

AVIATION WEEK

MAY 21, 1951

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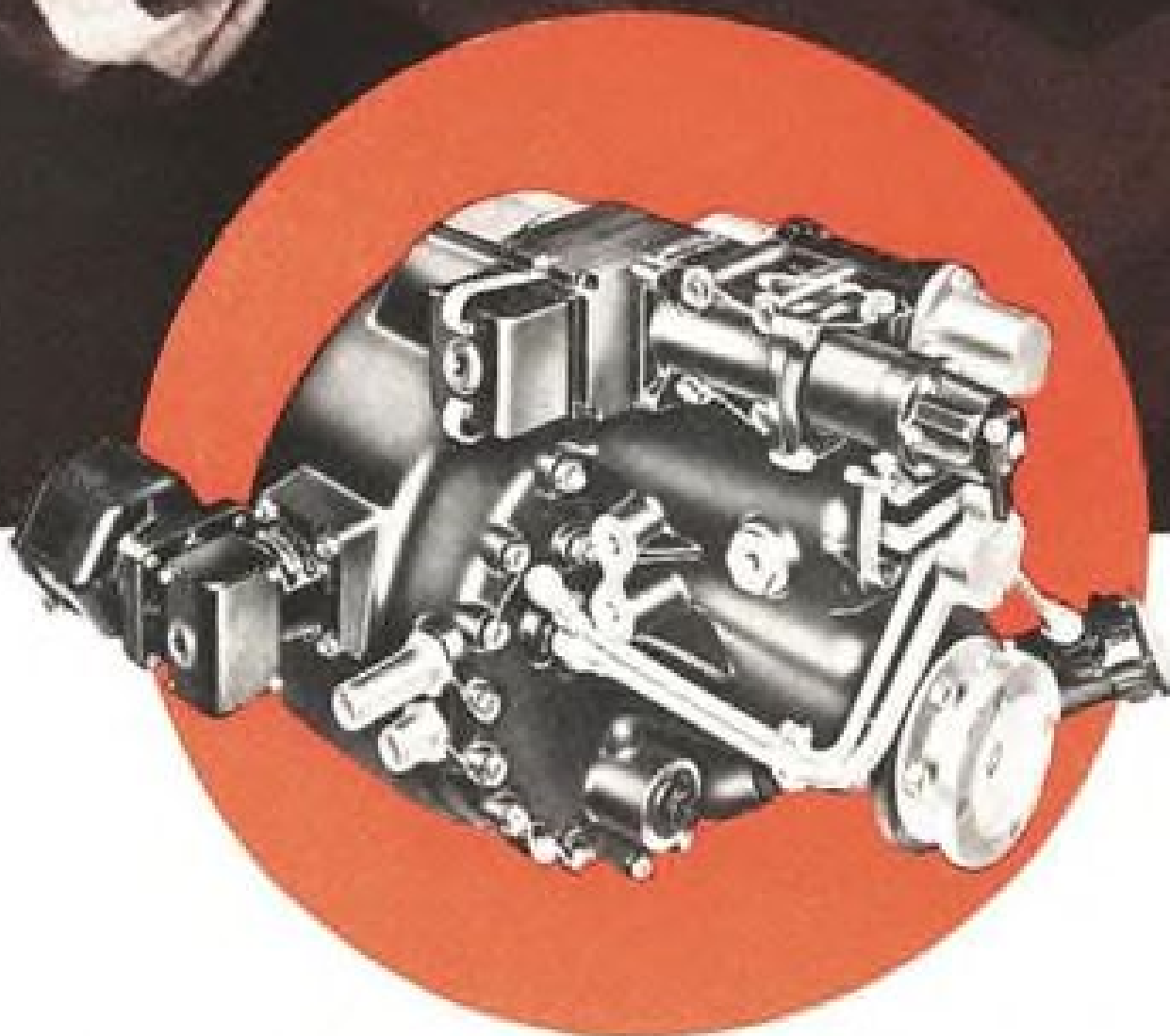
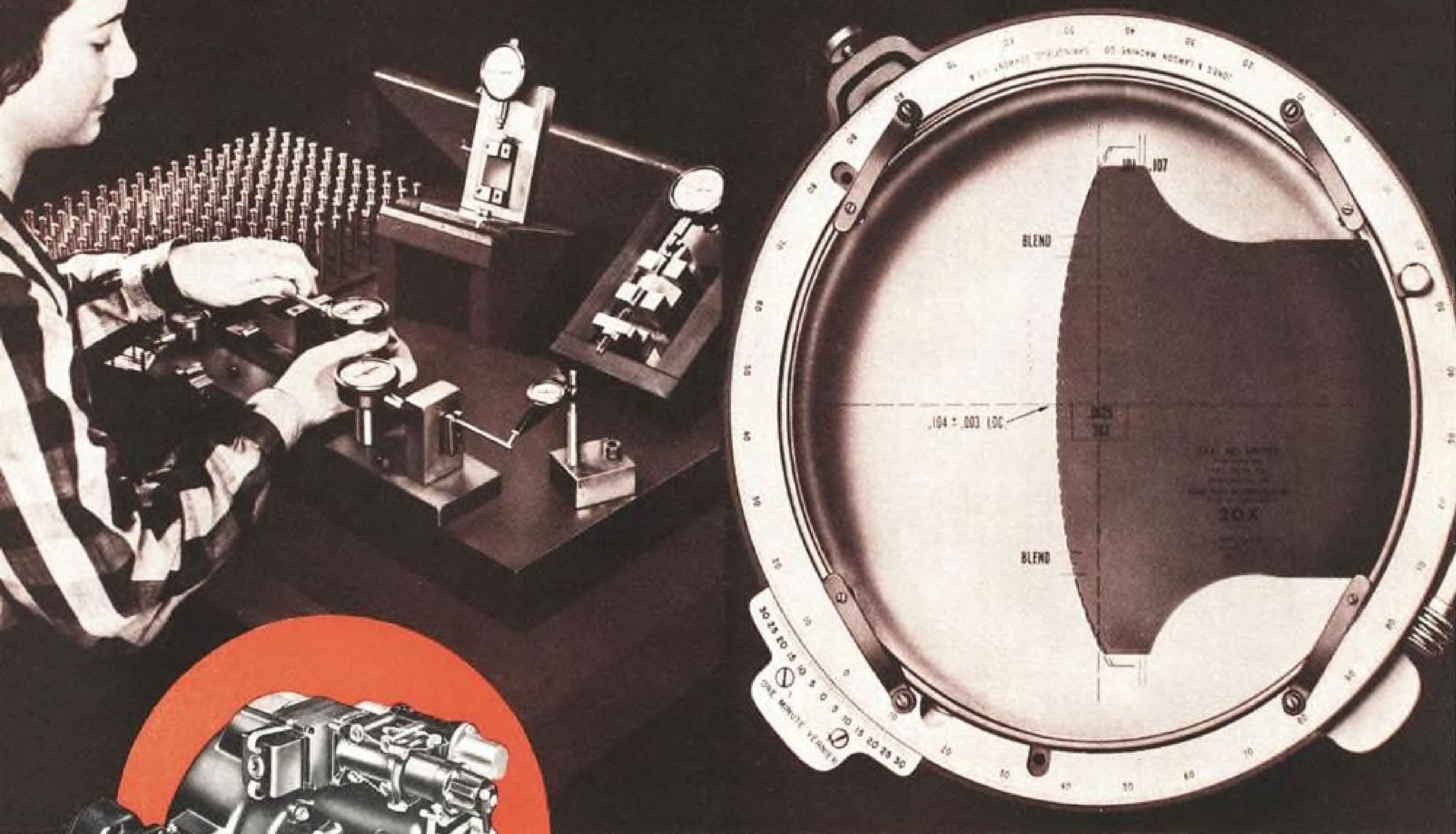
SUBMARINES BEWARE!

A fast lens catches a GRUMMAN GUARDIAN in mid-air close-up. Two versions of this carrier-based plane work together to protect ships of the U.S. Navy from submarine attack. Some GUARDIANS carry powerful detection devices. When these "hunters" locate an undersea enemy, more heavily armed, bomb-carrying GUARDIANS like the one shown here, come in for

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE,

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HOW Sundstrand uses quality control to insure alternator drive performance!



"100% inspection" assures *uniformity* of parts for alternator drives...

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An advanced system of scientific inspection procedures has been set up to cover every step in the production of every part that goes into constant speed alternator drives for the B-36. As an example, piston rods undergo 100% inspection. Individual rods are verified on electronic gages after each precision operation. When completed, each rod has every external and internal dimension checked precisely. Profiles must meet exacting standards... straightness and roundness conform to rigid requirements. Many tolerances are held within $\frac{.0005}{1,000,000}$ of an inch!

This constant striving to assure *uniformity* and *safety* is an essential ingredient in Sundstrand's *reliable* research, *expert* engineering, and *precision* production of specialized aircraft hydraulic products.



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B.F. Goodrich



Weight taken from plane's brakes goes into its wallop

THE NAVY NEPTUNE tracks down "snorkels" with electronic search equipment that these ordinarily radar-proof subs can't hide from. And it packs a powerful wallop with torpedoes, rockets, cannon, and machine guns.

But carrying all this equipment gave Lockheed designers a problem. Every possible pound had to be trimmed off the Neptune's empty weight. When it came to the wheel and brake assembly, they put the problem up to B.F. Goodrich.

B.F. Goodrich brakes can be designed lighter for a given amount of kinetic energy than any other brake because of expander tube design. The brake lining

in new-design B. F. Goodrich Expander Tube brakes is mounted on magnesium shoes—a construction that is lighter, yet gives longer wear. The brake has a new spider-type frame that's both lighter and stronger. And the wheels themselves are light, strong magnesium castings. As a result, B. F. Goodrich wheel and brake assemblies enabled designers of the Lockheed P2V Neptune to save a sizeable amount of weight over other designs.

The BFG brakes also provide smoother, safer landings. They respond smoothly and quickly to minimum pressure, take emergency overloads better,

cannot lock or grab. Plane utilization is increased because there's less in-shop time. Loads are evenly distributed, reducing wear on brake parts. Maintenance is cut.

The new B. F. Goodrich wheel and brake assembly is one of many effective solutions to aviation problems developed by B. F. Goodrich research and engineering. The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.

B.F. Goodrich
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- Aircraft Spark Plug Connectors
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Aviation Week



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Editorial Offices: 330 West 42nd St., New York 18, N. Y., Phone Longacre 4-3035
National Press Bldg., Washington 4, D. C., Phone National 3414.

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NORTH AMERICAN AVIATION INC.

16 YEARS


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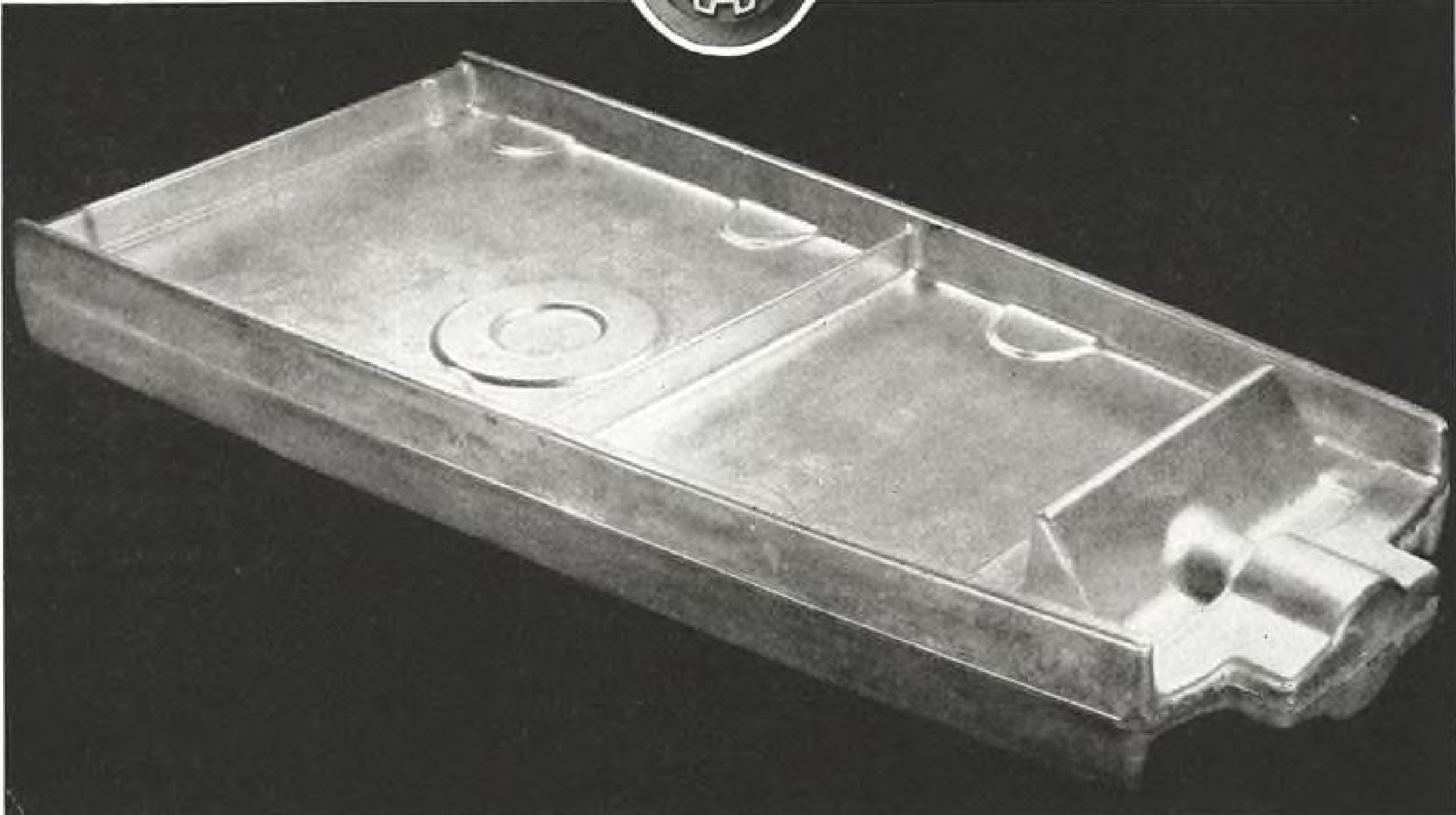
Since World War II, North American Aviation, Inc. has resolutely concentrated on the development and building of better and better military planes like the Air Force F-86 Sabre Jet Fighter, B-45 Tornado Bomber, T-28 Trainer, and the Navy AJ-1 Attack Bomber. Such a policy puts an extra burden on their design staff. When it comes to ball bearings, North American has turned to Fafnir . . . an association of 16 years. This can be attributed to Fafnir's ability to offer more than just good bearings. It's an attitude and aptitude . . . a way of looking at ball bearings from the designer's side, an aptitude gained from more than twenty years' specialization in aircraft ball bearings. The Fafnir Bearing Company, New Britain, Connecticut.

Fafnir Track Roller Bearings . . . one of the Fafnir Aircraft Type Ball Bearings specified by North American. Heavy section outer ring with convex exterior contour produces minimum track wear and compensates for errors in component parts. Strong inner



ring and full ball complement insures rigidity and high capacity. Efficient Fafnir Plya-Seals prevent loss of lubricant and entrance of contaminants.





Are you taking full advantage of the constantly growing range of forgings?

Typical is this aluminum alloy forging with a projected area of more than 1,000 square inches used in the wing structure of a modern military bomber. Such forgings are today made possible by the use of the largest die forging press in America (18,000 tons). For hammer or press die forgings of aluminum, magnesium or steel, Wyman-Gordon engineers are ready to serve you—there is no substitute for Wyman-Gordon experience.

