan and aluminum casing.

Selenium cell is a high-temperature unit manufactured by GE's evaporation process. Transformer, designed specifically for aircraft use, incorporates grain-oriented steel to make it lighter.

GE engineers say voltage regulation is held to within plus or minus 0.7 v. d.c. in all units. Ripple is 4½%, efficiency 77% minimum, and power factor approximately 75%.

Units now available have ratings of 50,100 and 200 amp. d.c. at 28 v. Weights range from 17.5 to 67 lb.

All units meet military specification MIL-E-5272.

General Electric Co., Lighting and Rectifier Dept., Schenectady 5, N. Y.



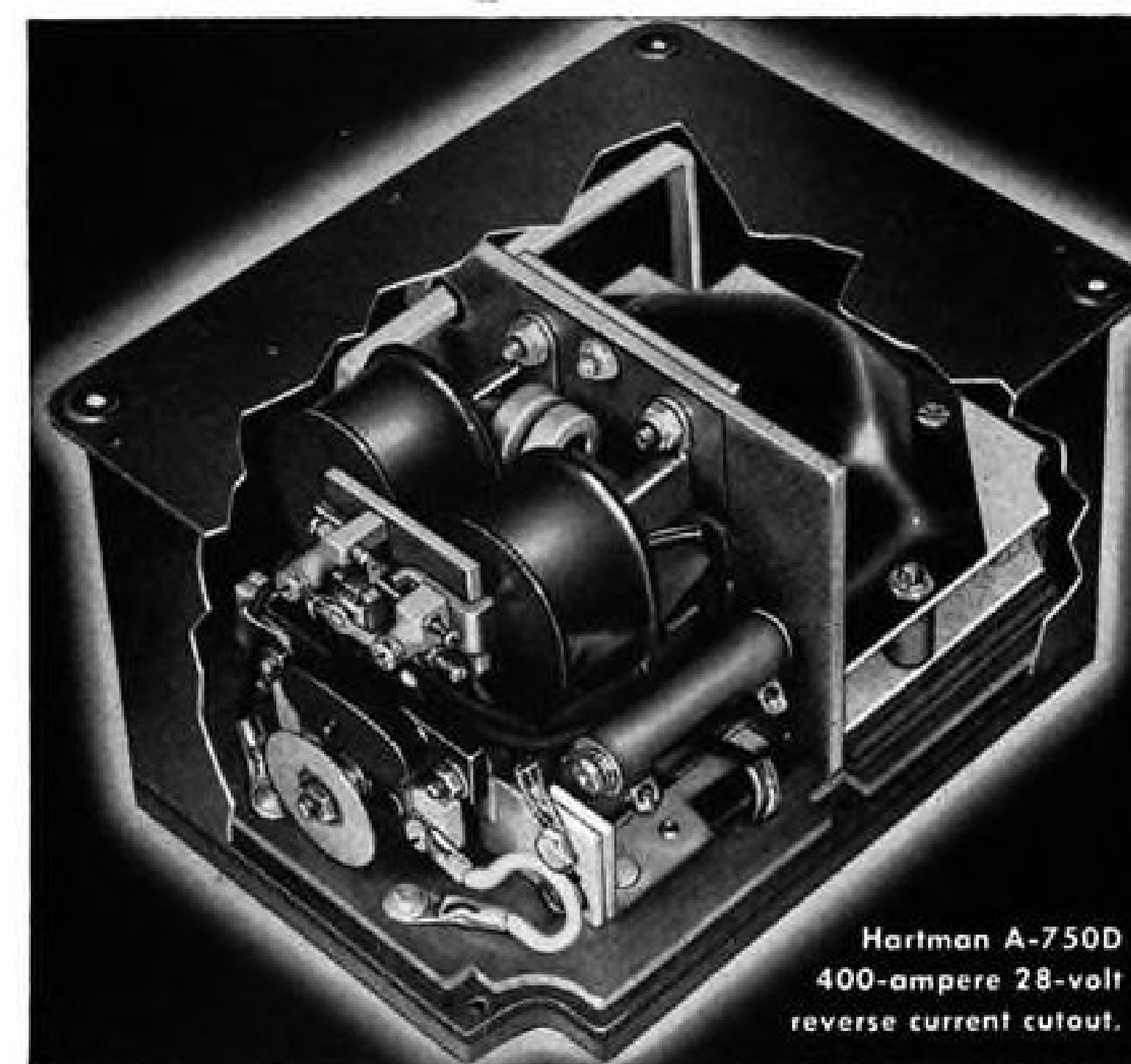
Regulator Guards F-84 Hydraulic Pressure

United Aircraft Products, Inc., is manufacturing a new air/oil regulating valve designed for pressurizing the hydraulic reservoir tank on Republic F-84s and F-84Fs, but which may be useful in other aircraft.

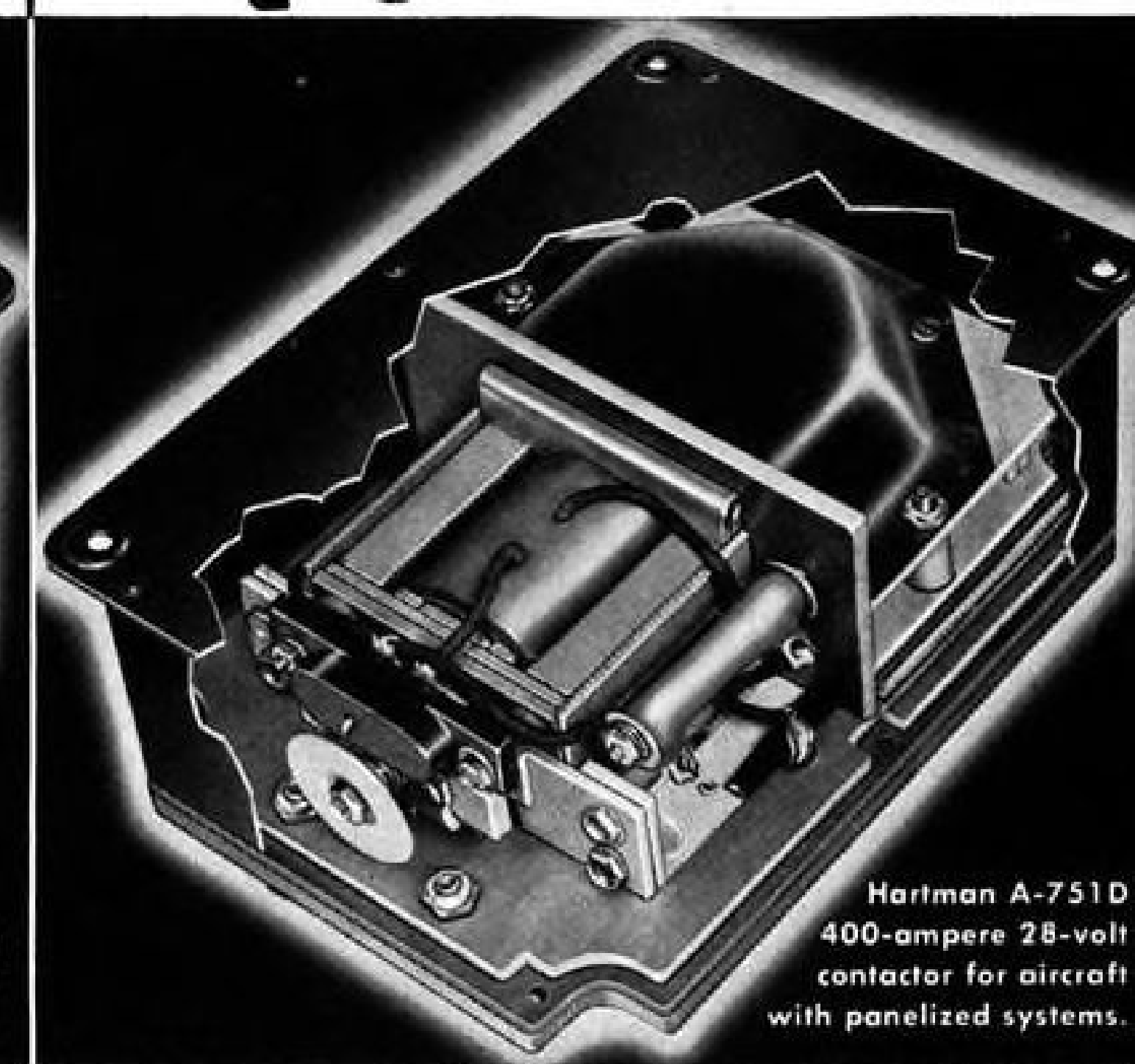
Manufacturer states that unit maintains minimum regulated pressure in tank during fluid level change, protecting against excessive pressures caused by fast pumping of fluid, through incorporation of relief valve.

Atmospheric pressure, piped through a vacuum venting valve, protects against vacuum condition being created in tank. A check valve in the regulator provides further protection by preventing air or hydraulic fluid from bleeding back into up-stream lines during

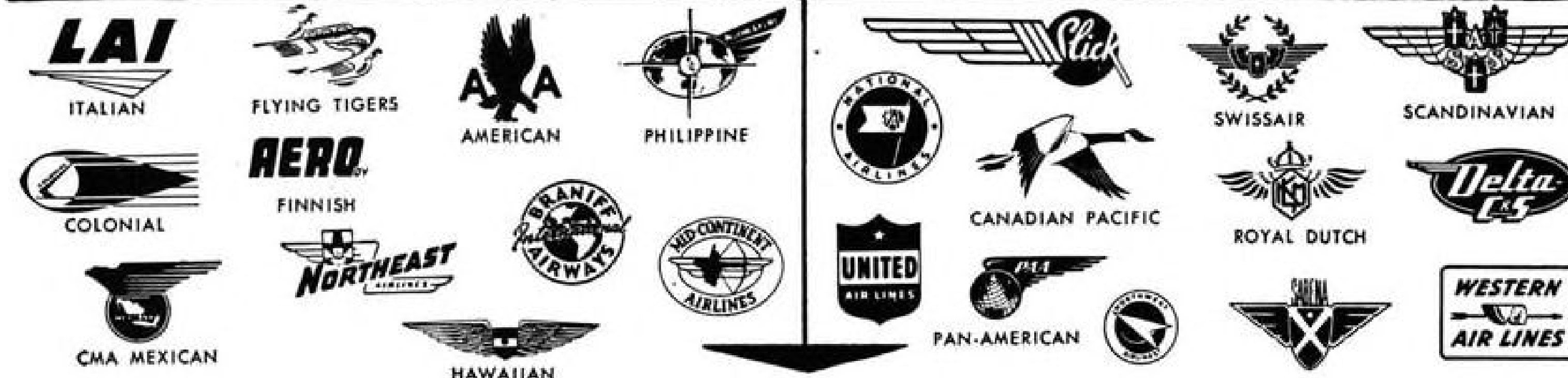
dependability plus...



Hartman A-750D
400-ampere 28-volt
reverse current cutout.



Hartman A-751D
400-ampere 28-volt
contactor for aircraft
with panelized systems.



that's why these leading airlines specify HARTMAN HIGH INTERRUPTING CAPACITY CUTOUTS

Thousands of operating cycles at rated capacity over wide temperature shifts . . . in humidity and dust . . . at altitude . . . under violent vibration, acceleration and shock. Add to this the possibility of 28-volt generators producing up to 175 volts if a failure applies full field at high rpm as on take-off. These rugged conditions demand the utmost in dependable interrupting capacity.

That's why these 23 leading airlines use Hartman high interrupting capacity switches in their

Convair 340, Douglas DC-6B and DC-7 aircraft. For the new Hartman reverse current cutouts and contactors have an *interrupting capacity greatly in excess of all requirements from sea level to 50,000 feet.*

Dependability and safety of these units is typical of many other Hartman aircraft control devices. So if you have an AC or DC control problem, turn it over to Hartman for speedy solution.