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NEWS DIGEST

DOMESTIC

Wilys-Overland Motors, Inc. has received a contract to tool for production of landing gear for the C-119. Contract exceeds \$3 million.

Cessna has received orders for more than 1000 additional L-19 all-metal liaison planes, bringing its Army contracts for this type up to more than 2000 planes. The firm has established a \$10-million line of credit in the form of a Regulation V-type credit agreement.

First U. S.-registered DH Dove to be delivered from England to this country by air has flown the Atlantic in 28 hr. flying time against prevailing winds. Stops were made at Reykjavik, Blue West, Goose Bay and Dorval. The Dove light transport is being delivered E. A. Hall of New Mexico.

Last of 22 B-36As have been converted to advanced RB-36E standards by Convair at Ft. Worth for delivery to the USAF. Modifications include installation of 3500-hp. P&W Wasp Majors in place of the 3000-hp. Wasp Majors formerly fitted, also installation of four GE J-47 jets in pods beneath the wings.

Max Conrad set an unofficial cross-country record for lightplanes by flying a modified Piper Pacer non-stop approximately 2460 mi. from Los Angeles to New York in 23 hr. 4 min.

FINANCIAL

Northrop Aircraft, Inc. has negotiated a \$9-million line of credit with a group of New York and California banks to strengthen its working capital. New arrangement was also concluded with the Reconstruction Finance Corp. Company reduced its RFC loan to \$3.5 million, and obtained an additional \$1.5-million credit.

Lear, Inc. reports loss of \$22,131 for the year ending Dec. 31, 1950, on income of \$7,973,937. Sales in 1949 of \$7,370,000 yielded a profit of \$510,000. Lear says 1950 results were due to heavy pre-production costs. Mar. 31 backlog was \$30,928,000.

Trans World Airlines reports net income after taxes of \$150,068 for the first quarter of 1951 on operating revenues of \$29,773,281. This is the first first-quarter profit since 1945. For the same period last year, TWA had operating revenues of \$21,235,162, and lost \$1,846,704.

Chicago & Southern Air Lines reports net income of \$224,327 for the first quarter of 1951 after taxes and special adjustments on operating revenues of \$3,405,299. Before reserve for foreign operations and profit on sales of aircraft, net after taxes was \$74,569. In like period of 1950, operating revenues of \$2,864,180 brought loss of \$72,715.

Flying Tiger Line reports revenues of \$3,857,163 for the third quarter of its fiscal year, ending Mar. 31, and profit after taxes of \$96,905.

Capital Airlines reports net profit for 1950 of \$1,160,031 after taxes and special adjustments on operating revenues of \$23,090,816. Normal income after taxes was increased by a \$93,190 profit on conversion of debentures. For the preceding year, profit after taxes and adjustments was \$1,681,671, but \$847,493 of it was profit on debenture conversion.

INTERNATIONAL

Philippine Air Lines' dispute, which resulted in resignation of President Andres Soriano and four of his top executives, was expected to be formally settled last week, with Soriano winning the decision. President of the Philippines' Quirino and Col. Soriano publicly announced they had "agreed to agree" on a new contract which would sharply define the future roles to be played by the private enterprise management and government members on the carrier's board.

Royal Air Force has placed a production order for its first sweptback wing fighter, the Supermarine "Swift" based on the experimental Model 510. The Swift will be powered by a Rolls-Royce engine.

New women's speed record has been set by Jacqueline Auriol, daughter-in-law of the French president, piloting a French-built Vampire jet fighter at 509.245 mph. Previous record, held by Jacqueline Cochran, was 469.549 mph., set in a modified F-51 piston-engine fighter.

New order for two de Havilland Comet jet transports has been placed by the French airline, Chargeurs Reunis S. A. Delivery is scheduled for the autumn of 1952. Planes will be operated by a subsidiary, Union Aeromarine de Transport, which flies from Paris to Africa and Indo-China.

Motor driven CONTROL STICK

VIBRATOR

(easy to install)



The Airborne Control Stick Vibrator is a

light weight reliable unit to indicate to the pilot the approach of a stall, and may be used to indicate any condition desired. When energized from a suitable stall measuring device, the Vibrator exerts a force of approximately 7 pounds at the point of attachment and at a frequency of approximately 1500 cycles per minute.

The Vibrator develops its force from the centrifugal force of an unbalanced rotor driven through gearing from a high speed, 26 volt series motor. The motor meets all requirements of AN-M-40 except radio noise.

Currently, the Control Stick Vibrator is being used on the McDonnell F2H "Banshee."



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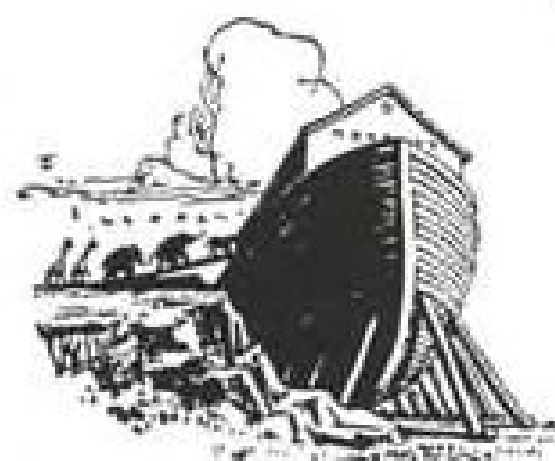
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Designed to carry a useful load greater than its weight, empty... a spacious compartment to accommodate bulk cargo or rolling stock... a power actuated ramp to facilitate loading and unloading. AVITRUC—the airplane for fast, efficient, economical handling and delivery of air cargo.

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SIDELIGHTS

Congress

Hearings will start soon by Senate Interstate & Foreign Commerce Committee on legislation for \$8 million to develop a local service plane. ATA is behind the measure, claiming millions of dollars can be saved in mail subsidies with an economical transport. . . House Appropriations Committee will scrutinize Public Relations activities of the armed services before it winds up hearings on fiscal 1952 military budget. A few weeks back the committee took Navy's chief, Adm. Sherman, to task on PR expenditures. Sherman says the Navy maintains 85 public relations officers in the Washington area, and 516 elsewhere. . . Legislation approving \$13.1 million construction by NACA has been approved by House Armed Services Committee. The House Appropriations Committee recently turned down NACA's request for funds for the projects, directing the agency to get authorization first. NACA plans call for modernization of tunnels at Langley & Ames, a hydrogen liquefaction plant and high altitude fuels facilities at Lewis and a flight test facility at Edwards Island. . . Early enactment of legislation for Commerce Dept. to offer war risk insurance to foreign and overseas aircraft operators is likely. The measure, approved by House Interstate, has already been passed by the Senate. . . Sen. Alexander Wiley told the Senate Gen. MacArthur has verified to him the fact that MacArthur's was the vote "which was cast against the finding which condemned Billy Mitchell." This confirmed an earlier AVIATION WEEK report to this effect, written by Katherine Johnsen.

Transport

The report being done by Ernst & Ernst for Senate Interstate & Foreign Commerce Committee is overdue. Sources close to the situation say when it is finally completed it will bypass the question of segregating compensatory rates from subsidy and instead confine itself to the question of subsidy as a benefit to communities through the airlines serving them. . . Slick Airways has not yet put its new DC-6A into regular operation but has already found it is possible to load 25,000 lb. aboard in less time than it takes to load 13,000 lb. aboard a C-46. Larger doors, and the extra door forward of the wing explain why. . . The so-called Douglas Report, the air transport mobilization survey which has been completed under auspices of NSRB, will stay on the secret list although its broad outline has been publicized in AVIATION WEEK. In general, the report suggests using in an emergency up to half the commercial airline fleet, mostly four-engined ships, on a contract basis wherever possible; make minor modifications on airliners now, to be ready for military work, etc. . . Appointment of Malcolm Mackay, New York financial man, as executive vice president of Northwest Airlines, hatched a crop of rumors

(Continued on page 80)



EGGS DUE TO DROP—Douglas AD Skyraider (Wright R-3350), carrying three 2000-lb. bombs, takes off from the 27,000-ton USS Valley Forge to strike enemy in Korea. Combat photo shows pilot is using considerable flap and right rudder in his takeoff.



QUAD-WHEELED PACKET TESTED—Fairchild C-119 (below, left) has been fitted with new four-wheel bogie-type landing gear designed to improve plane's performance when operating on rough sod or soft-surface fields. The wheel truck is pivotal mounted. Test equipment includes rate-of-descent arms (right) to aid in measuring continuously the loads sustained during evaluation.



Military Planes In the News

KAMAN PERFORMANCE—Kaman Aircraft's prototype Navy HTK-1, which was seen publicly for the first time at recent Washington, D. C., helicopter display (Aviation Week May 7), had only 1 hr. 40 min. flight time prior to show, was assembled from parts of three copters. The HTK-1 differs from the earlier K-225 in having longer, constant-chord rotors. It has a 235-hp. 0-435 Lycoming mounted behind the cabin. The "floating" tail is connected to collective pitch to enhance flight and autorotative characteristics.

TEMCO Well Into Second Phase of B-47 Program

Fuselages for the B-47, the World's Fastest Known Bomber, are rolling off the TEMCO assembly line with systematic regularity, due largely to the miraculous job done in the "take over" from the Boeing Plant:

The moving of machinery, duplication of tooling, the conversion of fixtures and the training of personnel was done expertly and efficiently without any delay in the delivery schedule. A record of which to be proud but one that is becoming more and more common at TEMCO. Current operations are being streamlined for even better production in all phases of TEMCO's aircraft activity.

Stratojet World's Fastest Known Jet Bomber

The Boeing B-47 Stratojet Bomber is the fastest known bomber in the world with top speed in excess of 600 MPH. Capable of carrying more than 20,000 lbs. of bombs, its swept back wings measure 116 feet from tip to tip. The experimental model flew from Moses Lake, Washington, to Andrews Air Force Base, Maryland, in 3 hours 46 minutes, an average speed of 607.8 MPH.

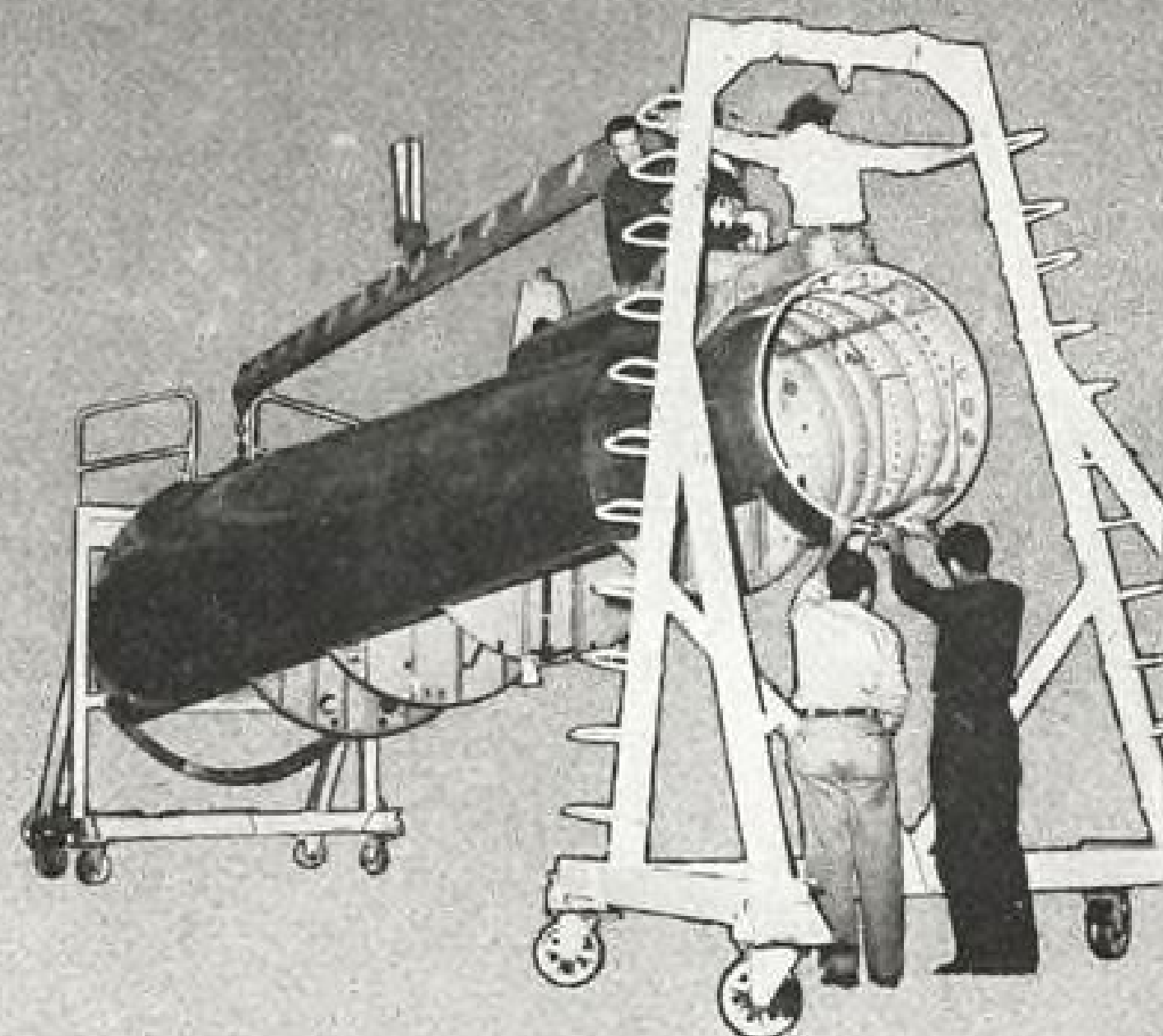
QUALITY CONTROL STRESSED AT TEMCO

Precision manufacturing and quality control are two of the essentials in producing high speed military aircraft—such as the B-47—for tolerances must be measured in thousandths of an inch.

At TEMCO this rigid conformance to specifications is assured not only by a skilled and fully equipped inspection staff, but more important by production workers whose many years of aircraft experience have taught them that true quality is built in a product—not inspected in it.

TEMCO

ENGINEERS AND MANUFACTURERS FOR THE AIRCRAFT INDUSTRY



IS BUILDING THE REAR FUSELAGE SECTION OF THE B-47

STRATOJET BOMBER



The rear fuselage section of the world's fastest known jet bomber, the Boeing B-47 Stratojet, is being fabricated by Texas Engineering and Manufacturing Company. This swept-wing plane powered with six turbo-jet engines is the design that last year flew from the west to the east coast in 3 hours and 46 minutes, an average speed of over 600 miles per hour. TEMCO was selected for this all-important manufacturing job because of its proved aircraft experience and that invaluable asset—"production know-how." The B-47 fuselage is just one of several major assemblies currently being manufactured by TEMCO.



Texas Engineering and Manufacturing Co., Inc.

DALLAS, TEXAS

WHO'S WHERE

In the Front Office

Paul Moore has been made executive vice president-general manager of Lear, Inc. Moore was president of the Haskellite Mfg. Co. from 1945 to 1949. Previous to and since his Haskellite connection, he had been a business consultant.

Kendall Perkins has been promoted to vice president-engineering for McDonnell Aircraft Corp. In his new position Perkins will be responsible for all development of planes, copters, guided missiles and powerplants. He joined the company in 1941 as a project engineer and has been manager of engineering since 1949.

Murray S. Gelber, vice president-secretary of the Garrett Corp., has been appointed vice president-manager of AiResearch Mfg. Co. of Arizona, a division of Garrett. Gelber, who joined the firm in 1939, has been in charge of production at AiResearch, Los Angeles, since 1948.