A-8410

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• Complete Control Assemblies.

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"CONTROL HEADQUARTERS"

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WIG-O-FLEX COUPLING



flexible union for connecting rigid tubes.

are you interested in weight reduction?

WEIGHT — POUNDS

10

1

WIG-O-FLEX COUPLING SAVES 17 POUNDS on B-66B

The New Douglas B-66B Bomber is 17 pounds lighter because WIG-O-FLEX Couplings replaced standard AN Connections and cut hose. The WIG-O-FLEX Coupling weighs 1/5 as much as the standard AN connection it can replace. (See weight chart for exact comparisons.)

PROVED SUPERIOR FOR FUEL, OIL, AIR.

- Withstands more than 1000 psi burst pressure.
- Accommodates 4° tube flexure.
- Installs locally. 80% lighter.
- Temperature range —65°F to +250°F.

SIZES

1", 1 1/4", 1 1/2", 1 3/4", 2", 2 1/2", 3", 3 1/2", 4".

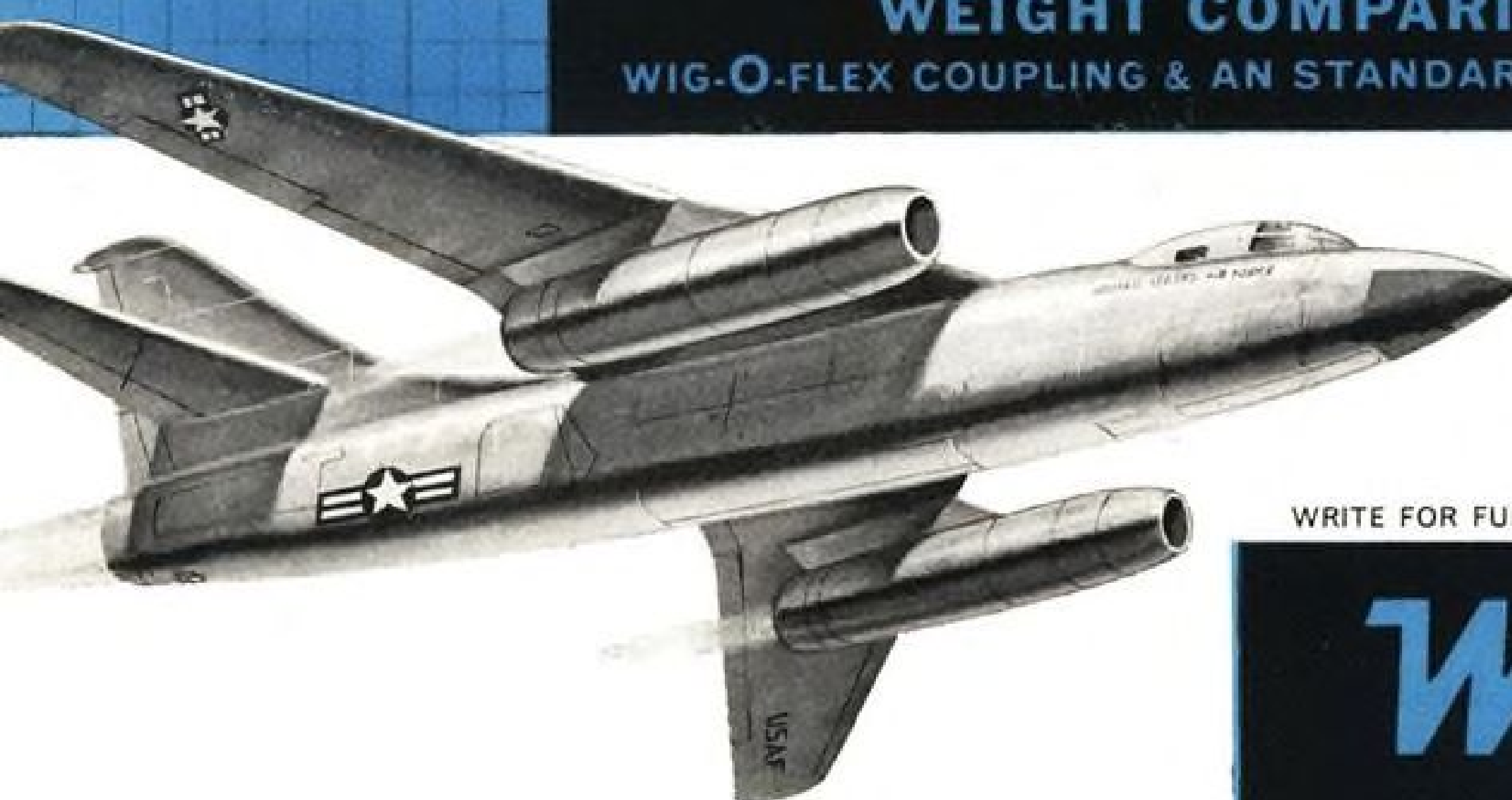
- One AN815D Union, Two AN818D Nuts and Two AN819D Sleeves.
- WIG-O-FLEX Coupling with O-rings.
- WIG-O-FLEX Boss Coupling with O-ring.

TUBE O.D. — INCHES

1" 1 1/4" 1 1/2" 1 3/4" 2" 2 1/2" 3" 3 1/2" 4"

WEIGHT COMPARISON CHART

WIG-O-FLEX COUPLING & AN STANDARD FLARED TUBE CONNECTION



WRITE FOR FURTHER INFORMATION.

Wiggins

E. B. WIGGINS OIL TOOL COMPANY, INC.

3424 East Olympic Boulevard, Los Angeles 23, California

pressure source failure or engine shut-down.

Body of unit is made of cast aluminum. Component parts are of fabricated aluminum, excepting stainless steel springs, diaphragms and seals.

Operating temperatures are minus 65°F to plus 250°F. Inlet air pressure range is 15 to 150 psig. while regulated pressure is 8.5 to 9.5 psig. with 0 to 1 cfm. flow.

Relief valve cracking pressure, air and oil, is 12.5 ± 1/2 psig. Cracking pressure of vacuum relief valve is from 0 to 2 psig.

Unit weighs .76 lb. All ports take AND 10050-6 fittings.

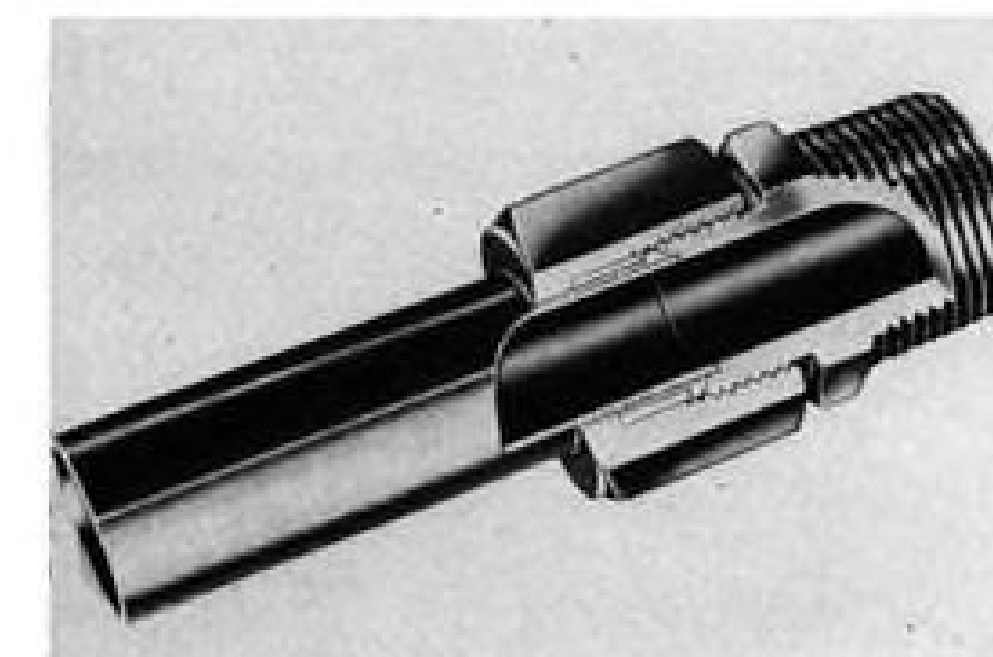
United Aircraft Products, Inc., P.O. Box 1035, Dayton 1, Ohio.

ALSO ON THE MARKET

New emergency flare being marketed by Air Associates is self-contained, needs no auxiliary pistol for firing. Outer cylindrical container serves as rocket launcher. Flare reaches minimum altitude of 1,500 ft. and provides red light of 20,000-candlepower for at least 30 seconds.

Wheel-caster assembly being produced by Aerol Co. is 16-in. pneumatic, individually-sprung, dual, shock-absorbing unit for use on ground handling equipment. Special feature is an anti-shimmy brake which permits vibration free operation at high speeds. Weight is 75 lb., construction is cast heat-treated 356 aluminum. Unit was developed for Republic Aviation Corp.—Aerol Co., Los Angeles, Calif.

Flareless fitting, available in sizes from 1/2 to 2 in., holds twice the tube bursting pressure (up to 50,000 psi.) depending on size unit used. It is tightened to a positive stop action, with no tube cutting or gouging action. Assembly is accomplished by insertion of tube



in fitting, tightening with wrench. By replacing sleeve, fitting may be reused. Available in steel, brass, aluminum and stainless steel. Meets requirements of specifications AN-F-47 and MIL-F-5506-A. Manufacturer of the item is Aircraft Fitting Co., 1400 E. 30th St., Cleveland, Ohio.

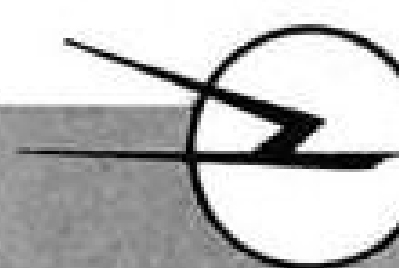


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ASSOCIATED AIRCRAFT SALES, INC.
ASSOCIATED FABRICATORS, INC.

1211 East Douglas

Wichita 7, Kansas

AVIATION WEEK, November 23, 1953

79

AEROPRODUCTS SELF-LOCKING ACTUATORS PERMIT INSTANT FLIGHT SURFACE CONTROL

AEROPRODUCTS SELF-LOCKING ACTUATORS MAKE POSSIBLE THE INSTANT, ABSOLUTE

CONTROL OF MOVABLE AIRCRAFT SURFACES. AN AEROPRODUCTS ACTUATOR WILL ADJUST

A MOVABLE SURFACE TO ANY POSITION WITHIN THE DESIGN RANGE, LOCK THE SUR-

FACE IN THE SELECTED POSITION, AND HOLD IT UNTIL CHANGE IS REQUIRED.

The power source for Aeroproducts actuators may be hydraulic, pneumatic, electric or manual—or any combination of these. Actuators can be readily synchronized in tandem or in series to provide coordinated control of related movements.

Announced applications of Aeroproducts self-locking actuators include control of the flyable tail in a jet fighter, the horizontal stabilizer in another, and the afterburner exhaust nozzle in a new high performance jet engine. Additional applications include control of wing flaps, dive brakes, cargo doors or ramps, variable wing sweep and incidence, wing fold and canopy slides, turbojet guide vanes.

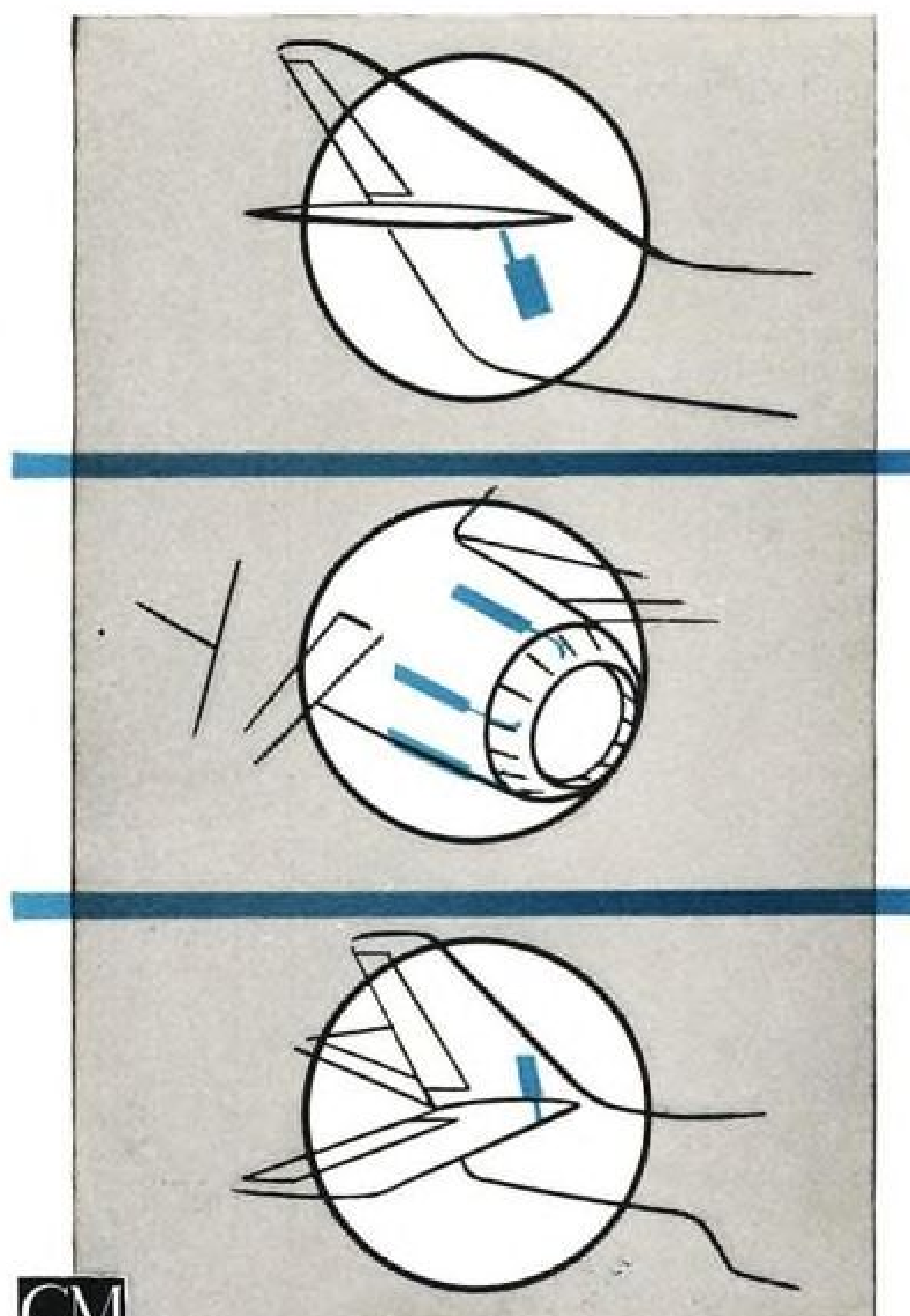
Let us know your requirements for aircraft actuators. Your inquiry will receive prompt attention.

Typical
Aeroproducts
Actuator



Aeroproducts

ALLISON DIVISION • GENERAL MOTORS CORPORATION • DAYTON, OHIO



Building for today
Designing for tomorrow

WHO'S WHERE

(Continued from page 10)

Walt Rollins has been appointed sales manager of Central Airlines. Other changes: James C. Dixon, traffic manager; E. H. Evans, superintendent of stations.

C. Gilbert Peterson has retired as chief engineer of Railway Express Agency's Air Express Division.

Henry J. Gardner is new chief engineer of Airmatic Valve, Inc., Cleveland.

John E. Drake has been named chief engineer of Century Controls Corp., Farmingdale, N. Y., taking charge of development of aircraft accessory control systems.

Adair Morrison has been appointed chief of the research section of Sprague Electric Co.'s research and engineering department, North Adams, Mass.

Vice Adm. Joseph Bolger (USN Ret.) has joined Agawam Aircraft Products, Inc., Sag Harbor, N. Y., as a consultant.

Allan F. Bonnalie, director of flight training for United Air Lines, has been promoted to rear admiral, USNR retired. William Ferree is UAL's new Los Angeles district publicity representative, and William Blaha has joined United as publicity representative in Chicago.

Richard M. Degen has been appointed chief engineer of Hydro-Aire, Inc., Burbank, Calif.

Douglas Knowles, former chief engineer of Avro-Canada's Gas Turbine Division, has joined Continental Aviation & Engineering Corp., Detroit, as assistant manager of the Turbine Division.

Hugh M. Clark has been promoted to supervisor of mechanical engineering at United Aircraft Corp.'s Hamilton Standard Division, Windsor Locks, Conn. New project engineers: Wilson M. Alford, Alfonse R. Civitate, A. D. Croxall, Jr., Howard H. Lawson, Jr., Earl K. Moore, William J. Morrow, J. A. Osterman, Anthony V. Pond, Donald P. Ramaker, Albrecht E. Reinhardt, and Frederick A. Young. Appointed design project engineer: James A. Mrazek and Norman B. Newton. Samuel E. Fitting, Jr., and David N. Foner are new vibration and mechanical metallurgy supervisors. Promoted to development engineer: George G. Walker, Jr., and Richard B. Wilson; to systems engineer: Harry M. St. John, Jr.; to preliminary-design engineer: Clويد W. Shaw; to design standards engineer: Charles R. Fowler.

Honors and Elections

William A. Patterson, president of United Air Lines, has been elected to the board of the Fund for Adult Education.

Dr. L. A. Slotemaker, executive vice president-foreign relations for KLM Royal Dutch Airlines, is new chairman of the Air Transport Committee of International Chamber of Commerce.

Richard A. Livingston, president of Tubing Seal Cap, San Gabriel, Calif., has been elected president of California Manufacturers Assn.

August C. Esenwein, manager of Con-vair's Ft. Worth Division, has been appointed to the board of Texas Manufacturers Assn.



SPEED NUTS® cut costs...weight on new Sikorsky "Copter" application!



Over the years, SPEED NUTS have saved many thousands of production dollars for Sikorsky! Tinnerman Anchor Types with their 84%

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Twelve of these standard SPEED NUT Brand Fasteners are spot welded to the Accessory Compartment Shroud. This makes a faster, easier attachment for the rubberized seal which prevents hot engine air from entering the compartment. Consider this money-saving solution in terms of your own fastening problems, both on military and civilian aircraft.

Lightweight, vibration-proof, self-retaining SPEED NUTS can make savings like these on many aircraft applications. Your Tinnerman representative is ready to help you discover them through better fastening methods! You'll be interested in the details of our complete Fastening

Analysis Service available at no cost or obligation! See him soon!



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ANCHOR TYPE
SPEED NUT**

This stainless steel fastener is spot welded in screw receiving position. It replaces riveted anchor nuts, saving 2 rivets per application... an extra savings in material and time over the amazing 84% in cost and 53% on weight.

Write today for your copy of "SPEED NUT Savings Stories", a booklet of typical SPEED NUT savings to industry. **TINNERMAN PRODUCTS, INC.**, Dept. 12, Box 6688, Cleveland 1, Ohio. *In Canada:* Dominion Fasteners Ltd., Hamilton, Ontario. *In Great Britain:* Simmonds Aero-accessories, Ltd., Treforest, Wales. *In France:* Aeroco-soires Simmonds, S.A., 7 rue Henri Barbusse, Levallois (Seine).



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NEW ADVERTISEMENTS: Address 330 W. 42 St., N. Y. 36, N. Y. for December 7th issue closing November 7th

A. W.

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"A secure future, exceptional opportunities for advancement, and a high starting salary await you at FAIRCHILD, if you are one of the men we are looking for. We have openings right now for qualified engineers and designers in all phases of aircraft manufacturing; we need top-notch men to help us in our long-range military program: turning out the famous C-119 for the U.S. Air Forces.

"FAIRCHILD provides paid vacations and liberal health and life insurance coverage.

"If you feel you are one of the men we are looking for, write me. Your inquiry will be held in strictest confidence, of course."

Walter Tydon

*Walter Tydon, widely known aviation engineer and aircraft designer and veteran of 25 years in aviation, is Chief Engineer of Fairchild's Aircraft Division.

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With MECHANICAL ENGINEERING DEGREE with 8 to 10 years experience in design of aircraft engines, at least four years of which has been on gas turbine engines. Must be capable of supervising all phases of design, experience in shop methods and manufacturing techniques, particularly sheet metal fabrication is required.

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Your letter of inquiry will receive prompt attention and reply. Please write to—

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P-9806, Aviation Week
520 N. Michigan Ave., Chicago 11, Ill.



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A Challenge to Men
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ASSIGNMENT — you will assist in the installation, operation, and maintenance of our equipment at aircraft plants and Air Force bases. The work will include liaison between AC and the customer, training of customer personnel, analysis of problems, and recommendations for improvements. Many of these outstanding openings are one-year overseas assignments.

YOUR BACKGROUND — your educational background can be in any of the fields of AE, EE, ME, Physics, or equivalent. To be successful in these positions you should have a definite interest in people as individuals and be willing to relocate to field assignments. Single men given preference.

TRAINING — out theoretical and applied in-plant training (here in Milwaukee) will prepare you for these assignments. In addition to your salary, you will receive a field allowance—and a substantial bonus if selected for overseas assignment. . . . if you're looking for an opportunity with a "present" and a future write us for further facts.

We need men of high caliber, experienced in the field of airborne automatic electro-mechanical control equipment. You will be engaged in the manufacture and development of highly complex equipment of the most advanced type in a steadily expanding division of our company—a division with 20 years of successful operation in the precision instrument field. We offer many advantages to those who join our organization—**SALARY** increases are based on merit and initiative . . . two weeks **VACATION** with pay . . . **HOSPITALIZATION BENEFITS** . . . **LIVING and RECREATIONAL FACILITIES** are among the best anywhere along Lake Michigan . . . **POSITIONS ARE PERMANENT** due to long-range manufacturing and development programs . . . in short—here at our "AC" Milwaukee plant you get small company advancement opportunities with large company employee benefits . . . **EXPENSES** incident to interviews are all absorbed by us.

For less experienced engineering graduates, we have a Junior Engineer Training Program which makes it possible for you to become acquainted with all phases of our company . . . you can also take advantage of educational opportunities for advanced degrees at Marquette University and the University of Wisconsin.

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Sikorsky Aircraft, foremost designer, developer, and manufacturer of helicopters, is increasing its production of the latest type, combat-proved helicopters and is expanding its research and development program.

Here's your chance to work with the top men in your profession—men who made the first practical helicopter.

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EXECUTIVE PILOT: 10,000 hours. ATR. Rated in DC-6, DC-4, B-28, Lodestar. 5 years airline captain. 5 years executive transportation experience. PW-9754, Aviation Week.

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PUBLIC RELATIONS and sales executive. Ten years experience in public relations and foreign trade specializing in Latin America. Eight years as Naval officer including Bureau of Aeronautics assignments. Seeking position in aircraft export sales or public relations. Have been security cleared for top secret in all federal agencies. Reply to PW-9847, Aviation Week.