Orvis M. Nelson, president of Transocean Air Lines, has been made president of Aircraft Engineering & Maintenance Co., Oakland Municipal Airport, military airplane overhauler and reconditioner, a subsidiary of TAL. Other new officers of AEMCO are Sherwood A. Nichols, executive vice president; Douglass F. Johnson, administrative vice president; and R. R. Pettit, secretary. Former AEMCO president, Ray T. Elsmore, resigned to concentrate on Taloa Academy of Aeronautics.

Leo A. Carter and T. E. Springer have been elevated to vice presidents of Douglas Aircraft Co. Carter had been general manager of the Santa Monica division and Springer had held the same post at El Segundo.

Changes

Lewis K. Marshall has been appointed manager of the Lincoln-Mercury Division gas turbine plant which will turn out Westinghouse J-40s for the Navy in a new facility, location as yet undisclosed.

George A. Lewthwaite has been named general manager of Bendix Aviation's Pioneer Central division, Davenport, Iowa, with Charles A. Wolf succeeding him as Eclipse-Pioneer sales manager. Lewthwaite takes over the opening created by the resignation of W. W. Fisher, who joined Daystrom, Inc., Elizabeth, N. J., as general manager of its Instrument division.

George L. Zimmerman has been made manager of the assembly division at General Electric's Lockland, Ohio, turbojet facility. In other moves at this location, Paul Nichols was named manager of development manufacturing division, A. W. Jacobsen was made manager of the parts division, and Marc A. DeFerranti has been named manager of facilities.

Don O. Benson has been named manager of general, aircraft and communications engineering for Northwest Airlines, succeeding Carl E. Swanson, who has resigned. George Masters is NWA's new assistant director of publicity.

INDUSTRY OBSERVER

► Douglas C-124A emergency payload of over 70,000 lb. attained in recent Edwards AFB, Muroc, Calif. test flight, puts the big USAF cargo plane well ahead of any other production aircraft in this country, and probably in the world, as a load lifter. While the new C-124A feat is still short of the Convair XC-99's record of lifting over 100,000 lb. payload, the Douglas feat is more significant, logistics-wise. USAF is beginning to accumulate a sizeable fleet of C-124As and has many more on order, but there is still only one of the six-engine XC-99s, and no firm plans for more.

► Pentagon sources report that the Fireye aircraft fire detector continues in advanced test status but that it still has not been released for a production contract. The equipment produced by Photo Switch, Inc., Cambridge, Mass., is being flown in installations aboard the F-86A, T-33, B-45, and B-50D and the Convair Turboliner. Air Force Fireye contract currently is for \$59,000.

► Production problems involved in getting the two versions of the Pratt & Whitney J-48 turbojet into sufficient production to meet demands of Navy and Air Force have brought about discussion of going back to the Allison J-33 engine for some of the Lockheed F-94s (the principal Air Force users of the J-48s). The F-94 versions will use an elongated afterburner with the J-48, but the Grumman F9F-5 the Navy user of the J-48, does not use the afterburner, even in the shorter version originally planned for the Grumman plane. Chrysler was licensed by Pratt & Whitney to build the J-48, but agreement provided for the Chrysler work to be done in a new plant, and there has been no public indication yet that the new plant is even started.

► Convair's 60-deg. sweptback delta wing XF-92A last week was set for additional test flights in the sonic range at Edwards AFB, Muroc, Calif. Testing will be with a more powerful, new Allison J-33-A-29 engine fitted with afterburner, replacing the J-33-A-23 formerly installed. The plane made more than 80 flights, many in the transonic range, with the former powerplant, and is expected to get substantially higher speeds with the additional boost from the new powerplant.

► U. S. technical representatives at the Airworthiness division, International Civil Aviation Organization meeting, Montreal, opposed a definite decision to reverse airplane seats in transport aircraft, as a safety measure. They were successful in blocking adoption of the plan, advocated especially by British representatives. U. S. spokesmen contended that further studies should be made on other means of increasing safety of passenger seating. A recommendation for a 50-percent increase in strength of seat attachments was voted (See p. 68).

► North American's T-28 tandem advanced trainers are coming out equipped with special ultra-violet and infra-red lighting on the instrument panel, so that the panels can be used by trainees with "view limiter" goggles in blind and night flying practice, without other extra equipment.

► While Chase Aircraft, because of other commitments, is not expected to go ahead with a study it made recently for installation of Allison T-40 turboprops installed on the versatile XC-123A assault transport, it is understood that some phenomenal rate-of-climb figures for the proposed powerplant installation have been closely scrutinized by military authorities and, may be one reason for the popularity of the turboprops in the new 25,000-lb.-payload competition.

► West Coast aviation observers are watching with interest the number of Convair people who are becoming connected with Hiller Helicopters in one way and another as a possible key to the validity of some merger talk which has been heard.

► Second order to de Havilland Ltd., Canada, for Army Field Forces liaison Beaver planes is reported to be on the order of 200 planes.

Washington Roundup

Holding Down Defense

The top military command is giving full support to the Administration's "go slow" program for defense.

At opening sessions on the 1952 fiscal year military budget, Undersecretary of Defense Robert Lovett, Joint Chiefs of Staff Chairman Gen. Omar Bradley, and Chief of Naval Operations Adm. Forrest Sherman have told congressmen that "the services are getting every penny they need or want." Gen. Hoyt Vandenberg of the Air Force has not yet been heard.

According to Rep. George Mahon, Chairman of the House Defense Appropriations subcommittee, "they say we are going to get the same program for \$66 billion they thought, last January, would take \$104 billion."

It's the "same" program—but stretched out over several years, instead of being compacted into the time between now and the mid-1952 target date the JCS had set for all-out war readiness.

The U. S. is readying itself for war, but not by mid '52.

Actually the difference is more than \$40 billion because prices have shot up; \$104 billion will buy less now, and probably in the future, than it would have at January cost levels.

But, Mahon comments: "There isn't the slightest indication of dissatisfaction on the part of the military with the size and rate of the defense build-up."

Washington observers say that Gen. Bradley, who now tells congressmen they are getting the "same" defense program for \$66 billion that they would for \$104 billion, told the same congressmen over the months preceding the June 26 Korean outbreak that the U. S. was getting more defense when former Defense Secretary Louis Johnson started his economy program.

More Money—In January

The three services will shortly ask for more money than the \$60 billion recommended for the '52 fiscal year by the President to take care of Korean war attrition. But they won't get it for a while.

The President's military budget for the '52 fiscal year, which starts July 1, is based on the premise that the fighting in the Far East will all be over by then, despite the prospect for an all-out Chinese Communist spring offensive.

Undersecretary Lovett and JCS Chairman Bradley have assured House Appropriations Committee members they will block the services' requests for seven or eight months. Defense Department won't be back asking Congress for more money until next January, they say.

Rep. George Mahon explained: "They say money won't be needed to take care of Korean losses for a good many months—that we're not losing enough planes to matter and that we're well stocked on ammunition."

No More Contracts

There won't be any more plane or engine contracts for at least another month. Air Force and Navy have already obligated all the money they have available. The picture:

• **Air Force.** The \$700 million for procurement now pending in Congress, is to make down payments—between the time it is okayed and July 1—on contracts already let. USAF won't have any more procurement money to obli-

gate until the '52 fiscal budget, with \$10.9 billion for planes and parts, is approved.

• **Navy.** All the money Navy had for planes and engines was obligated by last December. Navy hasn't been allowed any additional since then. BuAer won't have funds to let new contracts until the '52 fiscal year budget, with \$3.4 billion for planes and parts, is approved.

If the services consider it urgent to move ahead on production of a certain plane or engine, they will shift funds from other activities and let a contract.

But generally, USAF and Navy won't have money to let new contracts until the new budget comes through.

The next flow of contracts to plane and engine manufacturers won't come before July.

Guided Missile Setback

Defense Department's drastic cutback will slow Navy's and Air Force's guided missile programs—supposedly top-priority pegs in the defense build-up.

This year, USAF had \$150 million for missile procurement; the proposed budget allows only \$130 million for next year. Navy has \$101 million this year; the new budget gives it only \$33 million.

Undersecretary Robert Lovett and Defense Department Comptroller W. J. McNeil did not give any explanation for the startling action.

Here and There

• **U. S. Chamber of Commerce** adopted a plank for a single regulatory agency for all types of transportation at its annual meeting.

• **Airmail Separation.** Congress will probably turn down CAB's request for funds to make studies leading to the establishment of compensatory rates for all domestic routes by the end of the year. CAB asked for \$25,000 as a starter. Senate Interstate and Foreign Commerce Committee's chairman, Sen. Edwin Johnson, opposes the grant: "It will only delay legislation directing separation of airmail pay from subsidization. While CAB has studies on, they will keep urging Congress to postpone and postpone—until they have finished their studies."

• **Small Business.** The abundant talk about giving small firms a bigger slice of the defense business will increase. But little will actually be done about it. The basic fact is that piecemeal production of planes and other major procurement items, as advocated by small business' friend, Rep. Wright Patman, would send the cost of the defense program skyrocketing. It is a case of laudable theory not fitting the practical situation, observers say.

• **Pilot Training.** Congress won't take up legislation setting up a reserve officers training program—and authorizing the 187 colleges with USAF ROTC programs and the 267 colleges with Army ROTC programs to contract with private schools for flight training—until the draft bill has been cleared. This is on the shelf for the duration of the MacArthur investigation. At best, it will be another month before House and Senate Armed Services Committees get around to focusing on the ROTC measure.

• **Investigations.** Count on the House Armed Services Investigating Committee, headed by Rep. Edward Hebert, to tackle construction contracts for base and plant expansions as its first order of business.

—Katherine Johnsen

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THE PLANE that is the star of Chase Aircraft is the C-123, jet version of which is shown. Its role depends on the Air Force and Army, but grooming it are . . .



THE MEN who have joined forces, Chief Engineer Stroukoff, left, and President Kaiser. Watching are Treasurer Cousins, left, and Public Relations Director Neil Morris.

Kaiser Deal Spurs New Drive on C-123

Stock sale to auto firm gives Chase long sought cash and production resources.

By Ben S. Lee

Trenton, N. J.—A \$2.5-million purchase of 49 percent of the Chase Aircraft Co.'s stock last week moved Edgar Kaiser, president of Kaiser-Frazer Corp., more squarely into the middle of the aircraft manufacturing business.

The new combination of Chase research and development organization with the added Kaiser-Frazer resources and production puts a new light on the whole combat and assault transport picture, and has interesting implications as well.

Kaiser became president and chief executive officer of Chase Aircraft, as a result of the stock transfer, while Michael Stroukoff, former president, became vice president and chief engineer in charge of research and development. Jesse X. Cousins continues as treasurer of Chase. A new eight-member board of directors to be named this week will include three Stroukoff nominees, three Kaiser nominees, and two directors not now affiliated with either company.

► **C-123 Future**—Effect of the reorganization and new capital on Chase's C-123 assault transport program for the Air Force was still not entirely clear last week.

Air Force has programmed procure-

ment of approximately 400 of the transports for Army Field Forces, but has been holding up the final go-ahead on an order to Chase. Under the new aggressive Kaiser leadership, Chase is expected to make a strong bid to clear away obstacles remaining and get production rolling.

The Kaiser-Chase transaction also had the aircraft industry speculating last week as to its effect on the Kaiser-Frazer program for production of Fairchild C-119 Packet combat transports at the K-F plant at Willow Run, Mich.

Spicing industry conjectures was the background knowledge that Fairchild Engine & Airplane Corp. had at first vigorously opposed the Air Force-sponsored "shotgun wedding" which made Kaiser-Frazer a Fairchild licensee to build the Packets. And further background was the fact that Fairchild and Chase had been strong competitors for the assault transport competition won by the Chase C-123.

► **Plans**—According to Edgar Kaiser, while immediate plans are to map out complete engineering plans for military production of the Chase YC-123, the company will also begin exploration of commercial application of various Chase designs.

Stroukoff has already completed mock-up of a new twin-engine local

service transport which Kaiser and Stroukoff both believe to be revolutionary from point of economy and versatility. In its present configuration, the new transport would be powered by two Pratt & Whitney R-1340 engines, seat 16 passengers plus crew, cruise at 170 mph., and land at 64 mph.

The company, according to Stroukoff, also has several other designs for heavier, more powerful, long-range transports—in turboprop and turbojet versions—which are scheduled for complete analysis with an eye to manufacture under the new organization.

► **Two Sources**—Air Force has already indicated that it desires two sources of supply for military production of the Chase YC-123 because of military requirements. A survey team, sent by Lt. Gen. Kenneth B. Wolfe, Deputy Chief of Staff for Materiel, has just completed an inspection of the Chase Trenton facility to determine its suitability for production of the YC-123. Its findings have not yet been disclosed.

Second source supplier for the YC-123 is now under consideration by the Air Force and that manufacturer is to be named within the next two weeks. Air Force Undersecretary John A. McCone has indicated that the second source supplier will probably be an aircraft company which has not, until now, figured prominently in defense production. There are several companies, he said, which have had enviable aircraft production experience.

Kaiser-Chase, meanwhile, is hard at

work completing proposals to place the YC-123 in initial production at the Chase Trenton facility and later in major production at either the former Bechtol-McCone-Parsons plant in Birmingham or at the former Douglas-Chicago plant which is still held in stand-by status by USAF.

Chase now leases six bays of the Birmingham facility and is pressing USAF for authorization of major production there. But Air Force has previously indicated that it holds recapture rights to that facility, and some Pentagon installations experts do not consider it entirely suitable as a production site for a major aircraft. There is some USAF consideration, carrying considerable weight at present, to converting the Birmingham facility for use as a modification center for a current production aircraft. For this reason, it is reported, Chase is also submitting alternate proposals for the use of the Douglas-Chicago facility.

The Douglas-Chicago facility is now being used as a temporary storage depot for the National Air Museum and a considerable number of historically famous aircraft are now hangared there. In addition, according to USAF, several other minor activities are now being conducted there but the facility is available for aircraft manufacture if needed in the mobilization program.

► **Kaiser-Fairchild Production**—Acquisition of the interest in the Chase Aircraft Co., Kaiser stated, will in no way affect C-119 production.

Tooling engineering for Kaiser production of the C-119 at Willow Run is now virtually complete, he said, and the first production model should be flying by the end of the year. Peak production rate called for by USAF should be reached in a comparatively short time thereafter, he declared.

"As a matter of fact," Kaiser continued, "we intend to transfer approximately 200 of our top engineering tooling personnel from Willow Run to Trenton as their activities with the Fairchild project are completed." The transfer is expected in the next 30 days. The Chase Trenton facility now employs approximately 800.

Stroukoff disclosed that both Chase and Kaiser-Frazer will begin an immediate recruiting program to gain another 500 employees within the next 90 days. These will come primarily from two sources—Kaiser West Coast operations and in re-hires in the Chase Trenton area—he said.

Purpose of the immediate expansion of Trenton personnel, Kaiser explained, is to expedite Chase Aircraft's existing production engineering contract with

the Air Force. A committee has already been appointed to review Chase's production engineering organization, he said.

Chase already has on hand enough material to build 25 more C-123 planes at Trenton together with permanent jigs and sufficient tooling to begin their production immediately upon receipt of contract, Stroukoff said.

Current company thinking is that initial production will be performed in Trenton with a request for major production at a larger facility elsewhere. If this is authorized by Air Force, the Trenton facility will be retained for components manufacture of the military production C-123. The company will hold its Trenton facility intact, Stroukoff said.

► **Chase Background**—Stroukoff formed the Chase Aircraft Co. in New York in February, 1943. During succeeding years Chase designed, built, and flew seven different troop- and cargo-carrying gliders and transports. This was climaxed last month when the company flew the first American-developed jet transport, a jet-powered version of the XC-123. This was the first time that one aircraft had flown as a glider, with conventional engines and with jet power.

The jet version, powered by four GE J-47 jet engines, is still in its experimental stages. The J-47s develop 5200-lb. thrust each.

The first craft built by Chase was the CG-14, all-wood troop-carrying glider, capable of carrying 14 passengers. It was flown for the first time in January, 1945. The second craft produced by Chase, the CG-14A, was a 23-place glider. It was of similar design to the CG-14, but with tubular metal frame and plywood skin.

The company moved to Trenton in December, 1946, and undertook construction of the CG-18, an all-metal, 30-place glider, and flew it 12 months later. In November, 1948, Chase flew the YC-122 twin-engine troop- and cargo-carrying transport, marking the company's entry into the powered aircraft field.

The XC-123, latest of Stroukoff's designs, is capable of carrying 60 passengers and was first test flown in October, 1949. Shortly thereafter, the identical design was flown as a glider and designated CG-20.

Both these craft, along with the YC-122 and the CG-18, were evaluated by the USAF and Army at Elgin AFB, Fla., last fall, together with assault transport-type entries of two other major manufacturers. The XC-123 won (AVIATION WEEK Oct. 23).

How Rentzel Sees Transport Future

Within three years, helicopters will be giving short-haul passenger service and perhaps local airline service; turboprop transports will be introduced on the airlines; trunkline planes will cruise at 400 mph.; airline passenger traffic will be double last year's; and air freight haulage will have multiplied.

These are statements by Commerce Undersecretary Delos Rentzel to the fourth Wisconsin Aeronautics Conference. He says these are not predictions, "they are based on the economic and technical facts. . . ."

The remarks, Rentzel did not need to emphasize, were made with the consideration that the nation's industrial power does not have to be turned completely over to a war economy made necessary by an attack on the U.S. over that period.

"In addition, on certain segments of local airline operations we may soon begin experimenting on the use of passenger helicopters. We already have plans for helicopters to carry passengers from downtown areas out to principal air terminals. But we also have some expectation that as the helicopter develops it will be used on longer operations, and thus develop into a local airline transport."

As to war's effect, he says: "Of course, war could alter any or all of these developments, but I believe personally that it would only quicken the time of their arrival. . . . The military knows now the value of maintaining a strong, fast and powerful civil air transportation system, and for that reason I am confident that air transportation would continue development under war conditions."

Within the next year, Rentzel says, "we will see a special small modern transport type introduced in our local airlines that will improve their service and be far more economical for them to operate than the present war surplus C-47s." (See story on p. 68).

Korea Air Losses

UN plane losses in Korea due to enemy action have been 212 through May 9, Lt. Gen. O. P. Weyland, new deputy commander of the Tactical Air Command has stated. As of that date, enemy plane losses are estimated at 149 destroyed, 27 probables, 167 damaged. Of these, 139 were hit on the ground. MiG-15 casualties were given by the general as 53 destroyed, 17 probables and 103 damaged.



XF-92A DELTA WING: Inspiration for Convair's Navy shipboard fighter design?

Navy Studies Radical New Fighter

Convair and Lockheed are building convertiplane-like prototypes around Allison T-40 turboprop engine.

The Navy's answer to the recent Air Force and Army convertiplane competition is in the development mill.

It will be a fast turboprop interceptor with a rate of climb expected to far outstrip that of present fighters, jet or propeller. But even more significant will be its takeoff and landing characteristics. Specifications call for it to make virtual helicopter takeoffs and landings using its propeller as a rotor. Presumably it will also be able to hover like a copter, or nearly so.

► **Two Competitors**—Two West Coast companies, Convair and Lockheed, are developing prototypes, both using the Allison T-40 dual-section turboprop engine as powerplant. While the original Allison T-40 engine was credited with 5500 equivalent shaft hp., a more-advanced version of the T-40 is understood to step up the power to the vicinity of 8000 hp.

All three major propeller manufacturers, Curtiss-Wright, Aeroproducts and Hamilton Standard, are reported to be preparing six-blade dual-rotation propellers for both entries in the competition.

West Coast sources see a close similarity between the new Convair entry and the Convair XF-92A delta-wing jet experimental Air Force plane as far as fuselage and wing configuration is concerned.

However, both new planes will have their noses pointed skyward at a much greater angle than is customary for today's aircraft and will have landing gear more like helicopter gear than like conventional aircraft, it is understood.

Planes will be designed for shipboard operation, and presumably will be capable of operating from virtually any size carrier, if they attain the takeoff and landing characteristics aimed at.

The new designs will represent a new concept—combining the advantages of turboprop engine power with the special features of helicopter planes. The specifications for a plane similar in theory indicate what may be expected.

► **"Flying Pancake"**—A forerunner of the planes now being developed was the World War II Chance Vought "Flying Pancake" XF5U-1. Although completed at war's end, it never flew in its full-power, full-scale version and was shelved and finally scrapped. The drastic cutbacks which hit Naval aviation in the early postwar years were so severe that Navy could not or did not find even the small amount of funds necessary to carry out the plane's flight test program.

In the light of the present new program, the XF5U-1's design specifications are interesting. The plane was powered by two Pratt & Whitney R-2000 Twin Wasp engines buried in

the large circular planform wing on either side of the cockpit. These drove by means of right-angle transmission shafts, four-blade Hamilton Standard propellers mounted at the wingtips, using a 5-to-1 reduction gear ratio. Special clutches permitted either engine to drive both propellers in emergency one-engine-out condition.

Propellers were specially developed for the XF5U-1 with articulated blades similar to those used on helicopter rotors. This means that at high angles of attack the blades would move forward at constant pitch and then flatten out as they moved aft, so that plane was to be capable of hovering at low or zero speeds.

Plane was designed for a speed range of from 40 mph. to 425 mph, with expectation that a later model with turboprop power could attain an even wider range of zero to 550 mph.

► **Low Hovering Speeds**—Low or zero hovering speeds were to be attained by nosing the plane up into vertical climb position and hovering on its propellers. The lower the forward speed, the more power would be required for hovering.

Since the Chance Vought plane, which was designed by Charles Zimmerman, well-known NACA engineer, there have been marked advances in powerplants and in propellers which may give the new aircraft even more phenomenal performance than that which was projected for the Flying Pancake.

Study Civil Air Role In A-Bomb Defenses

Civil aviation's role in the emergency transportation picture in the event of an atomic attack will be studied in Washington next week. The examination will take place before federal, civil and military aviation authorities at a forum of leading civil aviation organizations May 28 at the Mayflower Hotel.

Under sponsorship of the Aeronautical Training Society, an organization of large aviation technical and flight schools, the seven-man forum panel will discuss "Civil Aviation's M-Day Role."

These are the participants and their organizations: Milton Arnold, Air Transport Assn.; Joseph T. Geuting, Jr., Aircraft Industries Assn.; J. B. Hartranft, Aircraft Owners and Pilots Assn.; Crocker Snow, National Assn. of State Aviation Officials; Wayne Weishaar, Aeronautical Training Society; N. F. Silsbee, Corporation Aircraft Owners Assn.; A. B. Curry, Airport Operators Council.

The forum will be a feature of the annual ATS meeting and election of officers. Charles F. Horne, CAA Administrator-nominee, will address the gathering.

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B-36 Too Big?

AF cites low loss rate as criticism follows on recent crashes.

The Air Force, studying two recent B-36 crashes, is receiving complaints that the big bomber is too much airplane—too complex a machine with its ten engines and myriad of electronic controls and weapon devices.

In a ten-day period—Apr. 27 to May 6—AF lost two of its most complex strategic air weapons, representing, in dollars, a write-off of approximately \$8 million, and, in lives, a loss of 36 highly trained crewmen and civilian technical experts.

AF says loss rates of new aircraft in early stages of development inevitably are going to be high. As experience is gained, accident loss rates lower proportionately. While the B-36 bomber cannot be considered strictly in the "new" plane category, the constant addition of new equipment and devices to improve the plane's performance virtually hold the big bomber in "new" category.

► **Loss Rate Dropping**—According to Brig. Gen. John B. Montgomery, Strategic Air Command director of operations. B-36 loss rate, based on standard of 100,000 flying hours, has gradually lowered since the plane first flew in 1946 and will average just below the loss rates of the SAC medium bombers. Contributing reason for the lower loss rate of the big bombers is that their crews are generally older, more experienced men.

To date, Montgomery said, there has been no pattern which could set up criteria for accident causes. As an example, he pointed out that during the last three years there have been two accidents attributable to human error; one due to combination of materiel and human error; one due directly to materiel failure; and the collision with an F-51 fighter, unavoidable from the B-36 standpoint.

That tabulation, Montgomery said, indicates that the B-36 is mechanically sound.

► **Accident Roll**—Below, are reports on accidents to the B-36 bombers during the last three years:

• **May 6, 1951**—Vicinity of Albuquerque, N. Mex., B-36 making a GCA landing because of the high, gusty wind conditions. Right wing touched ground on an attempt to pull up in course correction damaging right jet engine, No. 6 and possibly No. 5 engine. The plane crashed and burned. 23 fatalities.

• **Apr. 27, 1951**—Vicinity of Carney, Okla. collision of B-36 and F-51. Accident unavoidable on part of B-36 bomber. Findings indicate an error in



ONE PROP REMOVED, (arrow) the Aero Commander flies 1160 miles non-stop.

Odd Flight Adds Sales Appeal

With firm orders already received for the first 21 Aero Commander executive planes, officers of the Aero Design & Engineering Co. last week were planning on a production rate of two planes a week at their Tulakes Airplant at Oklahoma City.

First production plane is scheduled for completion in July. Production planes will be slightly enlarged versions of the prototype Aero Commander which May 9 flew non-stop with a single engine from Oklahoma City to Washington National Airport. It covered the 1160-mile distance at a speed of 149 mph. in an elapsed time of 7 hr. 55 min. To demonstrate the single-engine performance more graphically, the left propeller was removed for the entire flight, as illustrated. Pilots for the demonstration flight were Bert Bantle and E. R. Morris.

Enlargement will include lengthen-

ing the fuselage 14 inches, widening fuselage 4 inches, redesigned nacelles, said to result in a 6-percent reduction in drag, one-third increase in fuel capacity, and increase of gross weight to 48,000 lb. Price tag continues at \$45,000. Carl Wooten, sales manager, is setting up a system of 10 distributors, seven of whom have already been chosen for the assignment.

About 150 flight hours have been logged with the prototype since it converted to the 260-hp. Lycoming GO-435-C2 engines which will be used to power the production planes. Previously the prototype had installed two 190-hp. Lycoming O-435 engines which had logged some 500 flight hr.

Principal Aero Design officers are R. T. Amis, president; W. T. Amis, vice president; George Pew, board chairman; Ted Smith, general manager and chief design engineer, and Wooten.

missing in resulting crash.

• **September 1949**—Take-off from Carswell AFB. B-36 crashed into Lake Worth on takeoff due to inexplicable reversing of two engine propellers. Exact findings for reversing of props is classified. Five fatalities.

Interchange Battle

Tentative approval of the National Panagra interchange by the Civil Aeronautics Board will be fought out in oral argument before the Board, probably in June. Eastern, Pan American, and the four PAA directors of Panagra have filed petitions for reconsideration and withdrawal of the CAB tentative order.

High-Flying Bell

Large supersonic stable and copter production mark successful year.

What is probably the largest stable of high-altitude supersonic research craft anywhere in the world is being fashioned at Bell Aircraft Corp., with six offspring of the famed X-1 in process.

The company's annual report lists these as the No. 3 X-1, the X-1A, X-1B, X-1D, X-2 and X-5. Each, according to Bell, is designed for a different purpose.

• **No. 3 X-1** will have the turbine fuel pump which will add to the plane's range and presumably give it the performance originally specified for the XS-1: 1700 mph. at 80,000 ft.

• **X-1A, X-1B, X-1D** will be similar to the X-1 series, but will have special instrumentation to enable each to undertake investigations of particular aspects of supersonic flight.

• **X-2**, like the X-1s, will be rocket-powered, but will have sweptback wings, use stainless steel extensively and is designed for "considerably" higher speed and altitude than the X-1s.

• **X-5** is the most highly secret of all the Bell X planes, and Bell adds a fillip to speculation about it by stating that it will gather data "of a different nature than that resulting from X-1 and X-2 flights and therefore the three airplanes are not comparable."

► **Research Emphasis**—Bell's emphasis on these research planes and other experimental work is indicated by the fact that engineers represent 20 percent of total company employment. And the future course of the company may be deduced from the statement that 60 percent of the total engineering man-hours last year was spent on guided missiles and rocket engine work.

Last year Bell put some of its missiles into production. Types are unspecified, but the company is working on air-to-surface and air-to-air types, and is doing research on surface-to-air and surface-to-surface missiles.

► **Copter Division**—While the company's experimental work was growing, its helicopter business likewise was expanding, and right out of Bell's home area. First, the company set up a separate division for its helicopter operations and moved them into a leased plant in Buffalo. At the same time it started work on a new plant in Ft. Worth which, when completed, will house the complete helicopter division (AVIATION WEEK Apr. 9, p. 15).

In general, the helicopter division's growth has been part of overall industry growth stemming from the national emergency. But in particular, the de-

mand for helicopters stems from an amazing record compiled in Korea. Bell says, "As a result, (of the Korean experience) every branch of the military in this country, as well as in other countries, is procuring or planning procurement of helicopters."

Here is Bell's lineup: the three-place H-13D for the Army and HTL-4 for the Navy and Marines; the 10-place YH-12 for the Air Force; the two-place XH-15 for the Air Force; the commercial three-place 47D-1; and what Bell says is the largest copter for which a production contract has been awarded, the XHSL-1.

This Navy machine is the first helicopter designed especially for anti-submarine duty. It has tandem rotors powered by a single 2300-hp. Pratt & Whitney R-2800 engine.

In addition, Bell was one of the three winners in the recent AF-Army design competition for a convertiplane.

Bell's operations last year showed a strong comeback from the strike-riddled production of 1949. Income was up to \$36,362,832, as compared to \$11,984,381 in 1949. And profit after taxes soared to \$1,468,120 from 1949's \$204,142. The company's backlog likewise showed a healthy rise, to a postwar peak of \$225 million.

Salaries List of Equipment Makers

Top salaries paid by aircraft equipment manufacturing firms during 1950 are listed in a partial survey by AVIATION WEEK.

Earning details (with 1949 earnings in parentheses) are:

• **Westinghouse Electric Corp.** Gwilym A. Price, president, \$126,550, plus \$78,698 incentive payment and \$10,992 retirement benefit (\$126,400, plus \$73,587 incentive payment and \$10,620 retirement benefit); A. W. Robertson, chairman of the board, \$91,350, (\$91,400); G. H. Bucher, vice chairman, \$91,550, plus \$15,738 incentive payment and \$10,259 retirement benefit (\$91,500, plus \$14,718 incentive payment and \$9829 retirement benefit); Roscoe Seybold, vice president, \$60,600, plus \$30,000 incentive payment and \$898 retirement benefit (\$61,100, plus \$29,435 incentive payment and \$7252 retirement benefit); L. E. Osborne, vice president, \$75,000, plus \$47,217 incentive payment and \$6741 retirement benefit (\$75,000, plus \$29,435 incentive payment and \$6506 retirement benefit); all officers and directors, \$1,108,339, plus \$629,097 incentive payment and \$81,642 retirement payment (\$1,160,676, plus \$497,966 incentive payment and \$94,182 retirement payment).