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WANTED—BELL or Hiller Helicopter. Give price, delivery, condition and times. W-9796, Aviation Week.

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Gramman J-2F-6
"Duck" airframe under 400 hr 20 smoh, engine one 1820-54. 190 since New. Land, sea and snow triphibian. Over 2000 lbs payload 5-6 place convert to freight in 15 min. Two large baggage comp. 30,000 ft. ceiling. Lightened and streamlined cruise 175 to 190. Range 1300 mile. Exceptional performance on high altitude lakes and airports. New license Nov. 2, 1953. A beautiful well kept airplane with many extras. \$11,500.00. W. Stead, Box 856, Reno, Nev.

FOR SALE

(Additional For Sale Ads on
pages 86 & 87)

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Heater	Surface Combustion Co.	83A9	6	O.E.C. Unit	Torrington	NY4M(B24)	17	Circuit Breaker	Spencer	C6363-1-5A	115
Heater	Stewart Warner	921B	230	Bearing	Falmer	NR6L12	25790	Circuit Breaker	Spencer	C6363-1-2A	115
Blower	Dynamic Air Engine	4582-AA-6C	18			AN200-K3L2	18273	Circuit Breaker	Heinemann	AM1614-80	1700
Blower	Joy Manufacturing Co.	U-702-15	24	GAUGES				Circuit Breaker	Cutler Hammer	6141-H69A	237
Tank Unit	Minn. Honeywell	G-1098D	11	Compass	Eclipse	36001-0	20	Amplidyne	G.E.	5AM31NJ10	111
Trim Tab Control	Pioneer	#15701-R	20	Gyro Indicator	Eclipse	14601-1F-B1	11	Amplidyne	Kidde	A-4614	151
Oil Cooler	U.A.P.	U8416-MM	12	Gyro Indicator	Eclipse	10078-1AG	62	Ignition Switch	Scintilla	AN3213-1	70
Oil Cooler	U.A.P.	U8013-MM	14	Position Indicator	Weston	AN5780-2	400	Ignition Switch	Nesco	A-9(94-3226)	250
Hydraulic Pump	Vickers	MF9-713-15H	120	Position Indicator	Weston	AN5780-2	1000	Master Switch	Jos Pollack	M862A	126
Hydraulic Pump	Vickers	PF12-713-25BCE	124	Wheel & Flap	G.E.	AN5780-2	1000	Thermo Switch	Fenwall	17322-2	287
Hydraulic Pump	Vickers	PF4-713-20BCE	327	Wheel & Flap	Eclipse	20100-11C-4-A1	23	Heater Control	White-Rodgers	1033-4E1	148
Hydraulic Pump	Vickers	MF45-3911-20Z	43	Pitch Trim Gauge	Eclipse	15100-1B-A1	19	Air Ram Switch	Minn. Honeywell	PG208AS1	40
Hydraulic Cylinder	Air Associates	HC2109	29	Cowl Flap Indicator	G.E.	8DJ29AAY	21	Pressure Switch	Aerotec	M-101-B	20
Hydraulic Cylinder	Air Associates	HC2110	8	Oil Temp. Indicator	Lewis	77C3	23	Pressure Switch	Kidde	3135-11C	88
Fire Detector	Edison	117-47	46	Oil Temp. Indicator	Lewis	77C4	13	Impact Switch	C.H.	8909-K99	2000
Fire Detector	Edison	ASD2	65	Oil Temp. Indicator	Weston	828TY13Z2	71	Switch	Grimes	AN3096-4	2585
CO ₂ Cylinders	Kidde	981280	183	Manifold Pressure	Manning, Maxwell & Moore	AN5770-2	28	Dome Light	Grimes	AN3096-5	775
CO ₂ Cylinders	Kidde	M870036B	47	Manifold Pressure	U.S. Gauge (Metric)	AW2-3/4-25K	146	Dome Light	Grimes	AN3096-6	1365
Anti-Icer Pump	Adel	D7818	195	Fuel Quantity	Eclipse	3801-3B	128	Cannon	Cannon	NAF310310-4B	2747
Auxiliary Power Unit	Eclipse	NEP-2	29	Relay	Weston	828TY12Z2	40	Leach	Leach	7964-404	402
Auxiliary Power Unit	Lawrence	LER-30D	16	Relay	Weston	77C3	22	Leach	Allied	BOBX-2	31
Pump	Pesco	1EAR-280BH	15	Relay	Weston	119862	40	Relay	Square D	82A	718
Pump	Pesco	1E-621	8	Relay	Weston	727TY70Z2	11	Relay	G.E.	CR2791-G100-K4	281
Pump	Pesco	2E258SA	21	Relay	Weston	727TY72Z2	85	Relay	G.E.	CR2792F101-A3	626
Separator	Pesco	3V-217-HC	32	Relay	Weston	727TY73Z2	88	Relay	Guardian	G34464	41
Accumulator	Vickers	AA14002A	35	Relay	Weston	727TY74Z2	83	Relay	Guardian	G31502-A	350
Actuator	Air Associates	M-2031	22	Relay	Weston	727TY75Z2	10	Relay	C. P. Clare	D2060	45
Wobble Pump	Erie Meter	AN4014	17	Relay	Weston	728-40Z2	298	Control Box	Vapor Car	9804B	34
Oxygen Cyl.	Kidde	923748	74	Relay	Weston	727-TY37P	33	Compensator	Heating Co.	46B311	25
Windshield Wiper Kit	Marquette	K14949E	140	Relay	Weston	47B22	28	Solenoid	Heating Co.	AB12	202
ENGINE ACCESSORIES				Relay	Weston	47B23	54	Interstate Aircraft & Eng. Co.			
Starter	Eclipse	1416-12E	75	Relay	Weston	47B24	30	Flex. Cable	Airesearch	25432	66
Generator	Eclipse (NEA-3A)	716-3A	100	Relay	Weston	47B21	9	Temp. Control	Fulton Syphon	715E	52
Starter Motor	Jack & Heinz	JH950-R	90	Relay	Weston	76B19	8	Noise Filter	Mallory	NF3-5	500
Generator	G.E.	2C444A2	4	Relay	Weston	20100-42B-14A2	9	Regulator	G.E.	3GBD1A18A	13
Carburetor	Eclipse	1003-4	71	Tachometer Indicator	Eclipse	8DJ13ABK	6	VALVES			
Carburetor	Stromberg	PD19K10	550	Tachometer Indicator	Eclipse	2222-1F-2A	200	Valve	Kidde	982585	396
Carburetor	Stromberg	PR48-A1	236	Magnesium Pos. Indicator	Eclipse	20000-8A-14	9	Valve	Oh. Chem.	AN60009-1B	325
Carburetor	Holley	1685-HAR	90	Magnesium Transmitter	Eclipse	20000-43A-13A1	8	Valve	Oh. Chem.	AN60009-2A	247
Carburetor	Holley	1375-F	19	Magnesium Indicator	Eclipse	23000-2A	67	Valve (3000 PSI)	Parker	2-1046-76	47
Magnet	Scintilla	SF9-LN-2	407	Pressure Transmitter	Eclipse	22101-11-A4	15	Restrictor Valve	Parker	SP4-2746-77	68
Fuel Pump	Pesco	2P248EB	6	Pressure Transmitter	Giannini	47114-D2-0-20	8	Restrictor Valve	Parker	SP4-2746-78	105
Fuel Strainer	U.A.P.	U635A	76	Differential Pressure Gauge	Kollman	906-6-011	22	Restrictor Valve	Parker	SP4-2746-79	40
Governor	Woodward	5x18	10	Differential Pressure Gauge	Kollman	2548K-6-052	48	Restrictor Valve	Parker	SP4-2746-80	48
Prop. Reversing Control	Hamm. Standard	72400	20	AIRCRAFT (RADIO)				Restrictor Valve	Parker	SP4-2746-81	60
Oil Separator	Eclipse	564-2A	384	Transmitter	Bendix Radio	TA-12B	20	Restrictor Valve	Parker	SP4-2746-82	142
Oil Filter	Bendix Radio	731A	100	Receiver	Bendix Radio	RA10-DB	35	Restrictor Valve	Parker	SP4-2746-83	33
Pressure Relief Valve	Aerotec	V301B7	20	Amplifier (PB10)	Eclipse	15401-1	10	Restrictor Valve	Parker	SP4-2746-84	127
Tachometer	Eclipse	2227-11-D3A	11	Amplifier	Eclipse	12086-1C	11	Restrictor Valve	Parker	SP4-2746-85	123
Vacuum Pump	Eclipse	610-2C	6	Radio Noise Filter	G.E.	1C-200	740	Restrictor Valve	Parker	SP4-2746-86	620
Spark Plugs	Aero	LS4-AD1	185,000	Radio Noise Filter	G.E.	NF10084	959	Restrictor Valve	Parker	SP4-2746-87	540
AIRCRAFT ENGINES & PARTS				Tube	Hewlett Packard	JAN6AL5	327	Restrictor Valve	Parker	SP4-2746-88	112
Engine	Wright	R-1820-52	1	Standing Wave Ind.	Hewlett Packard	415A	3	Restrictor Valve	Parker	SP4-2746-89	7
Engine	Wright	R-1820-54	16	Antenna Switch	Bendix Radio	MS49A	26	Restrictor Valve	Parker	SP4-2746-90	23
Engine	Wright	R-1820-60	4	Control	Bendix Radio	3616	81	Restrictor Valve	Parker	SP4-2746-91	478
Engine	P & W	R-1830-43	1	Station Box	Bendix Radio	3620	23	Restrictor Valve	Parker	SP4-2746-92	668
Bearing	P & W	1045A	166	Insulator	Bendix Radio	MT48C	518	Restrictor Valve	Parker	SP4-2746-93	428
Flange	P & W	3506	500	ELECTRICAL PARTS				Restrictor Valve	Parker	SP4-2746-94	179
Follow-up Assy.	P & W	8288	130	Transformer	Eclipse	DW33	11	Restrictor Valve	Parker	SP4-2746-95	237
Blower Assy.	P & W	3M814	814	Transformer	Eclipse	DW28	80	Restrictor Valve	Parker	SP4-2746-96	27
Shaft	P & W	48362	53	Transformer	Eclipse	DW47	33	Restrictor Valve	Parker	SP4-2746-97	237
Shaft	P & W	48363	75	Transformer	G.E.	70G3	26	Restrictor Valve	Parker	SP4-2746-98	744
Gear	P & W	48461	390	Servo Motor	G.E.	#1300-20	57	Restrictor Valve	Parker	SP4-2746-99	244
Gear	P & W	76236	78	Motor	G.E.	5BA40NJ1A	425	Restrictor Valve	Parker	SP4-2746-100	2900
Bearing	P & W	84289	1178	Motor	G.E.	5DP65-MB1	189	Restrictor Valve	Parker	SP4-2746-101	114
Housing	P & W	84487	113	Motor	G.E.	5BA25D-J48	44	Restrictor Valve	Parker	SP4-2746-102	1865
Nose Housing	P & W	84591C	77	Motor	Airesearch	26675	25	Restrictor Valve	Parker	SP4-2746-103	240
Crankcase Assy.	P & W	84350-D	200	Motor	Diehl	FD65-5	21	Restrictor Valve	Parker	SP4-2746-104	814
Pump Assy.	Wright Aero	420313	33	Circuit Breaker	Spencer	PM-5	2094	Restrictor Valve	Parker	SP4-2746-105	335
Drive Assy.	Wright Aero	416421	46					Restrictor Valve	Parker	SP4-2746-106	74
O.E.C. Unit	FM1		36					Restrictor Valve	Parker	SP4-2746-107	60

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AVIATION WEEK, November 23, 1953

AIR TRANSPORT

AA Calls Ducted Fan Key to Jet Airliners

- Analysis director spells out airline's engine views.
- But builders say proposed turbine is years away.

By William J. Coughlin

Los Angeles—American Airlines believes the ducted-fan engine may be "the key that opens the door to widespread use of the commercial jet transport," Harold E. Hoben, AA director of aircraft analysis, told a group of engineers here Nov. 12.

Hoben also spelled out in detail the carrier's views on turbojet and turboprop transport aircraft.

"Our answer to the question of turboprop vs. turbojet is neither, for the present, unless our hand is forced by competition," he said.

► **Debated Position**—American's thinking on jet transports was detailed in a paper prepared by Hoben and W. C. Lawrence, AA director of development engineering. It was delivered by Hoben at a meeting of the Southern California section of the Society of Automotive Engineers.

Engineering officials of Douglas Aircraft Co., Lockheed Aircraft Corp., and Boeing Airplane Co. were on hand to debate the airline's position. Most of these agreed a practical ducted fan, or bypass, engine is too far in the future to warrant consideration.

"He is wishing for something that is many years away," commented George Snyder, chief of preliminary design for Boeing.

Snyder said his company also believes the turboprop airplane has no future in the airline business.

► **Chief Objections**—Hoben said American's chief objections to the turbojet engine are its excessive cruising specific fuel consumption, relatively low takeoff thrust, and the noise produced at high power near the ground.

Objections to the turboprop engine are complexity of control and noise produced in cruising flight within the passenger cabin. Lack of a desirable turboprop engine at present is another factor, he said.

► **Compromise Configuration**—"What we are waiting for is further development," stated the AA official. "The wait may not be so long as one would think. . . . There is a third configuration of gas turbine engine, which may be visu-

Average Operating Costs of Jets vs. Pistons

(Cents per plane-mile)

	Proposed jet transport estimated	Today's transport actual
Flight crew salaries & expenses.....	12.4	16.2
Fuel, oil & taxes	43.4	32.6
Insurance (liability & property)	7.1	1.2
Total flying operations	62.9	50.0
Aircraft maintenance and overhaul	12.0	11.7
Engine maintenance and overhaul.....	27.8	16.5
Total flight equipment maintenance direct.....	39.8	28.2
Depreciation airframe.....	35.5	12.6
Depreciation engines	8.1	1.3
Total depreciation flight equipment	43.6	13.9
Total direct flight expense.....	146.3	92.1

Turbojet, Turboprop Comparison on 1,000-Mi. Flights

Estimated costs	Turboprop cent/mile	Turbojet cent/mile
Flight crew salaries & expenses.....	13.4	12.4
Fuel, oil & taxes	28.3	43.4
Insurance (liability & property)	7.1	7.1
Total flying operations	48.8	62.9
Aircraft maintenance	12.3	12.0
Engine maintenance	30.9	27.8
Propeller maintenance	1.1	...
Total flight equipment maintenance direct.....	44.3	39.8
Depreciation airframe	33.2	35.5
Depreciation powerplants	11.3	8.1
Total depreciation flight equipment	44.5	43.6
Total direct flight expense	137.6	146.3
Ratio per mile costs	1.00	to 1.06

alized as a compromise between the previous two."

This, he said, is the ducted-fan, or bypass, engine.

"By this we mean a gas turbine engine, probably a twin-spool arrangement with a large and relatively low-compression front compressor stage. A portion of the air from this compressor bypasses the combustion chamber and turbine

and is accelerated to the rear through an annular nozzle surrounding the tail pipe."

This results in an intermediate propulsive efficiency, he said. Combustion jet velocity is reduced by extracting an additional increment of energy by means of the turbine, but this energy is then used to accelerate an additional quantity of secondary, or bypass air, to

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approximately the same reduced velocity.

► **Advantages**—"The result is a propulsive efficiency, and therefore a specific fuel consumption, somewhere between that of the jet and that of the turboprop engine," Hoben commented.

"Naturally, its weight will be increased over that of a comparable jet engine, but this should easily be offset by reduced weight of fuel."

He listed additional advantages as:

- **Large takeoff thrust** because ability to augment the basic gas generator thrust is most pronounced at low forward speeds.

- **Lighter, better-performing aircraft** as a result of this increased takeoff power.

- **Reduced noise level** due to reduction of the jet velocity to perhaps one-half the velocity produced by a jet engine during takeoff.

Hoben said it appears that such a powerplant of the right size would be useful not only for a commercial transport but also for any military application where jet aircraft may be pressed for range.

► **British Development**—"Rumor has it—and all we know of this is what we read in the British press—that an engine of this general nature is under intensive development in England by a company of very good repute," he remarked.

Chief engineer Kelly Johnson of Lockheed commented in rebuttal that the U. S. military carried on some development work with the ducted-fan engine but found it was not practical for military aircraft because, while very effective at a given Mach number, it was not efficient for overall speed range.

"Perhaps it might be a good transport engine," Johnson added, "since the jet transport will be flying just under Mach 1 for the next 15 years."

But Carlos Wood, chief of preliminary design for Douglas, questioned the economy of the ducted-fan engine and commented: "Attempts have been made to interest the military and manufacturers in ducted fan but nothing has been done."

► **Foreseeable Future**—Regarding the turboprop engine, American takes the stand that the truly highspeed turboprop is not within the present state of the art of transport design nor will it be practical within the immediately foreseeable future, according to Hoben.

This seemed to conflict somewhat with statements made recently by other officials of the airline.

Hoben made these three points concerning turboprop:

- **"The great precision** of the speed control required over a wide range of forward speeds and engine powers has led to an intricate system of controls to coordinate the propeller with the engine.

"In normal flight configurations, the propeller is the dominant control. During landing, this function becomes too demanding for the propeller, and the dominant control becomes the engine. This leads to a very much more complex powerplant control system than those with which we have had experience.

"We are not entirely satisfied that it will operate with the reliability which has been characteristic of reciprocating powerplants . . .

- **"Noise and vibration** within the cabin has always been a problem in propeller-driven airplanes. Experience and all available information lead us to believe that this problem will become more acute as powers and forward speeds are increased.

"The result, we suspect, will be a compromise in the case of the turboprop airplane under consideration. It will be difficult, if not impractical, to make the improvement in comfort which we desire . . .

- **A most important** consideration in the selection of new equipment is its probable span of service. This could be quite short for the turboprop airplane in competitive service.

"We suspect that this airplane might almost immediately be made obsolescent for mainline routes—perhaps by a jet airplane which offered greater passenger comfort and faster schedules without increase in fare."

► **Cost Comparison**—The AA analyst introduced a comparison of turbojet and turboprop costs that showed a ratio-per-mile cost of 1 cent for turboprop against 1.06 cents for turbojet.

"The foregoing comparison may be surprising to some, for much greater economic advantages have commonly been claimed for the turboprop powered airplane," Hoben said. "The theoretical cost differential in this case has been scaled down by very practical considerations relating to the actual engines.

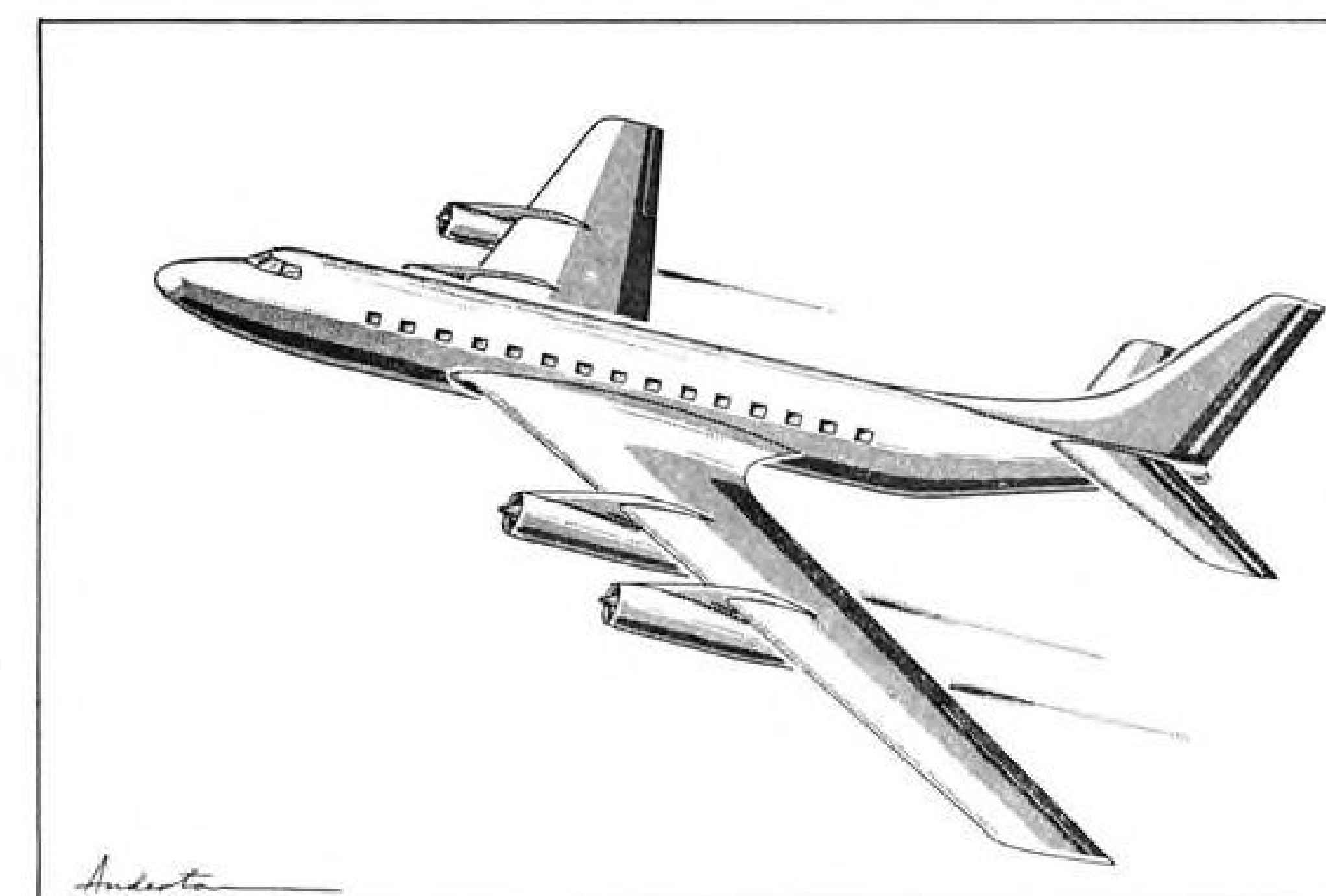
"The specific turbojet engine under consideration represents the highest state of the art in aviation gas turbine engine development to date, and further, it is scheduled for large-scale production. Consequently, its efficiency is very high for its type; and its price, because of mass production, is relatively low.

"The turboprop engine considered, on the other hand, is slightly obsolescent in design, and will be produced only in small quantities. Accordingly, its specific fuel consumption, as well as its price, is higher than might be expected."

While use of an "ideal" turboprop engine would obviously further reduce the costs of the turboprop airplane in the study, he said, no such engine will be available in the near future and "hence we feel that such an assumption would not be valid."