• **Minneapolis-Honeywell Regulator Co.** Harold Sweatt, president, \$85,416, plus \$25,000 bonus and \$25,440 retirement benefit (\$75,000, plus \$22,500 bonus and \$22,052 retirement benefit); Charles Sweatt, executive vice president, \$54,166 salary, plus \$17,500 bonus and \$10,684 retirement benefit (\$50,000, plus \$15,000 bonus and \$7741 retirement benefit); Willard Huff, executive vice president, \$54,166, plus \$17,500 bonus payment and \$17,120 retirement benefit (\$50,000, plus \$15,000 bonus and \$16,026 retirement benefit); George A. Dutoit, vice president, \$23,400, plus \$2,000 bonus and \$7416 retirement benefit (\$23,400, plus \$2000 bonus and \$7361 retirement benefit); all

officers and directors, \$464,683, plus \$100,000 bonus and \$90,188 retirement benefit (\$416,882, plus \$73,500 bonus and \$82,783 retirement benefit).

• **B. F. Goodrich Co.** John Collyer, president, \$179,000, plus \$17,321 pension benefit (\$159,000, plus \$12,946 pension benefit); James Newman, vice president, \$81,000, plus \$7629 pension benefit (\$71,000, plus \$7690 pension benefit); T. G. Graham, vice president, \$70,000, plus \$6135 pension benefit (\$60,000, plus \$6414 pension benefit); G. W. Vaught, vice president, \$70,000, plus \$6449 pension benefit (\$60,000, plus \$6616 pension benefit); all officers and directors, \$890,500, plus \$50,720 pension benefit (\$860,400, plus \$45,598 pension benefit).

• **Goodyear Tire and Rubber Co.** P. W. Litchfield, chairman of the board, \$125,000, plus \$11,982 pension benefit (\$125,000); E. J. Thomas, president, \$101,562, plus \$57,623 bonus and \$14,442 pension benefit (\$98,750, plus \$59,546 bonus and \$7154 pension benefit); A. G. Cameron, vice president of subsidiary, \$34,520, plus \$25,610 bonus and \$4528 retirement benefit (\$34,000, plus \$23,157 bonus and \$3520 retirement benefit); R. DeYoung, vice president, \$49,791, plus \$25,610 bonus and \$4157 retirement benefit (\$42,500, plus \$23,157 bonus and \$1991 retirement benefit); Howard Hyde, vice president, \$35,770, plus \$12,805 bonus and \$4469 retirement benefit (\$32,250, plus \$11,578 bonus and \$2017 retirement benefit); P. E. H. Leroy, vice president, \$71,041, plus \$40,016 bonus and \$14,545 retirement benefit (\$68,750, plus \$41,351 bonus and \$6629 retirement benefit); R. S. Wilson, vice president, \$68,854, plus \$38,415 bonus and \$15,296 retirement payment (\$66,250, plus \$36,389 bonus and \$6998 retirement benefit); all officers and directors, \$729,595, plus \$281,715 bonus and \$106,016 retirement benefit (\$700,172, plus \$274,574 bonus and \$44,334 retirement benefit).

• **Irving Air Chute Co.** Leslie Irving, president, \$31,005 (\$30,937); all officers and directors, \$61,873 (\$59,327).

• **Firestone Tire and Rubber Co.** Harvey S. Firestone, Jr., chairman of the board, \$135,000, plus \$27,500 contingent compensation and \$10,531 retirement benefit (\$135,000, plus \$27,500 contingent compensation and \$8478 retirement benefit); Lee R. Jackson, president, \$110,000, plus \$22,000 contingent compensation and \$21,511 retirement benefit (\$110,000, plus \$22,000 contingent compensation and \$19,792 retirement benefit); James E. Trainer, vice president, \$77,500, plus \$15,500 contingent compensation and \$6523 retirement benefit (\$77,500, plus \$15,500 contingent compensation and \$4965 retirement benefit); Raymond Firestone, vice president, \$51,458, plus \$2403 retirement benefit (\$46,250, plus \$1576 retirement benefit); Leonard Firestone, president, Firestone Tire and Rubber Co. of Calif., \$46,250, plus \$2255 retirement benefit (\$46,250, plus \$1654 retirement benefit); Roger S. Firestone, president, Firestone Plastics Co., \$36,875, plus \$1403 retirement benefit (\$33,750, plus \$981 retirement benefit); all officers and directors, \$848,365, plus \$125,537 retirement benefit (\$837,964, plus \$100,933 retirement benefit).

• **Breeze Corps.** John Mascuch, president, \$39,208, plus \$1500 bonus and \$7239 pension benefit (\$36,000, plus \$6373 pension benefit); all officers and directors, \$127,240, plus \$6344 bonus and \$17,375 pension payments (\$115,700, plus \$12,370 pension payments).

• **Solar Aircraft Co.** Edmund Price, president, \$45,000 (\$44,999); all officers and directors, \$166,934 (\$166,403).

• **Emerson Electric Manufacturing Co.** O. C. Schmitt, president, \$63,999 (\$38,000); J. A. Driy, vice president, \$39,000 (\$32,000); All officers and directors, \$149,499 (\$111,716).

• **Chrysler Corp.** L. L. Colbert, president, \$127,433, plus \$80,000 contingent compensation and \$5926 retirement benefit (\$100,000, plus \$70,000 contingent compensation and \$6342 retirement benefit); E. E. Hutchinson, vice president, \$225,800 (\$225,700); K. T. Keller, chairman of the board, \$250,800 (\$250,800); Fred M. Zeder, vice chairman, \$215,400 (\$215,400); all officers and directors, \$1,427,692, plus \$426,000 contingent compensation and \$86,739 retirement benefit (\$1,352,266, plus \$415,000 contingent

compensation and \$81,200 retirement benefit).

• **The Garrett Corp.** J. C. Garrett, president, \$50,650, plus \$2373 bonus and \$2028 retirement benefit (\$50,750, plus \$2790 bonus and \$2278 retirement benefit); W. D. Morgan, vice president, \$35,549, plus \$1215 bonus and \$1419 retirement benefit (\$31,916, plus \$1158 bonus and \$1412 retirement benefit); W. R. Ramsaur, vice president, \$35,150, plus \$1425 bonus and \$1399 retirement benefit (\$30,837, plus \$1351 bonus and \$1366 retirement benefit); W. C. Whitehead, vice president, \$29,000, plus \$1252 bonus and \$1156 retirement benefit (\$29,000, plus \$1415 bonus and \$1298 retirement benefit); B. N. Snow, vice president, \$24,400, plus \$706 bonus and \$973 retirement benefit; all officers and directors, \$260,987, plus \$10,342 bonus and \$973 retirement benefit; all (\$254,229, plus \$10,677 bonus and \$10,939 retirement benefit).

SEC Lists Latest Stock Transactions

Purchase of 100 common shares of Northrop Aircraft, Inc., stock by Oliver P. Echols, chairman of the board, making a total holding of 2400 shares is among the transactions by aviation officials and directors reported in Securities and Exchange Commission's latest survey.

Other recent transactions:

• **Aero Supply Manufacturing Co.** Purchase of 500 capital shares, total holding, by Henry A. Rudkin, director.

• **Air Associates, Inc.** Acquisition of 2000 common shares by exercise of option by Gilbert Colgate, beneficial owner, making a total holding of 15,248 shares.

• **Avco Manufacturing Corp.** Purchase of 200 common shares by Joseph B. Hall, director, making a total holding of 400 shares.

• **Breeze Corp.** Acquisitions through stock dividends, as follows: John Maseuch, director, 8702 shares, making a total holding of 22,304 shares; Herbert J. Dwyer, officer, 570 shares, making a total holding of 1140 shares; Joseph F. Lucas, director, 1200 shares, making a total holding of 2400; Frank Mindnich, director, 100, making a total holding of 200 shares; Robert B. Reynolds, director, 251, making a total holding of 502 shares; Fred Shupp, director, 300, making a total holding of 600 shares. Philip Stephenson, director, 200, making a total holding of 400 shares.



WRIGHT FIELD STUDIES RUSSIAN

Air Materiel Command engineers are evaluating this Russian-built IL-10 captured at Kimpo Airfield, near Seoul, Korea. Designed for ground support, the IL-10 has heavy armor around cockpit, which carries two,

Capital Airlines, Inc. Conversion to common stock of \$273,000 debentures by George Hann, director, making a total holding of 39,572 common shares; conversion to common stock of \$25,000 debentures by Thomas Neelands, Jr., director, making a total holding of 2350 common shares.

• **Eastern Air Lines.** Purchase of 100 common shares by S. Peabody, Jr., making a total holding of 400 shares.

• **Fairchild Engine and Airplane Corp.** Purchase of 300 common shares by George Chapline, making a total holding of 700 shares.

• **Lockheed Aircraft Corp.** Purchase of 100 capital shares, total holding, by Charles S. Thomas, director.

• **Glenn L. Martin Co.** Purchase of 100 common shares, total holding, by Richard L. Johnson.

• **Northeast Airlines.** Exchange of 34,000 preferred shares by Atlas Corp., making a total holding of 392,663 common shares; sale of 800 common shares by James Fitzgerald, director, leaving a holding of 3200 shares; sale of 700 common shares by Eugene Vidal, director, leaving a holding of 14,000 shares.

• **Northwest Airlines, Inc.** Sale of 1000 common shares by Robert M. Hardy, director, leaving a holding of 575 shares.

• **Pan American World Airways.** Sale of 100 capital shares by Robert Ferguson, officer, leaving a holding of 671 shares; acquisition of 300 capital shares as compensation by John Leslie, director, making a total holding of 851 shares.

• **Republic Aviation Corp.** Purchase of 100 common shares, total holding, by Henry Lehme, officer.

Fairchild, Republic Wage Pacts Studied

Two aircraft wage agreements granting increases of 15 cents an hour—exceeding the 10-percent wage increase ceiling—await consideration of the re-organized Wage Stabilization Board.

One is between Fairchild Aircraft, Hagerstown, Md. and the CIO United Auto Workers. The other, between Republic Aviation, Long Island, N. Y., and the International Association of Machinists, AFL, also provides some fringe benefits on top of the 15-cent hourly raise.

Ten aircraft contracts are included by the Bureau of Labor Statistics in an analysis of the termination or wage-reopening provisions of 188 major union contracts, each covering at least 5000 employees. They are:

• **Consolidated Vultee (San Diego) and IAM,** covering 9500 employees. Expires in August.

• **Consolidated Vultee (Fort Worth) and IAM,** 19,000 employees. Expires in November.

• **Douglas (Santa Monica and El Segundo) and IAM,** 12,000 employees. Two contracts expire in August, 1952, but may be reopened on wages this August.

• **Douglas (Long Beach) and UAW-CIO,** 7500 employees. Expires in September.

• **Boeing (Seattle) and IAM,** 15,000 employees. Expires this month.

• **Boeing (Wichita) and IAM,** 9700 employees. Expires in November, but is currently reopened on wages.

• **Lockheed (Los Angeles) and IAM,** 12,300 employees. Expires in August, 1952, but may be reopened in June.

• **North American (Los Angeles) and UAW-CIO,** 12,700 employees. Expires in October, 1953, but has quarterly cost-of-living adjustment.

• **Glenn L. Martin and UAW-CIO,** 7700 employees. Expires in October.

Canadian Fighter Production Rising

Production of F-86E Sabre fighters at the Canadair Ltd. plant, Montreal, is expected to reach its planned rate this summer or early autumn, and the CF-100 Canuck fighter built at A. V. Roe Canada Ltd., Toronto, by early 1952, according to Canadian Defense Minister Brooke Claxton in Parliament recently.

It is costing between \$5 million and \$30 million to tool up for production of the CF-100, he stated. The Sabres are costing \$400,000 apiece, including \$175,000 for components and engine brought in from the United States. Production of the two planes is planned to be at the rate sufficient to equip one new fighter squadron (about 25 planes) for the Royal Canadian Air Force each month by the end of 1951.

RCAF is to purchase bombers soon, now that the fighter production is underway, Claxton stated.

MIT Copter Course

A special helicopter course in automatic stabilization and control will be given at Massachusetts Institute of Technology, July 9-18. Course is for graduate engineers with aeronautical experience; preference will be given those now working on rotary-wing aircraft.



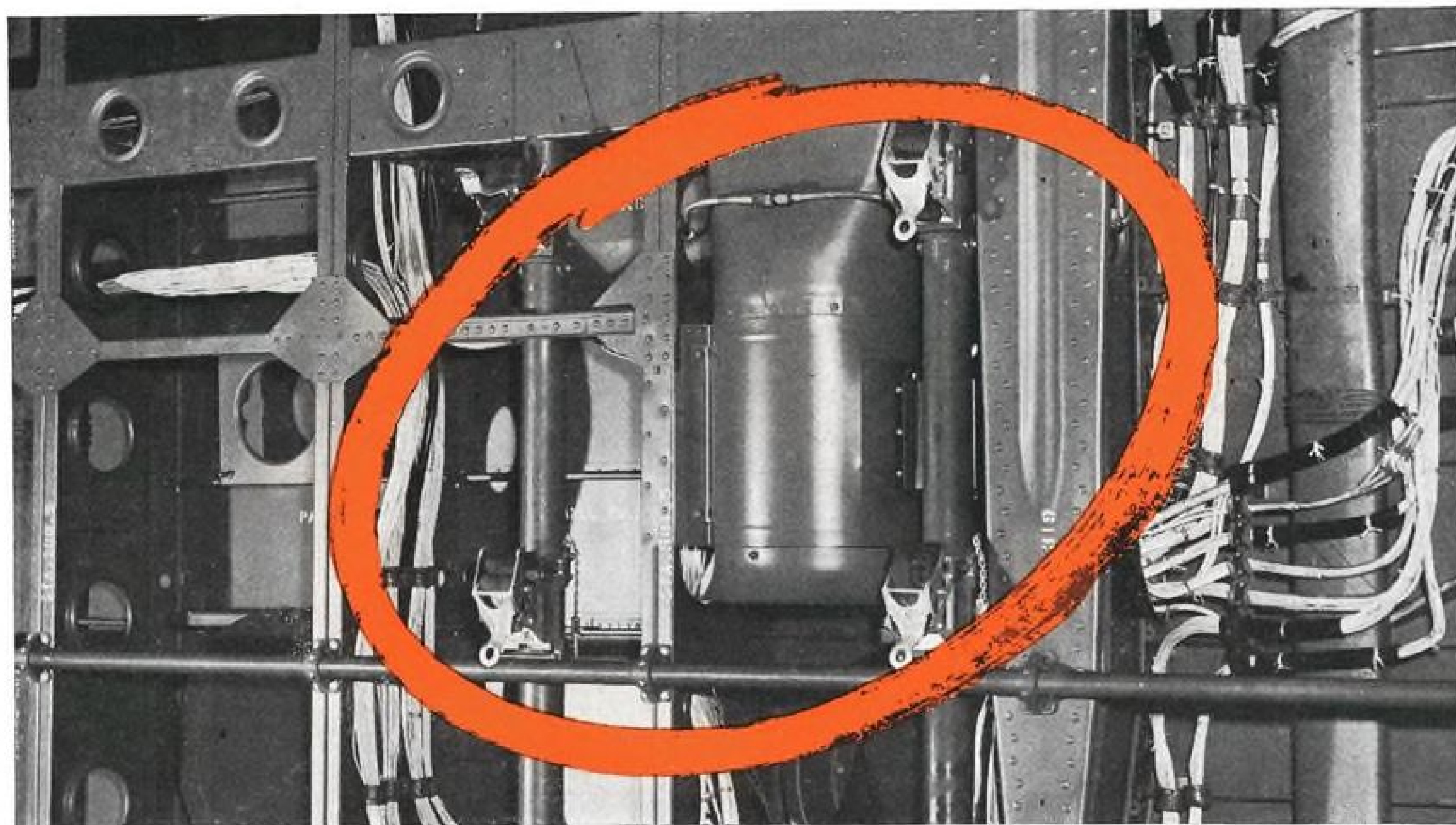
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AERONAUTICAL ENGINEERING

The Atom: Power for Flight

ALMOST SIX YEARS AGO, the first atomic explosion shattered the quiet of dawn over the New Mexico desert. Less than one month later, two modern cities were devastated by the energy stored in chunks of material the size of your fist.