► **Turbojet Performance**—In his remarks on turbojet, Hoben listed these as the characteristics of the up-to-date turbojet transport airplane currently proposed by several "experienced" U. S. manufacturers:

- **Cruising speed:** 550 mph.
- **Cruising altitude:** 35,000 ft. and up.
- **Range:** transcontinental nonstop flight.
- **Engines:** four of most advanced twin-

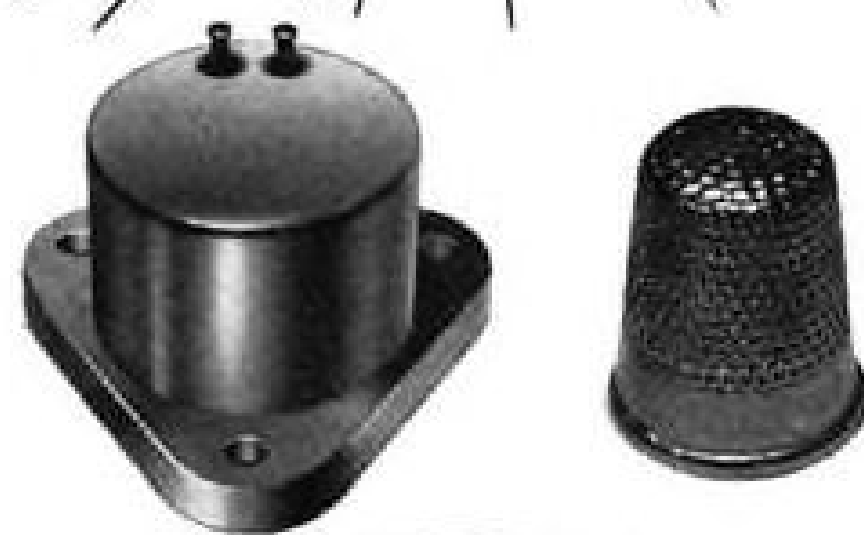


Artist's Conception of Douglas DC-8

Douglas Aircraft Co.'s present DC-8 jet transport design has a fuselage very similar to its DC-6 and DC-7 series. Wings are swept back 30 deg., with its four jet engines

mounted in pods projecting well forward of the wing's leading edge. Tail design somewhat resembles that of Boeing's sweptwing B-47 Stratojet medium bomber.

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- **Takeoff gross weight:** 175,000-200,000 lb.

Hoben said the axial-flow jet engine, particularly when mounted in pods, now offers considerable promise of equivalent safety to that of present piston installations.

"With regard to the airplane and its equipment, we have some reservations," he added. "Early types of highspeed aircraft have, in some cases, demonstrated seriously deficient control characteristics at speeds only slightly above those of normal cruise."

Cabin pressurization systems must be made more reliable for flight above 35,000 ft. than any system developed to date, he said.

► **Financial Hurdle**—"We have no real doubt that . . . safe and reliable jet airplanes can shortly become available," the airline official commented. Main obstacle to American's acceptance of turbojet aircraft is financial, he indicated. Public acceptance of the noise level is another hurdle.

"It must be realized that even a minimum fleet of 10 or 12 airplanes, with spares and ground facilities, will require an investment of about \$50 million," Hoben said. "At this price we cannot afford to make any serious mistake. We must be convinced that the airplane is right in design philosophy and right in detail design before any such commitment is made."

► **Inherent Noise**—American's study of jet noise during takeoff has been most discouraging, according to Hoben.

Noise, he said, is an inherent quality of large turbojet engines and not likely to be reduced short of radical redesign of the engine.

"There is reason to expect that annoying sound levels during takeoff will affect at least twice the ground areas now involved," he estimated. "We doubt that the public is in a frame of mind to tolerate this increase, particularly at metropolitan airports in the eastern section of the country. We are reluctant to be the first to put this theory to the practical test."

► **Premature Pioneer**—A combination of large payload required for economy and very large weight of fuel required for jet engines will necessitate takeoff gross weights of 200,000 lb. or more for transcontinental nonstop flights, Hoben forecast.

"Unfortunately," he commented, "many runways at major airports are marginal in length or structural strength at such gross weights."

Hoben summed up American's attitude toward the jet transport this way:

"As a flying machine we like it; we should like to offer the improved service that it can provide. But, frankly, we are afraid of its price, its size, its appetite for fuel, and its noise."

"This feeling may change with further development or with more experience. It could conceivably change very quickly if some bold individual buys a few jet transports for operation on a competitive route."

"There is nothing final or irrevocable about our position; but for the present we are not eager to prematurely pioneer the jet transport."



British Airlines Bid for Princess

By Nat McKittrick
(McGraw-Hill World News)

London—Saunders-Roe's huge 10-engine Princess flying boat, previously rumored as headed for the scrap heap, got a new lease on life this month when Aquila Airways expressed interest in the big plane.

Aquila, Britain's only flying boat op-

erator, told the government it would be willing to pay more than \$3 million each for the Princesses—when new engines are available.

And British Overseas Airways Corp., tipped off about the Aquila offer, suddenly found renewed interest in the big flying boats.

► **White Elephants**—Like Britain's big Bristol Brabazon, the Princess had been

considered a white elephant, and rumor was it would be junked along with the Brabazon.

After spending \$30 million on the Princesses, the British government ended up with no customers, one flyable aircraft with an inadequate engine and two other airframes in mothballs.

Upshot of this new spurt of publicity is certain to keep the big flying boats intact for a while longer anyway. However, it will be sometime before anyone can operate them.

► **Atlantic Transport**—Aquila, which this year merged with Silver City Airways, British car-ferry service, operates four-engine Short Hythes and a Short Solent four-engine flying boat on routes between Southampton and the Madeira and Canary Islands. The airline soon will announce a service between Southampton and Capri.

Aquila won't say exactly where it wants to operate the Princesses, but it certainly is looking farther afield than its present routes. Best bet: trans-Atlantic service, perhaps to the West Indies.

The Princess, with its present Bristol Proteus 2 engines, is designed to carry 100-plus passengers 5,500 mi. With the right engines, it could carry 200 passengers a nonstop distance of 3,550 mi.

► **Viewed With Suspicion**—Aquila made the offer in response to a questionnaire sent out by Britain's Ministry of Supply, legal owners of the Princesses. BOAC apparently heard of the offer before it was made public, came out with this announcement:

"BOAC will co-operate with the government and the Saunders-Roe Co. in the operational development of the Princess. . . It should be possible to operate the Princess on most of BOAC's present Commonwealth and Atlantic routes."

Aquila management made it clear it regarded this sudden renewal of interest with the utmost suspicion. Relations between the big nationalized corporations and the private operators in Britain are not good. BOAC doesn't like the idea of independents operating services that it might provide at a profit.

► **Increased Power**—The Princess was to be powered by four coupled Proteus 2 turboprops plus two single Proteus 2s. The one Princess now flying has those engines. But the Proteus 2 was scrapped as inadequate more than a year ago.

Its successor is the Proteus 3, most advanced version of which is rated at 3,650 shaft horsepower, plus 1,320 lb. thrust. The latter probably could propel the Princess at 380 mph. over a still air range of 5,500 mi.

For sometime ahead, the proposed production of the later Proteus turboprops will be earmarked for the Bristol Britannia transport. But Bristol announced last week that the engines

would be available eventually for use in the Princess.

The company figures the increased power of the later Proteus will make coupled installations on the Princess unnecessary. The assumption is that a Proteus 3-powered Princess would have fewer than 10 engines, all single installations. Present Princess has two Proteus engines for each pair of contra-rotating props on the four inboard nacelles, one engine for each of the two outboard nacelles.

Specifications on the present Princess: span 219 ft. 6 in.; length 148 ft.; height 55 ft. 9 in.; gross weight 315,000 lb.

SHORTLINES

► **Aircoach Transport Assn.** member companies have more than doubled military passengers carried per month from about 7,000 to more than 15,000, and increased passenger miles from 12 million to 23 million. Revenue has grown in proportion but ACTA's commission for developing the business has been reduced from 10% to 5%.

► **Bonanza Airlines** has started one roundtrip daily service from McCarran Field, Las Vegas, Nev., to Death Valley, Calif., the first scheduled carrier to provide such service.

► **British European Airways** increased its passengers carried during the fiscal year ending Mar. 31 from 1.4 million the year previous to 1,596,000. Revenue earned increased from \$35,386,400 to \$38,701,600.

► **Lake Central Airlines** has observed its fourth anniversary of continuous scheduled flight operations without a fatal accident and has won CAB approval to extend its certificate of public convenience and necessity for its airmail route until Jan. 1, 1956.

► **Linea Aeropostal Venezolana**, government-owned airline of Venezuela, has begun that nation's first scheduled commercial flights to Europe. Flights depart each Sunday by way of Bermuda and the Azores for Lisbon, Portugal.

► **North Central Airlines** has carried more than a half-million revenue passengers in its six years of operation, 28.5% of whom were carried this year.

► **Seaboard & Western Airlines** reports its commercial and military operations over the Atlantic and Pacific during September were 3% higher than the same month last year.



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BY THE MCGRAW-HILL DEPARTMENT OF ECONOMICS

Income Changes Make New Travel Market

Air Transportation Is Expected to Attract Greater Share of Each New Dollar Added to Earnings of Growing Middle-Class Group.

THERE'S BEEN A STRIKING CHANGE—it's been called a revolution—in the facts about the incomes Americans earn. The revolution has been going on for a good many years, and it has made a major contribution to building the potential market for air transportation. Here's what has happened, and is likely to happen in the next few years, to the size and distribution of American incomes.

1) INCOMES HAVE GROWN SHARPLY since before the war. Total personal income after taxes went up by 77.6% between 1939 and the middle of 1953, even after the effects of price inflation have been taken out. Income per person has not grown so fast, because the population has been expanding rapidly (see AVIATION WEEK Oct. 19, p. 97). But it's up substantially—about 46% since 1939, even allowing for the big increase in the share going to the government in income taxes.

Income growth has had a major effect on people's ability to pay for travel, which for many persons constitutes a luxury. In fact, the effect on ability to indulge in the good things of life (such as air travel) has probably grown even faster than income. The reason is that much of the income added since 1940 falls into the class of "supernumerary income"—the amount left over after people have provided for their most basic needs for food, clothing and shelter. In other words, people are fairly free in making decisions on how to spend this income. They can spend it for the product or service they find most attractive.

Since the American people are in general well fed, clothed and housed today, most future increases in per capita income will fall into this supernumerary category. Thus, air transportation stands to get a greater share of each added dollar of consumer income in the future, provided its service is made sufficiently attractive.

Incomes are not likely to grow as fast in the next few years as they have since 1940. The chief reason is simply that the number of people working and producing income won't be growing as fast. The number of people in the most active working ages—20 to 64 years—grew 13.5% between 1940 and 1950, but will probably expand by only about 6%-7% between 1950 and 1960. Growth in average income per person will be held back by this slower growth in the labor force. But from the point of view of the air transport industry, the fact that most increases in income will be over and above the basic living requirements of the population may more than offset the slower rate of total increase.

2) THERE HAS BEEN A DRASTIC CHANGE in the distribution of income among the American people. Incomes have moved a long way toward equality, and a tremendous middle-class income group has been created in

the process. Back in 1929, people in the middle-income brackets accounted for only 29% of all consumer income. By 1951, they were receiving almost half of all consumer income. (As used here, "middle income" means \$3,000-\$7,500 a year, in 1951 dollars.) And these figures refer to income before taxes. Income taxes have carried the equalization process even further. As an illustration: The top 1% of the population got 18.9% of income after taxes in 1929; by 1948, this group's share was down to 7.2%.

The trend to more equal incomes probably will go more slowly in the future. Some of the influences that caused it—like the highly progressive income tax—have gone about as far as they seem likely to go for a while. Then, too, there's not too much room left for change before incomes actually do become equal. But incomes may continue to move slowly toward equality over the next few years, especially if the nation continues to be prosperous. Prosperity means full employment, or close to it. And full employment—high demand for workers—is one of the major causes of the shift in income distribution. When workers are in demand, their wages tend to rise faster than dividends, interest payments and executive salaries—sources of income for the upper-income groups. So incomes move closer together.

What does more equality in incomes mean to the air transport business? It is a major asset for any industry that wants to build a mass market—especially for a fairly costly service like air transportation.