THE HEAT THAT VAPORIZED Hiroshima and Nagasaki was released in one-millionth of a second. It was unbridled, uncontrolled power production. But there were thoughts of controlling it, of ways to slow down the process and to make the enormous power reserve in the atom available to drive turbines, wheels, propellers.

IN FEBRUARY OF THIS YEAR came the announcement that the feasibility of aircraft propulsion by nuclear energy had been demonstrated in theory. With that simple statement of fact, the aircraft industry was presented with a new world full of possibilities—and associated problems. Since February, AVIATION WEEK has been gathering the material necessary to acquaint you with this new source of power. The result is a series of four articles, of which this is the first, intended as a background necessary to the understanding of nuclear energy and its application to the propulsion of aircraft.

By David A. Anderton

Present ideas on atomic structure visualize it as analogous to our solar system—a central nucleus (sun) surrounded by orbital electrons (planets).

There are three structural building blocks from which all atoms are made:

- The electron, lightest particle capable of separate existence, carrying a negative charge of electricity.
- The proton, a particle 1837 times the mass of the electron, carrying a positive charge of electricity of equal magnitude to the negative charge of the electron.
- The neutron, a particle of mass about equal to the proton, but carrying no electrical charge.

Any atomic nucleus— $2\frac{1}{2}$ trillion of them in a line would span one inch—is built of an integral number of protons. Hydrogen—the simplest atom—contains one proton. Uranium has 92.

The number of orbital electrons exactly equals the number of protons in the nucleus; thus, the resultant charge on the atom is zero.

► **Structural Number**—The number of protons in any atomic nucleus is called the atomic number of the substance. (Therefore, for uranium, the atomic number is 92.)

The mass number is a whole number which represents the approximate ratio of the mass of any atomic nucleus to the mass of one proton. The word "approximate" is used in the definition to sidestep the awkward use of fractional numbers.

Uranium in nature occurs in three varieties, of mass numbers 234, 235 and 238.

There are chemically identical species of atoms which have the same atomic number (and therefore the same

atomic structure) but different mass numbers (which means that their nuclear structure differs). Such non-identical twins are called isotopes. U234, U235 and U238 are all isotopes of uranium.

There has to be some way to explain the existence of isotopes and the difference in mass numbers. And here is where the neutron comes in.

► **New Particle**—The neutron, star performer in the atomic theater, is a recent (1932) addition to the cast. It is a component of atomic nuclei. The fact that the particle is uncharged delayed its discovery—and also makes the free neutron a high-speed atomic projectile impossible of direct detection.

The number of neutrons in an atom is defined by the difference between the mass number and the atomic number. For Uranium 235, the mass number is 235; subtracting the atomic number, 92, leaves 143 neutrons.

The present view of nuclear structure assumes binding forces between protons and neutrons in the same nucleus, coupled with repulsion between positively charged protons. Apparently these forces interact so that only some combinations of protons and neutrons are stable. For a simple nucleus of few neutrons and protons, stability exists when their numbers are about equal. For more complex structures, the number of neutrons needed increases disproportionately until, at somewhere around 150 neutrons, stable nuclei cease to exist.

► **Work to Do**—In order to disrupt a stable nucleus, work must be done. Einstein's famous equation relating mass and energy indicates that the total mass of a stable nucleus should be actually less than the mass of the separate protons and neutrons that comprise the nucleus. The difference in mass should be the equivalent of the energy needed to form—or break up—the nucleus. And

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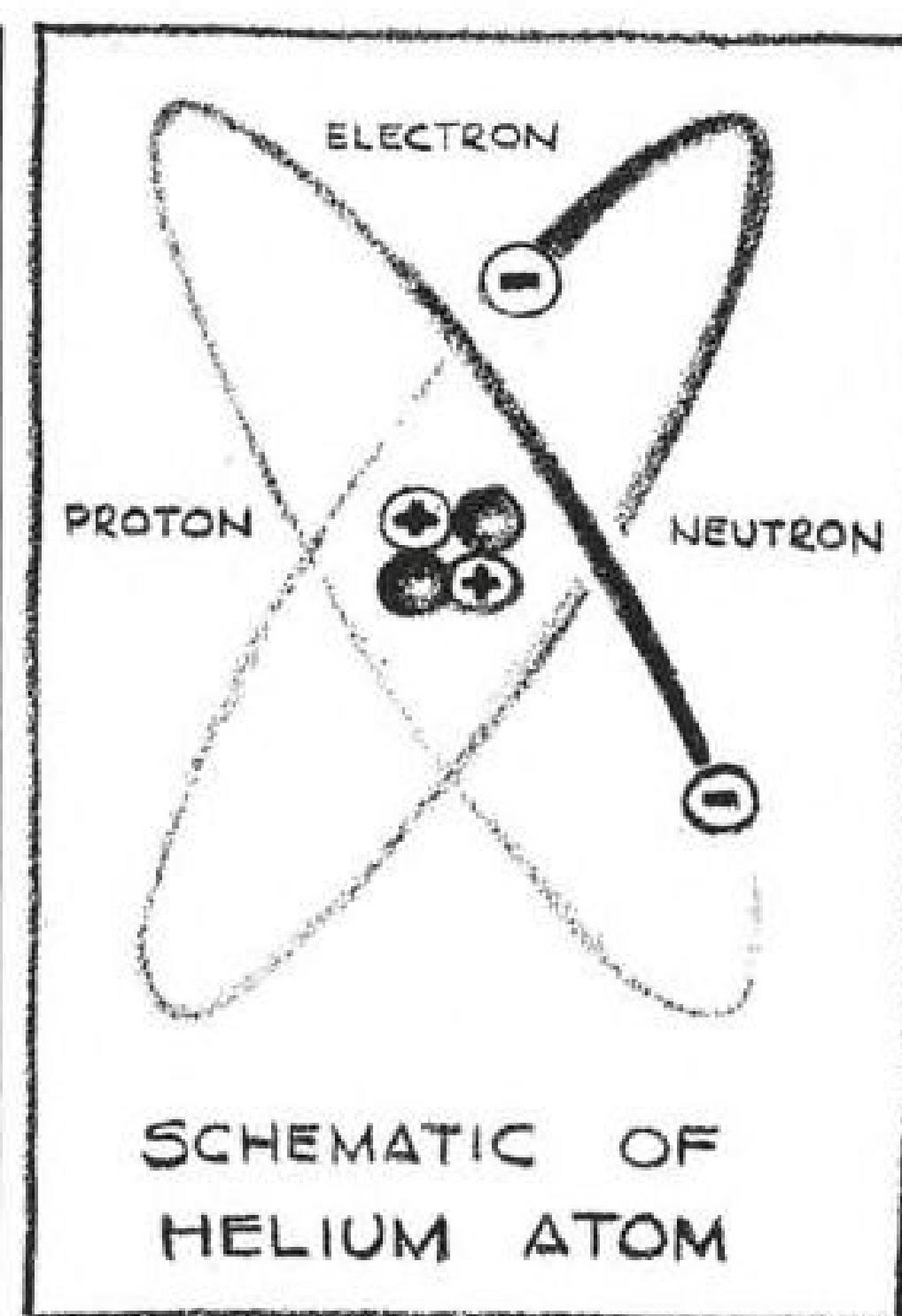
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this energy is called the binding energy.

Taking helium as an example, over 250,000 hp.-hr. would be needed to disrupt all the nuclei of all the atoms in one gram (1/30 ounce) of helium.

Conversely, this much energy would be released in forming a helium nucleus from neutrons and protons.

Accurate binding energy figures are available for many different atoms. And the general trend of these figures shows that binding energy increases to a maximum value for atoms around the middle of the periodic table and then decreases again. So, nuclei of mass numbers from 40 to 100 are most strongly bound.

And any reaction which results in forming tighter-bound nuclei from loosely bound nuclei will release energy.

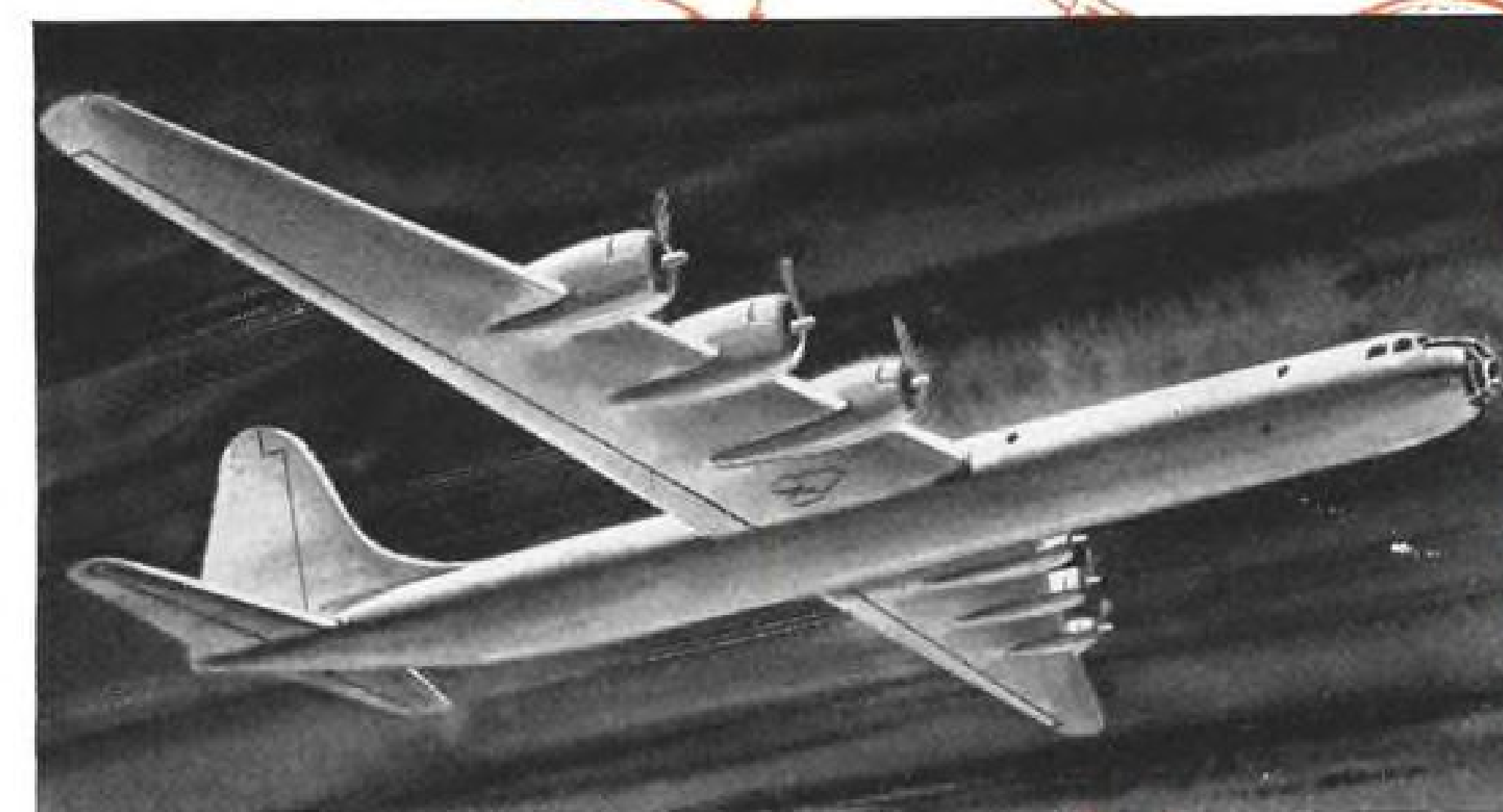
► **Getting Energy**—This consideration of formation or binding energies leads to the supposition (proved at Alamogordo six years ago) that energy can be obtained by breaking heavy nuclei into several small fragments, or by combining light nuclei to produce heavier ones.

To produce this energy—to initiate a nuclear reaction—neutrons must be produced.

But merely having neutrons is not enough. There is no guarantee of collision between a free neutron, slashing along through space, and an atomic nucleus. Take uranium, for instance. If you built a greatly enlarged model of the atomic structure, and represented the nuclei by pinheads, you would have to space them at 250-ft. intervals to maintain the correct proportions.

So the probability of nuclear reaction varies, depending on the particular nucleus and the bullet which hits it.

The particular nuclear reaction that led first to the atomic bomb and later



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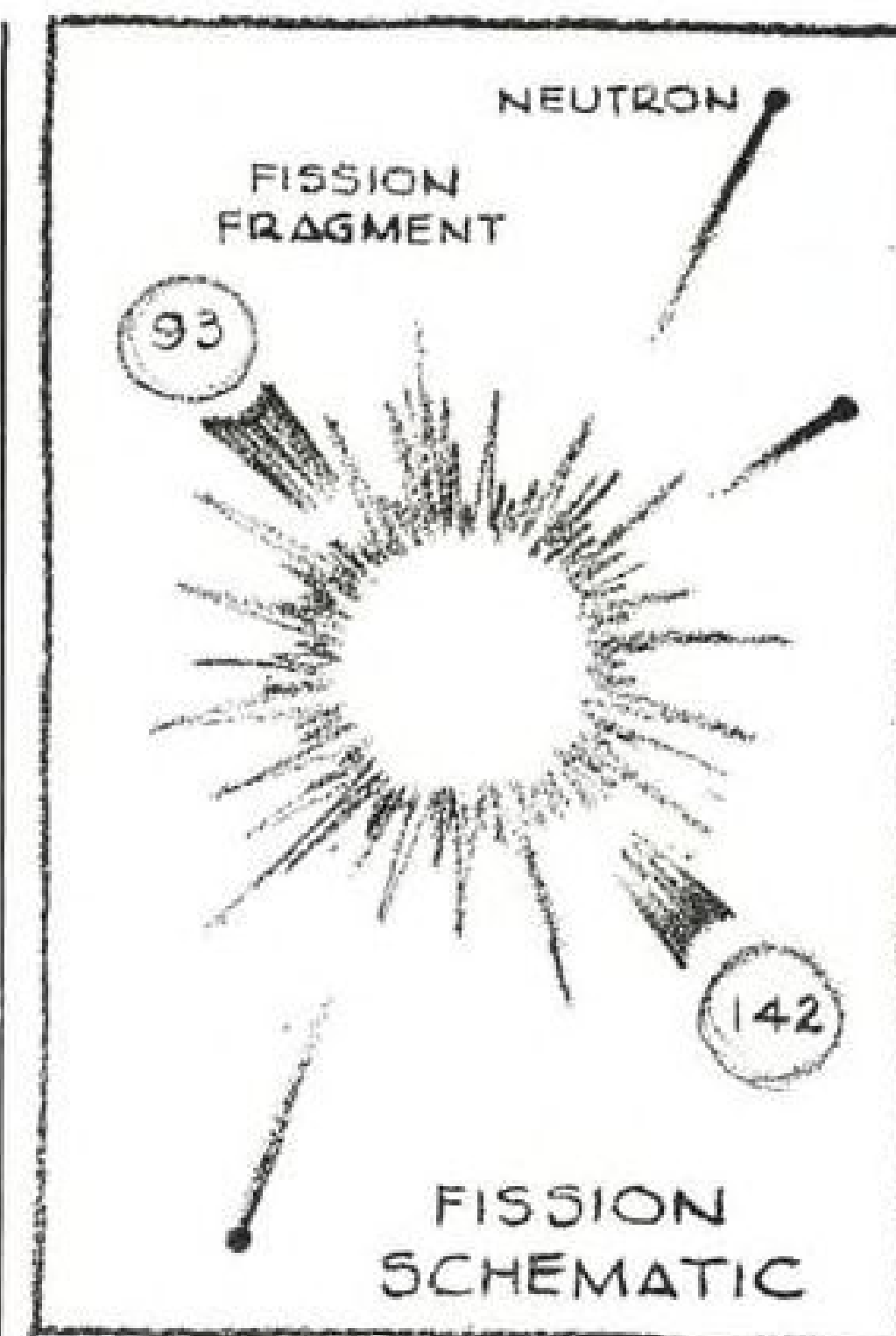


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to considerations of power generation is known as fission. And we are particularly concerned with the fission of uranium, although some other fissionable materials may enter into discussion from time to time.

► **Recent Addition**—Discovery of uranium fission occurred only a little over twelve years ago. There are two ways to look at the process; direct description is one, but a simple analogy is perhaps a better introduction.

Atomic nuclei have been compared to drops of water held together by the binding force of surface tension. Any distortion of the water drop from its spherical shape can only be accomplished by the addition of energy.

Suppose some energy is added to the water drop—it could be the impact of a speck of dirt blown through it by the wind—and the drop is broken up into smaller droplets. If there were high-speed photographs of the process, you could see that the drop, on impact, begins to take the shape of a dumbbell. And you could then see the two bulbs of the dumbbell become more spherical and finally, the thin thread of fluid between them would break. The two droplets would at first be unsymmetrical where the fluid's thread had been attached, but surface tension would soon form each into a sphere.

Crudely, this is what happens in nuclear fission. More sophisticatedly, this is what occurs:

► **Nuclear Fission**—A free neutron, coasting through the nebulous structure of the outer electron shell of an atom, slams into the nucleus. The addition of the neutron creates a compound nucleus, and the system shows an energy rise. If there is enough energy to deform the atomic structure (to something analogous to the dumbbell in the

water drop process) the nucleus breaks into two separate fragments propelled in opposite directions. There is a net decrease of the mass of this system (unlike what happens in fragmentation of the waterdrop), this mass difference appears in the form of energy.

The two fragments which were formed by fission have atomic numbers and mass numbers which when totaled give the mass number and atomic number of the original single nucleus. But the two fragments' nuclei are actually unstable; they have a combination of neutrons and protons which cannot stay in equilibrium.

So in order to maintain equilibrium, the atomic structure must rearrange itself. It can do this by ejecting all the surplus neutrons, by converting the neutrons into protons by giving off electrons, or by some combination of these two possibilities.

► **Unequal Products**—With uranium, the fission products are not of equal mass; instead, they are of mass numbers about 140 and 90. Only a few neutrons are emitted; the remainder of the process is the emission of electrons (radioactive decay) until stable nuclei are formed.

Using current data for binding energies, calculations show that this particular rearrangement gives a final total mass considerably less than the original mass of uranium, and that tremendous amounts of energy are released.

Most of this fission energy appears in the kinetic energy of the fission fragments—the two unstable nuclei mentioned before. These particles, following their formation, have speeds around 22 million mph. The kinetic energy due to this high speed produces, by collisions, a temperature rise in the reactor.

In the meantime, the neutrons which were liberated have been tearing into other nuclei, disrupting and forcing structural changes, with the further release of fission particles and neutrons. And this brings us to the concept of the chain reaction.

► **Definition**—Chain reaction is a descriptive term which pretty much defines the process. It means simply that one fission process releases some free neutrons which initiate other fission processes. And these in turn trigger more fission processes. The whole chain reaction takes only a short time, if allowed to proceed unchecked.

As one example of the speed of reaction and the amount of energy liberated, consider doubling the nuclei which undergo fission in each step or generation. In eighty generations, there would be 10 to the 24th power neutrons in the system, which is enough to cause the fission of every uranium nucleus in a little over half a pound of uranium. The energy released would be 6.7 mil-

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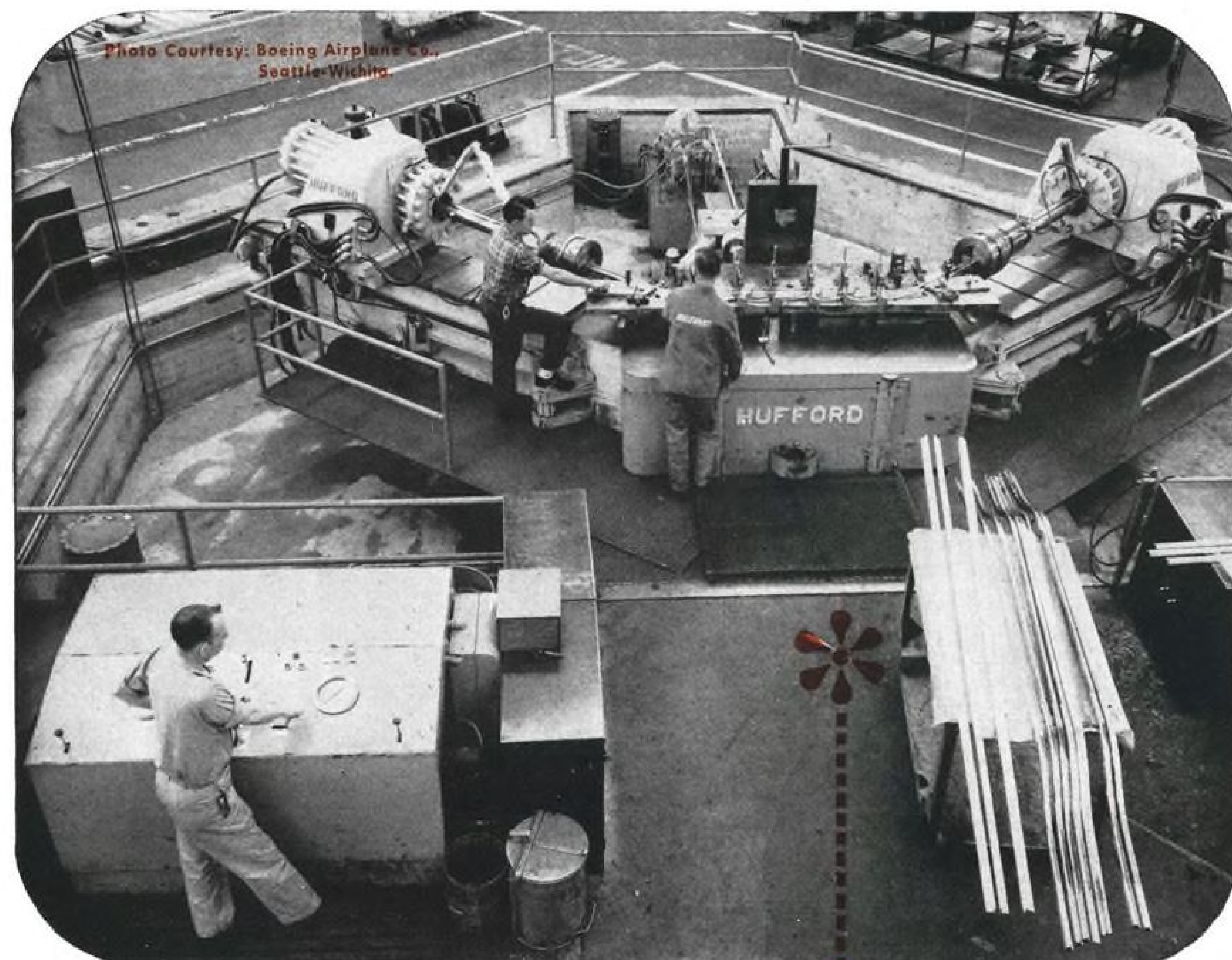
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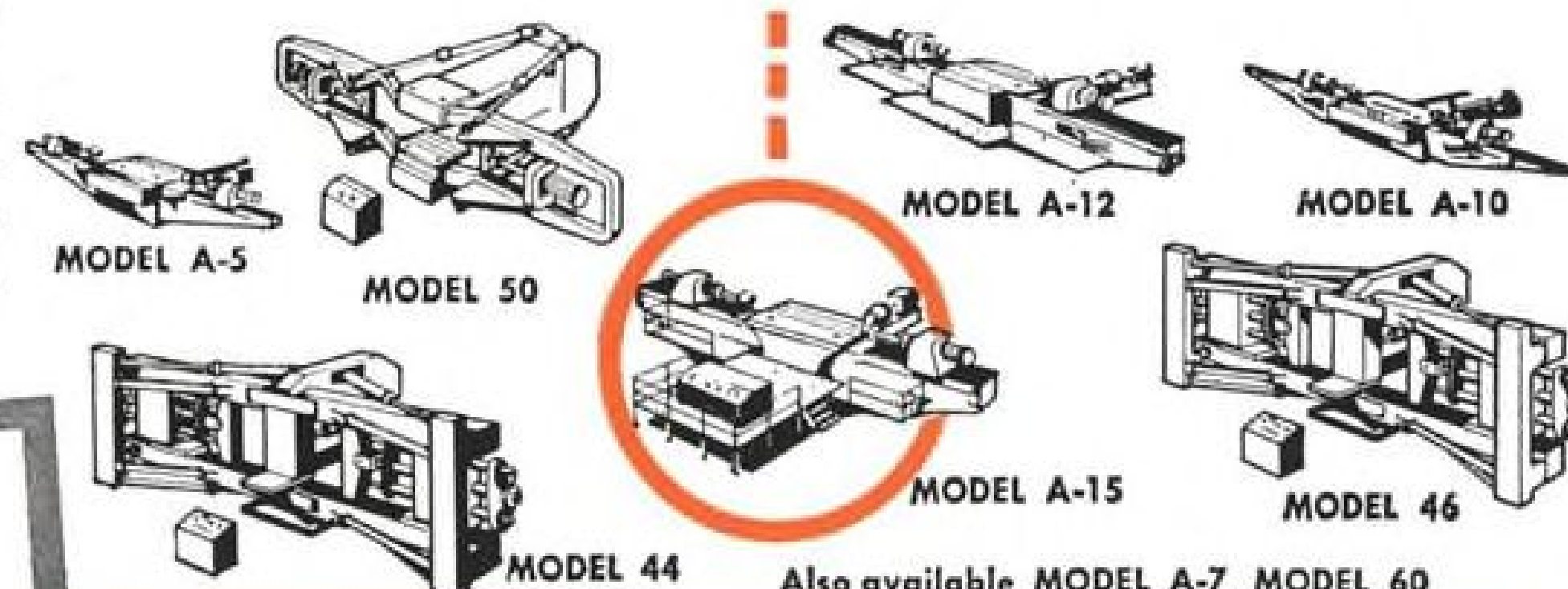
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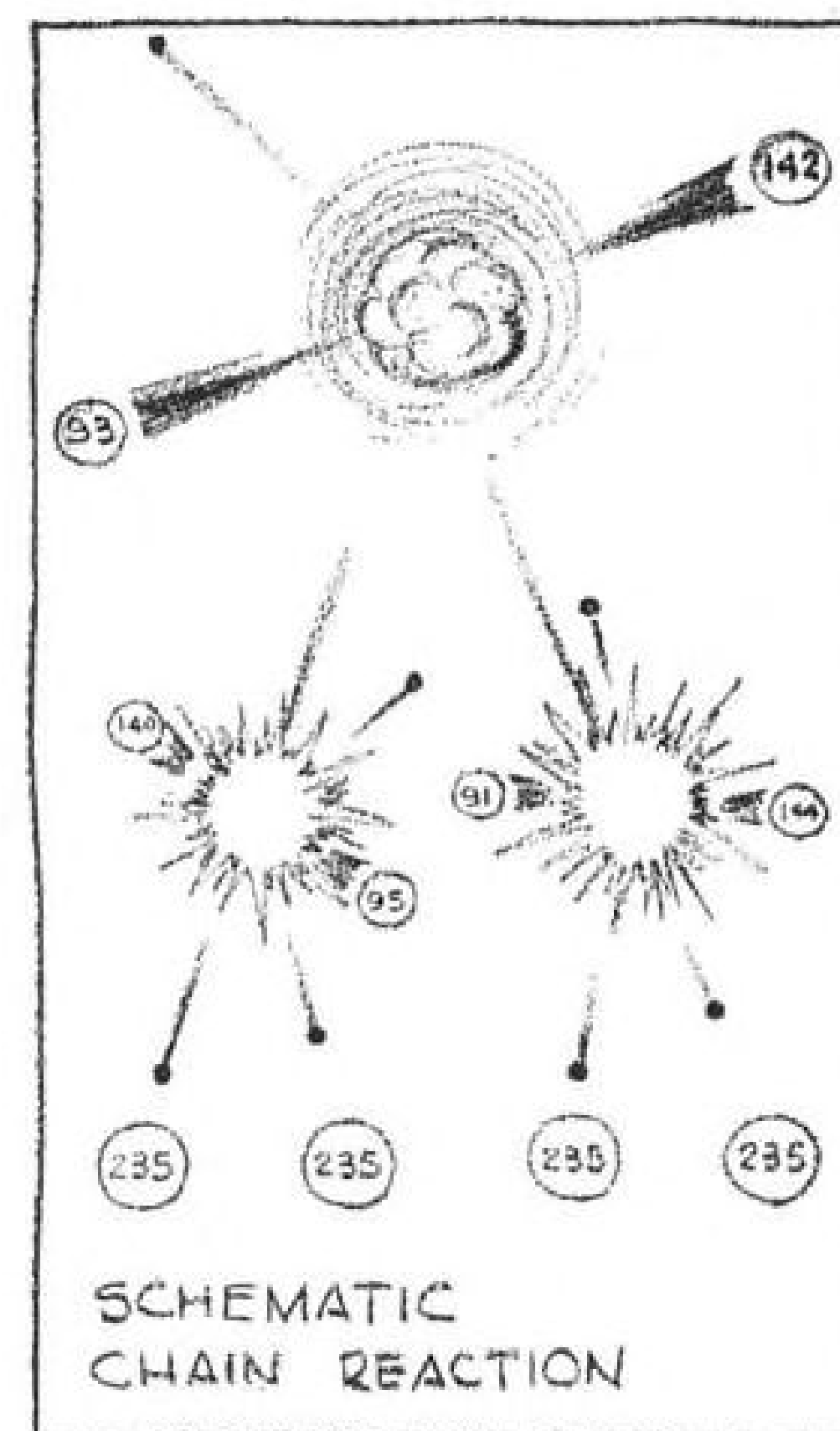
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- Neutrons can cause fission, and in so doing, liberate more neutrons.

Which of these three occurs depends on the physical structure of the system, and on the critical size.

By definition, the critical size of a fission system is the size that produces zero change in the total number of neutrons in the system. Re-arranging this a bit, when a fission system is at critical size, the number of neutrons produced by fission exactly balances the number lost by escape or absorption.

A system of smaller than critical size can not sustain a chain reaction.