With the current income distribution, any increase in national income increases the incomes of a large number of potential air passengers. Under the 1929 distribution, about 19% of any increase in income might have gone to 1% of the population, while the vast majority of people—in the lower-income groups—would have experienced very little increase in their ability to buy.

However, this income distribution only means that more consumers will become more able to buy air travel as incomes rise. It does not mean that they will buy it.

A large part of American industry is bidding heavily—with automobiles, new homes, appliances and other good things—for the dollars of the new middle class. Competition for these dollars will get steadily tougher in the next few years.

3) INCOMES ARE ALSO MOVING toward equality among the different regions of the country. Back in 1929, per capita income in the Middle Atlantic states was more than 2½ times as great as in the Southeast. In the past two decades, the gap between the poorest and richest region has narrowed by about 40%. Relative improvement in incomes in the less well-to-do regions may turn them into better sources of air travel in the future.

Future articles in this series will discuss the major factors affecting air travel in the changing economy: leisure time; changes in business travel; relationship between air travel and general business activity. Earlier installments Oct. 12 and Oct. 19.

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NEWS SIDELIGHTS

Lockheed's Kelly Johnson has been taking a lot of kidding on his recent SAE paper extolling the virtues of straightwing design, was introduced at a recent meeting as the founder of a new Greek fraternity: No Delta Wing.

Rapid labor turnover in the aircraft industry is demonstrated by expansion plans of the Douglas-El Segundo Division. Plans call for expansion of the division to about 26,000 by next November, against 19,500 at present. To increase the size of the El Segundo unit by 7,000 workers, Douglas officials estimate they will have to hire 14,000.

To check ground handling characteristics of the jet transport it is building, Boeing has been using a B-47 to simulate a carrier, taxiing it up to and away from passenger loading ramps. Tests indicate jet blast as a passenger hazard will not be a problem.

Maj. Gen. Albert Boyd, commander of Wright Air Development Center, and Lt. Col. F. K. (Pete) Everest, who flew the F-100 to a new 15-km. speed record, have checked out in the Douglas F4D.

Howard Hughes had something to smile about this month. While workers at North American Aviation were walking the picket line and other firms were deep in negotiation, Hughes Aircraft Co. and the Aircraft Industry Workers Local 1533 (AFL) quietly signed a new two-year agreement. Terms call for a five-cent-an-hour general increase plus a one-cent cost-of-living boost.

Los Angeles Chamber of Commerce finally has admitted the existence of smog as a hazard to aerial navigation. A recent flyers' guide prepared by the California Aeronautics Commission in cooperation with the L. A. Chamber notes: "We must learn to fly in restricted visibility if the airplane is to have maximum utility in Southern California." The guide gives a step-by-step procedure for visiting flyers to follow when approaching airports in the Los Angeles area under smog conditions. It was published by Pacific Airmotive Corp. as a public service. Free copies are available from PAC, 2940 North Hollywood Way, Burbank, or from the L. A. Chamber.

Failure of the Lockheed board of directors to declare a quarterly dividend at their meeting early this month caused such a fuss that the company issued a statement by President Robert E. Gross to quiet the rumors. "The unusually high volume of the company's activities this year prompted the directors to feel that it was more appropriate to wait and give the matter special consideration (at a meeting later this month) rather than treat it in a routine manner," the Gross statement said.

Convair has a problem at Ft. Worth. B-36 work there will phase out some months before work on the B-58 phases in. Company officials are worrying over how to fill the gap. Convair had hoped to get the C-123 contract to fill the gap, but now must look elsewhere after losing out to Fairchild.

In a reverse of the usual trend, the human pilot was tabbed as indispensable in a recent Los Angeles speech by Frederick H. Green of the preliminary design section of AiResearch: "For some control functions human beings are more efficient because they occupy less space and weigh less."

Here is one indication of how long the CAB nonsked hearings on the West Coast may be expected to continue. One of the CAB examiners assigned to the case has rented his home in Washington and moved his family to California.

Harvey Aluminum turned up at the Senate subcommittee titanium hearings in Los Angeles with an extruded longeron roughly 6 ft. in length. Without giving further details, the company said the titanium part was for "a Lockheed aircraft." This presumably would be the prototype F-104 now under construction, since the weight-saving might be worth the cost in a light-weight fighter.

AVIATION CALENDAR

- Nov. 23-24—Operations Research Society of America, fall national meeting, Statler Hotel, Boston.
- Nov. 29-30—Society for Advancement of Management Conference, Hotel Statler, New York.
- Nov. 30-Dec. 1—Fifth annual Air Cargo Day, ASME, Hotel Statler, New York.
- Nov. 30-Dec. 2—American Society of Mechanical Engineers, annual meeting, Hotel Statler, New York.
- Dec. 1-2—ASME's Frequency Response Symposium, Hotel Statler, New York.
- Dec. 1-2—Second annual Heavy Press Program, ASME, covering helicopter transmission design features and turbojet components, Hotel Statler, New York. Luncheon honoring engineers' contribution to powered flight by ASME and IAS.
- Dec. 7—Civil Aeronautics Board, second session of annual meeting on review of Civil Air Regulations, inter-departmental auditorium, Washington, D. C.
- Dec. 17—Seventeenth Wright Brothers Lecture, U. S. Chamber of Commerce building, Washington, D. C. Aero Club Wright Memorial Dinner, Hotel Statler.
- Dec. 17—Royal Aero Club dinner commemorating 50th anniversary of powered flight, Dorchester Hotel, London.
- Jan. 10-12—Institute of Surplus Dealers, trade show and convention, Madison Square Garden, New York.
- Jan. 18-22—American Institute of Electrical Engineers, winter meeting, Hotel Statler, New York.
- Jan. 20-22—Operations Research in Production and Inventory Control, Case Institute of Technology, Cleveland. Speakers include Paul Stillson of Lockheed Aircraft Military Operations Research Division.
- Jan. 25-28—Plant Maintenance & Engineering Show, International Amphitheater, Chicago. Conference will be held concurrently at the Hotel Conrad Hilton.
- Jan. 25-29—Institute of the Aeronautical Sciences, 22nd annual meeting, Hotel Astor, New York. Honors Night Dinner Jan. 25.
- Feb. 3-5—Society of Plastics Industry, ninth annual division conference on reinforced plastics, Edgewater Beach Hotel, Chicago.
- Mar. 22-25—Institute of Radio Engineers, national convention, Waldorf Astoria Hotel and Kingsbridge Armory, New York.
- Apr. 5-6—Society of the Plastics Industry (Canada), Inc., 12th annual conference, Mount Royal Hotel, Montreal.
- Apr. 29-30—American Society of Tool Engineers, 10th biennial industrial exposition, Convention Center, Philadelphia.
- May 5-7—Third International Aviation Trade Show, sponsored by Aircraft Trade Shows, Inc., 71st Regiment Armory, New York.
- May 12-14—Engineering Institute of Canada, annual meeting, Quebec.
- May 17-20—Basic Materials Exposition and Conference, International Amphitheater, Chicago.
- May 31-June 11—Canadian International Trade Fair, to be held in conjunction with the National Air Show at Toronto. Canada's Aviation Day will be marked on the final day of the trade show.
- Sept. 13-24—First International Instrument Congress and Exposition, Commercial Museum and Auditorium, Philadelphia.

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Critical Times for Cargo Lines

The momentous one-year experiment launched by the Post Office Department to carry ordinary three-cent mail by air between New York-Chicago and Chicago-Washington opens up possibilities of a tremendous traffic market for aviation. But in the early stages it appears to offer mixed blessing.

For economic reasons, there is still no great enthusiasm on the part of the participating airlines, and considerable questioning. Mail-carrying air carriers need to know what such traffic will or would represent in income and expenses, how regular airmail rates will be affected, whether lines now getting subsidies will get new rates.

Meanwhile, Civil Aeronautics Board holds that the only airlines eligible to carry mail are those whose certificates specifically include mail privileges. All scheduled passenger lines possess mail certification, as well. This appears to keep the unsubsidized airfreight carriers out of whatever further market develops in mail transportation. Mail is not interpreted as cargo. This strict interpretation of the Board comes at a time when the cargo carriers are fighting to keep their heads above water.

"If the passenger lines are successful in keeping the freight carriers out of this three-cent mail," one airfreight observer told AVIATION WEEK, "the freighter's position is critical, for they can then assure themselves basic freight loads which will enable them to render an all-round service that the freight lines will find it difficult to match. The potential in three-cent mail is so great that if the cargo companies cannot participate in this nonsubsidized, government traffic, they are eliminated from the right to bid for one of the biggest—if not the single biggest—pieces of freight business in the country."

CAB says it cannot grant holders of freight certificates any mail rights whatever without first requiring the traditional involved legal procedure petitioning for another certificate. In other words, the cargo carriers probably would be compelled to start from scratch.

Robert W. Prescott, president of the Flying Tiger Line, told a San Diego audience that "the future of civil aviation is in danger of falling into the hands of a stifling monopoly," and called the current situation one of "special privilege that would limit all future progress to the hands of a few." The founder of the country's first all-freight airline urged aviation to "look forward as well as back" on its golden anniversary.

Prescott, the fighting tiger, said "historical accident bequeathed 'grandfather rights' to a handful of passenger lines, then (1938) struggling in starvation and bankruptcy. Unfortunately, these operators appear to have regarded the Civil Aeronautics Act, and its accompanying subsidy, not as a tool to promote the air transport industry for the good of all the people, but rather as a great bonanza to themselves. They have banded together into one of the strongest Washington lobbies

in existence today for what appears to be two express purposes: (1) protect and increase their own subsidies; (2) keep out, by the use of the law of the jungle, any possible competition from any newcomer to the field of aviation."

Prescott repeated the frequent comment of the non-scheduled carriers, that "not one single passenger trunk-line has been certificated in competition to these 'grandfather' lines in the 15 years that have passed since passage of the Civil Aeronautics Act."

Prescott said "had it not been for the overwhelming proof that we offered the CAB, at a cost of hundreds of thousands of dollars in hearing expense and law fees, that airfreight service was needed in this country . . . we would not have gained even the temporary certificate we now hold."

These certificates, Prescott pointed out, "contain specific provisions denying us subsidy, the right to carry U. S. mail, or air express or, in effect, do anything that offers any possible competition to the subsidized passenger airlines."

The airfreight carriers last year moved 240 million lb. of freight, Prescott said, "of which nearly one-half was transported by the nation's two freight carriers in competition with 18 subsidized lines." This year the industry would develop nearly \$60 million worth of traffic. "Yet the slow strangling by our passenger competitors may yet sound a death knell for us, because of a government dictum that thus far permits only passenger lines to carry on the current experiment in moving first-class mail by air."

Prescott said the freight lines proposed this idea in 1947 and made the claim that it probably could save the government \$40 to \$50 million a year by reducing the cost of airmail.

"Recently, the Post Office, eager to get rid of high-cost mail pay at 45 cents a ton-mile, announced it was going to try an experiment and haul three-cent mail by air. The rate offered by the Post Office was 18.6 cents a ton-mile. We were the only ones in line waiting to take it.

"The grandfather lines announced that they would fly it if the government would make up by subsidy any loss of revenue of the 45 cent per ton-mile traffic. However, the Post Office declined. The CAB offered its blessing to the experiment and the project was begun. But here is the hitch: Only the grandfather lines who have steadily fought the project since 1947, when we first proposed it, and who stand to lose the most if the experiment is successful, were given the right to fly it."

The cargo carriers, born in labor and strife, now face the prospect of deciding whether to fight for the renewal of their certificates—soon to expire—in the face of heavy obstacles, or to run up the white flag. The best and most economical public service is the only issue; Washington officials have some heavy thinking ahead of them before they dare to let these unsubsidized operators go out of business.

—Robert H. Wood

AVIATION WEEK, November 23, 1953

BLIND FLYING...

another Sperry first... 1929

"Blind" flying has an interesting history. For years many people had flown "blind" on occasion through clouds. And in 1926, William C. Ocker proved man's physiological inability to fly "blind" without instruments. His experiments, based on the Sperry-developed Turn and Bank Indicator, helped pilots understand and use flight instruments. The era of dependable all-weather flying did not begin, however, until Lieutenant "Jimmy" Doolittle made his historic "blind" flight in 1929. With the aid of two new Sperry instruments—an artificial horizon and a gyroscopic directional indicator—he led the way to dependable all-weather flying.

TODAY, AS THEN, SPERRY LEADS THE WAY

Twenty-four years have passed since the Doolittle flight. In those years Sperry has pioneered in development after development, utilizing electronics to make earlier instruments more precise, and to provide still greater mastery of the elements. With the Sperry Zero Reader* Flight Director, for example, military pilots now manually fly and navigate at supersonic speeds with accuracy and precision approaching that of automatic flight—and, with Sperry armament can intercept and destroy enemy aircraft unseen by human eyes.

*U. S. REG. U. S. PAT. OFF.

1932 Captain A. F. Hegenberger in Douglas BT-2A makes first solo "blind" flight and landing at Wright Field, with Sperry Gyro-Horizon and Directional Gyro.



1936 Air Corps Major Ira Eaker, left, makes first transcontinental "blind" flight—and alone—in BT-2A, equipped with Sperry Gyro-Horizon and Directional Gyro. Major William E. Kepner pilots escort plane.



1929 In covered cockpit of his NY-2, Lieutenant "Jimmy" Doolittle, using Gyro-Horizon and Directional Gyro makes first "blind" flight including take-off and landing. Lieutenant Ben Kelsey acts as check pilot.



1941-45 Sperry flight instruments enable U. S. Navy and Marine fliers to operate from carriers, day or night. Airborne radar helps pilots locate enemy aircraft and submarines.



1953 The Sperry Zero Reader Flight Director in conjunction with radar aids interception at high altitudes, day or night.

SPERRY **GYROSCOPE COMPANY**
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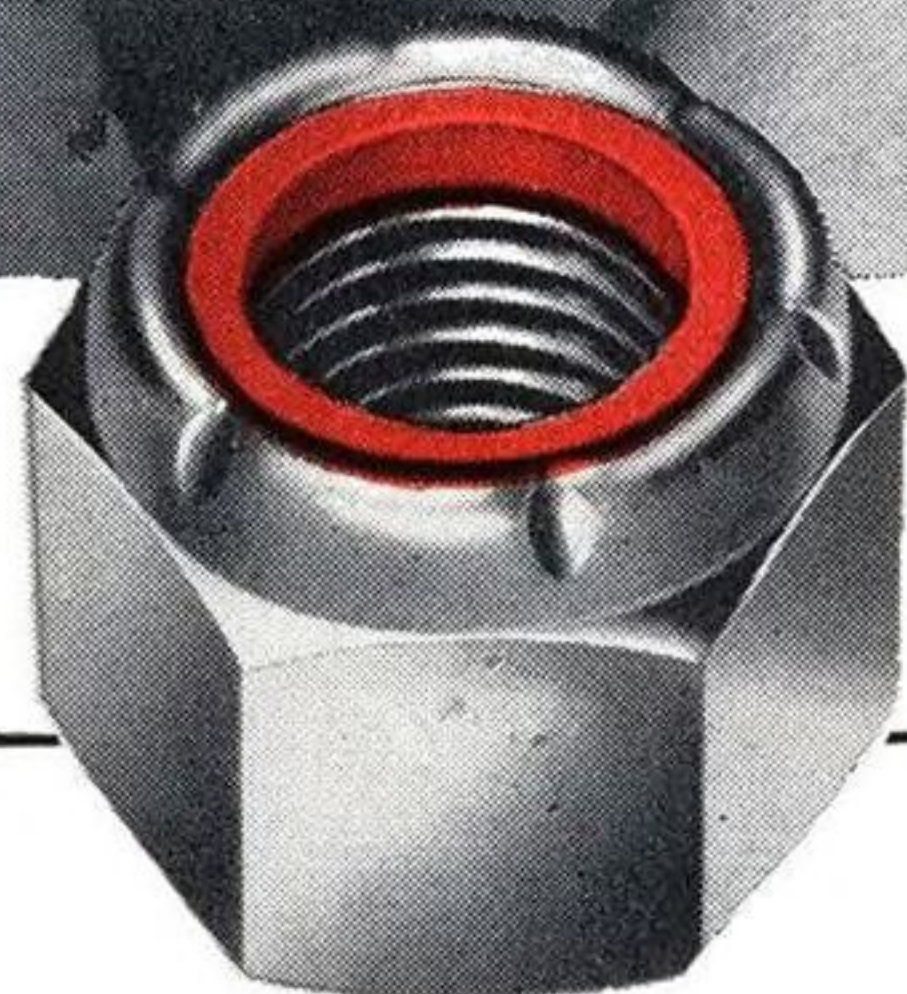
One of a series of advertisements commemorating the Fiftieth Anniversary of Powered Flight.

Wobble means wear

Formula for Failure

$$\frac{w + e + s + \alpha}{\times v} =$$

a loose
connection



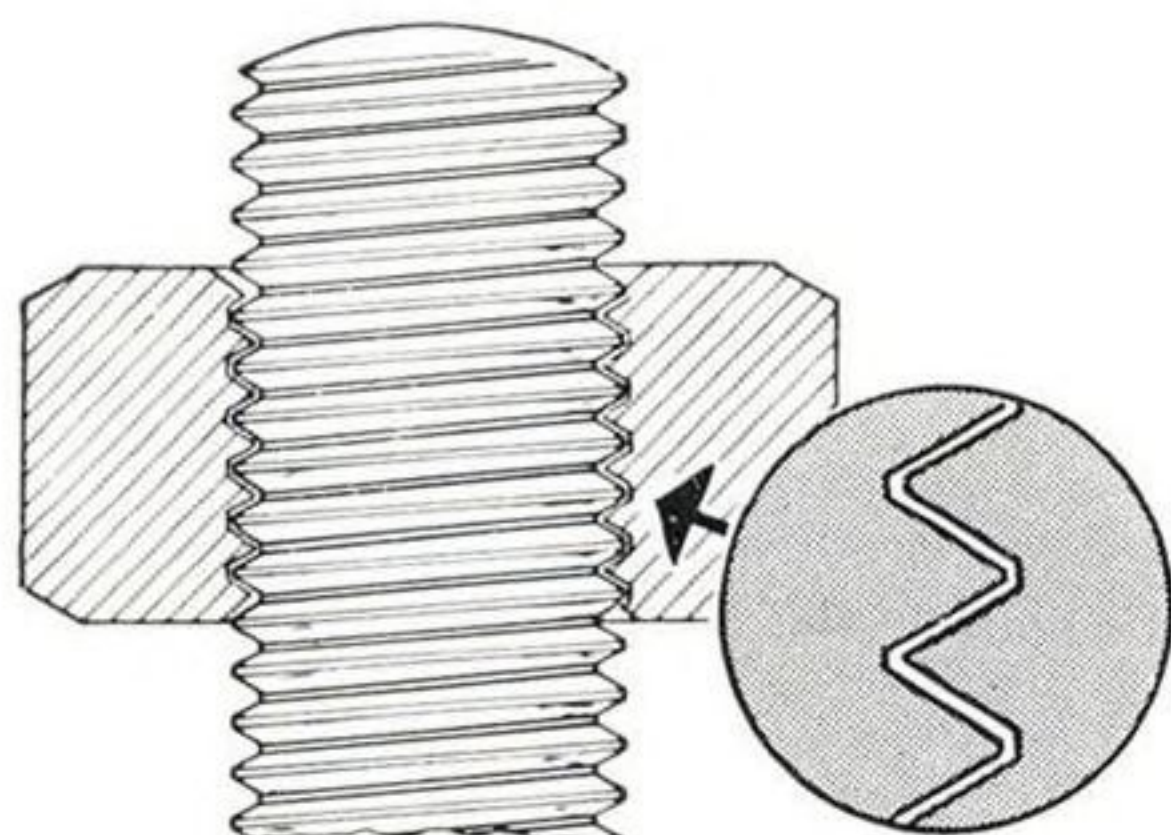
Elastic Stop nuts can't wobble

Formula for Failure—[(w) Initial thread wear + (e) bolt stretch + (s) thermal expansion or contraction + (α) wobble] × (v) vibration = a loose connection.

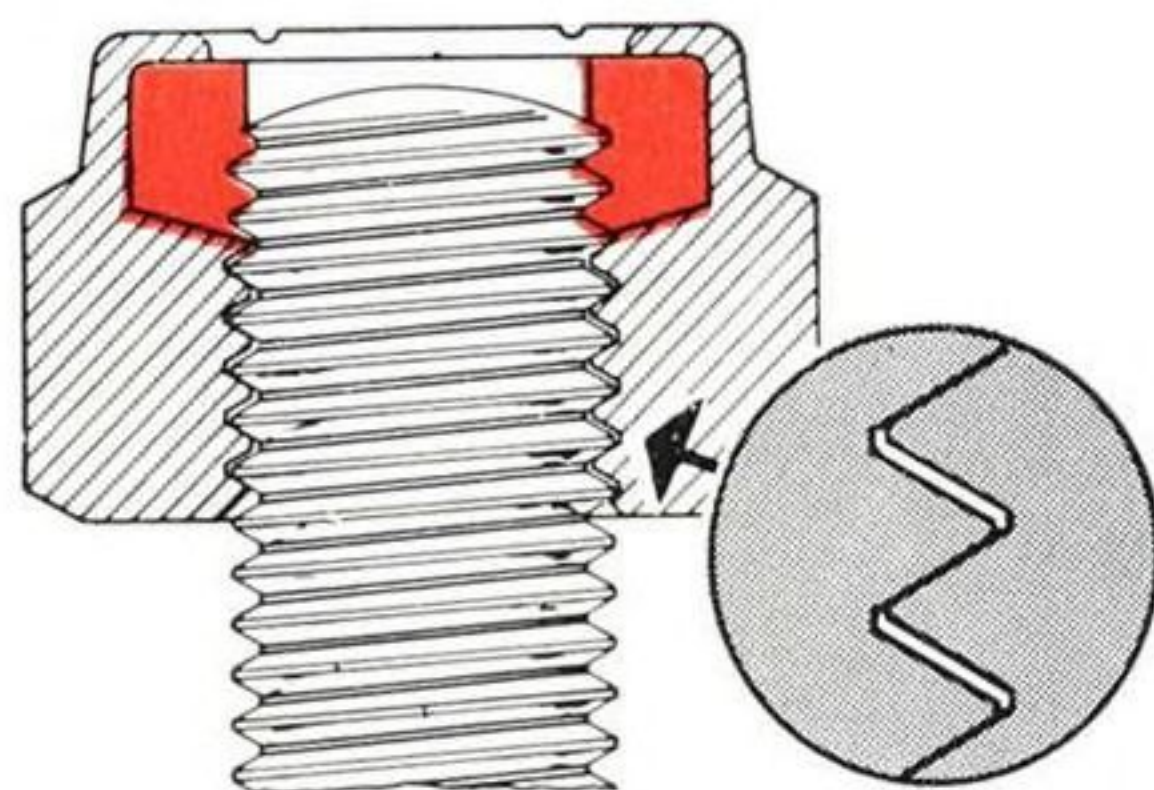
WOBBLE, permitted by normal axial thread play, and vibration are two of the major elements contributing to thread wear, loose connections and ultimate failure of a threaded fastener.

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