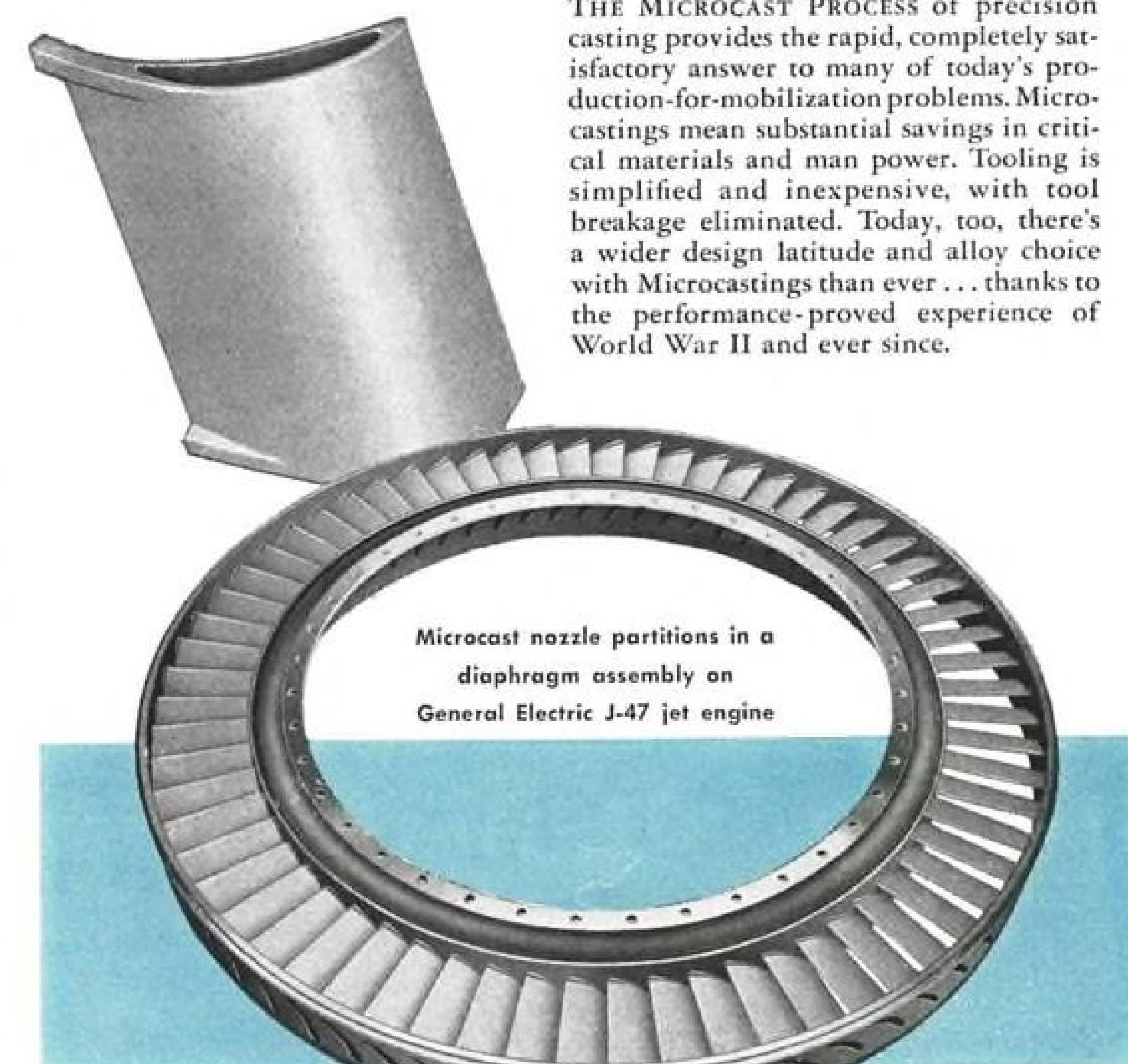
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L-M Field Engineers throughout the country are backed by experienced district lighting engineers and a complete engineering staff at airport lighting headquarters. To get this service, fill out a copy of the Engineering Data Check sheet shown below. You can get this sheet by asking the L-M Field Engineer who calls on you, or by writing Line Material Company, Airport Lighting Division, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

SOME L-M-LIGHTED AIRPORTS

L-M runway lighting is in operation at small, medium, and large airports all over the world. With its various types of units L-M can serve practically any airport. Below are listed some of the principal airports with L-M High Intensity Runway Lighting. Most of these have the latest-

type 180,000 candlepower unit with the famous L-M controllable beam, some have the fixed focus type. In addition there are many, many airports with L-M medium-intensity units. If you are interested, ask for a list of L-M-equipped airports in your area.

Worcester, Mass.
Boston
Windsor Locks (Hartford), Conn.
New York (La Guardia)
New York International
Newark
Philadelphia International
Raleigh, N. C.
Winston-Salem, N. C.
Columbus, O.

South Bend
Indianapolis
Lansing
Battle Creek
Chicago
Milwaukee
Madison
Minneapolis-St. Paul
Sioux City, Ia.
St. Joseph, Mo.

St. Louis
Bristol, Tenn.
Chattanooga
Knoxville
Nashville
Jackson, Miss.
Birmingham, Ala.
Jacksonville, Fla.
Oklahoma City
Rapid City, S. D.

Phoenix
Salt Lake City
Arcata, Calif.
Pocatello, Idaho
Seattle
Spokane
Rineanna, Ireland
Dublin
Amsterdam
Brussels

Paris
Tel Aviv
Teheran
Shanghai
Canton
Hankow
Caracas
Panama City
Georgetown, B. G.

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Here is some of the complete L-M Equipment for Small and Large Airports

L-M's famous 180,000 cp controllable-beam high intensity runway light, type L 818.

L-M high intensity unit with fixed focus, type L 819.

L-M medium intensity runway light for smaller airports, and for taxiways at larger airports.

L-M revolving beacon for Class I, II, and III airports.

L-M marker and obstruction lights, single or double.

L-M control panels for large and small airports.

Get this Engineering Data Check Sheet Free

A simple way to check the information and data on which to determine the runway lighting requirements for your airport. Sent free on request to airport managers and others concerned with runway lighting installations.

factor is called the multiplication factor, or sometimes, the reproduction factor.

Actually, this factor defines the number of neutrons in successive generations in the fission process. If, for example, a particular reaction starts with 200 neutrons on hand, and one generation later there are 300 neutrons, the multiplication factor of the system is 300/200, or 1.5.

If this factor is greater than 1.0, a chain reaction is possible. If less, there is no possibility of maintaining the chain reaction.

Up to now, we have talked about the atom and its structure; about the forces that bind the nucleus together and about how this force can be released. We have seen that the release of energy from one atomic nucleus can trigger off a series of successive energy releases which can propagate at enormous rates. If permitted to develop unchecked, the result is a Hiroshima, a Nagasaki, a Bikini.

If controlled, the result is power generation without coal or oil fuels, or a submarine or battleship that would require perhaps only annual refueling. Or—an aircraft that can fly nonstop to any place in the world and back, and do it several days in a row without refueling. And this is the application for us.

(Next Week: The conversion of nuclear energy to power.)

Jet Engine Cans Give Protection

New orders reported for jet engine steel shipping cans point up the growing importance of these containers as protective housings.

Developed by Rheem Mfg. Co. in collaboration with General Electric Co.'s Aviation Gas Turbine division and the Air Materiel Command, these flammable cans open along a longitudinal seam into two "bathtub" halves.

For shipment, the can is hermetically sealed and filled with de-humidified air under light pressure. A relief valve releases pressure if it reaches too high a value. An external humidity indicator shows the presence of any moisture in the can.

A shockmount system insures against engine "in resonance" vibration, as might occur in freight car shipment.

Engine mount bolts are easily removed from the shockmount installation, cutting engine removal time from a closed-container start to about 2 man-hours.

The Rheem radial engine container, made in sizes up to those accommodating the R-4360, was developed from an original type pioneered by the Navy Bureau of Aeronautics and Pratt & Whitney Aircraft.

LEWIS Selector Switches

FOR RESISTANCE THERMOMETERS AND THERMOCOUPLE THERMOMETERS

EACH SWITCH HAS "OFF" POSITION PLUS NUMBER OF POINTS LISTED.

Points	Size	Switch Part Numbers	
		Thermocouple Type	*3 Wire Resistance Thermometer Type
2	2"	1152	36SR2
3	2"	1153	36SR3
4	2"	1154	36SR4
5	3"	1055	37SR5
6	3"	1056	37SR6
8	3"	1058	37SR8
9	3"	1059	37SR9
10	3"	10510	37SR10
12	3"	10512	37SR12
16	3"	10516	37SR16
18	3"	10518	37SR18
20	3"	10520	37SR20
24	4"	27524B2	38SR24
28	4"	27528B4	38SR28
40	4"	3852C	

*Resistance thermometer switches are provided with a safety resistor on off position.

SPECIAL SWITCHES

No. 37S6C2, Four "4 Point and OFF" thermocouple switches combined in one 3" case.

No. 9S5, Single Pole, Four Point Instrument Switch in 1 1/4" round case.

No. 44S4, Six Pole, Double-throw Instrument Switch in 2 1/2" round case, one hole mounting, 1/2-32 threaded bushing.

DESIGNED FOR TEST WORK AS WELL AS FOR PERMANENT INSTALLATIONS. LEWIS SELECTOR SWITCHES ARE CONSTRUCTED WITH STURDY CONTACTS OF LOW RESISTANCE AND POSITIVE DETENT. THESE SWITCHES ARE SPLASHPROOF, DUSTPROOF AND ARE BUILT TO GIVE YEARS OF SERVICE.

2" SIZE

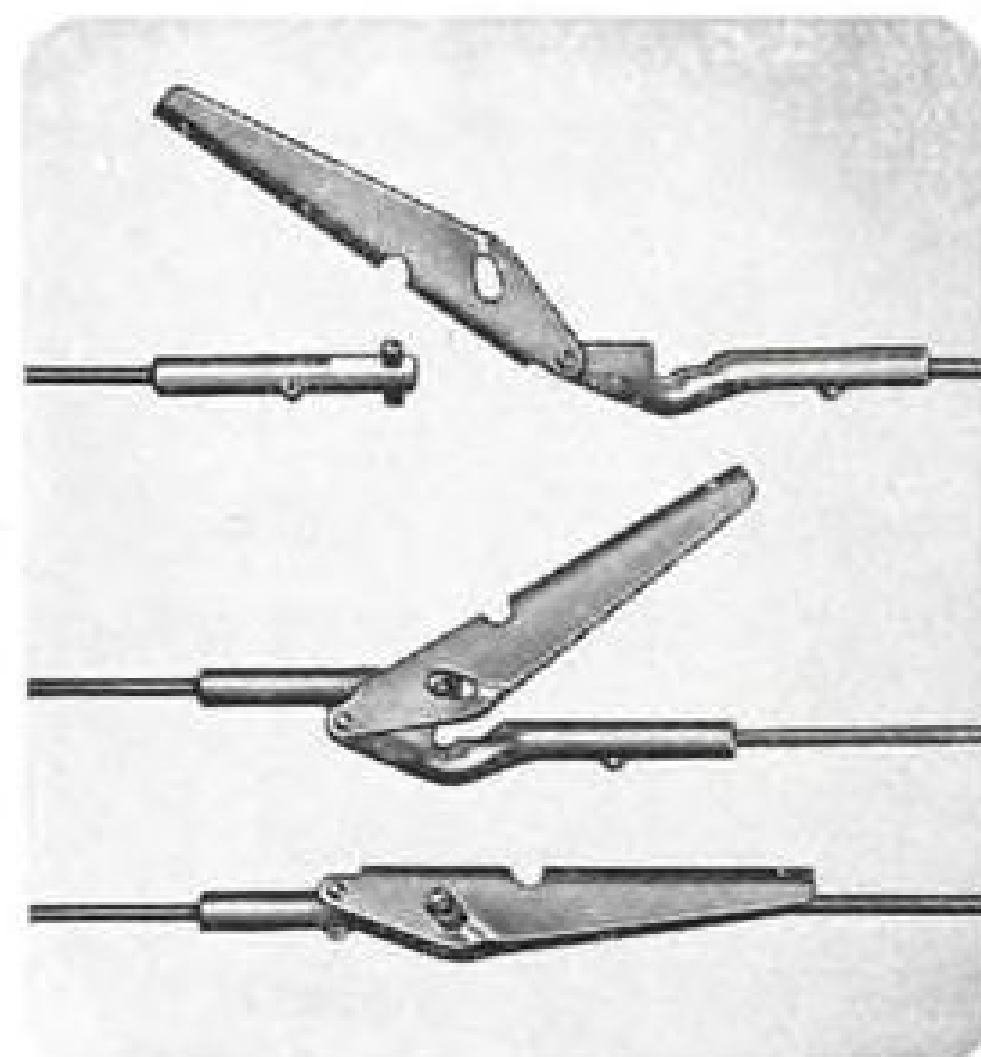
3" SIZE

4" SIZE

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NEW QUICK-DISCONNECT for AIRCRAFT CONTROL CABLES



With "SPEED-RIG" you can disconnect and rig in a matter of seconds!

10 TIMES FASTER than existing turnbuckle installations. A flip of the handle and cable is disconnected. To restore identical rig load, simply connect the unit and close the handle. It's that simple! With "Speed-Rig," after adjusting to required cable tension by threaded shank, the turnbuckle portions remain safety wired.

INTERCHANGEABLE: Speed-Rig replaces existing single barrel turnbuckle installations. It comes in two types... *standard*, which fits existing turnbuckle terminals, and *swage*, which may be swaged direct to the cable.

NO TOOLS required... The Speed-Rig handle serves to turn the barrel as a turnbuckle for proper tension adjustment.

SAFE... rugged, yet small and light, Speed-Rig is made to withstand a minimum of 110% of cable strength. Handle is safety-wired in closed position and cannot open if cable slackens.

AVAILABLE to fit cable sizes 1/16" through 3/16".

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EXHAUST MANIFOLD SYSTEM life span is stretched by use of thin ceramic coating.

Ceramics: Exhaust Protection

Research pushed on thin coatings to help improve heat and corrosion resistance in new higher-power engines.

The potential of ceramics is being exploited to lick exhaust system problems in high-power piston engines.

Ceramics for this application is not entirely new. In World War II, Ryan Aeronautical Co. turned out more than 500 exhaust systems with thick enamel coatings for the Douglas A-20 attack bomber, when the low-carbon SAE 1020 steel was used instead of the critically short stainless.

But Ryan is still pushing its development studies because the necessity for improved heat-resistance and for checking corrosion in exhaust systems has greatly increased. Today's piston plants, with their boosted power and higher exhaust temperatures, have created more severe operating conditions for exhaust system components.

► **In Stratocruiser**—Now Ryan, Boeing and Pan American Airways engineers are teamed in tests on thin coatings of .001-.003-in. ceramics on Ryan-built exhaust parts in a PAA Stratocruiser operating under regular service conditions on trans-Pacific runs.

First check in Ryan's engineering lab was on exhaust headers having 650 hr. of service. These components bolt directly to the engine cylinder heads. Some were ceramic-coated inside and outside, some inside only, others had no coating. Also checked were headers fabricated of heat- and corrosion-resistant alloys.

This 650-hr. proving period already has established sufficient data to warrant production of B and C row cylinder header assemblies with ceramic

coatings for the Boeing Stratocruiser.

One example of the protection offered by the coating is seen in the application where only the inside of the header was covered. There was but a slight reduction (.003 in.) in gage thickness, resulting from scaling on the outside surface.

► **Protection Effective**—And the trials have been extended to cover a longer operating period. After 1234 hr. of service, there was no reduction in gage thickness (.045 in.) on the header coated on both sides, indicating that the ceramic was completely effective in retarding corrosion over this extended period.

Headers used in the Stratocruiser are built by Ryan of 19-9DL steel. The ceramic coating is National Bureau of Standards' type A417, designed for jet engine and other high temperature applications, to prevent oxidation, carbon absorption and corrosion effects. Ryan builds the header, then ships it to California Metal Enameling Co., Los Angeles, for the coating process.

► **Other Applications**—Other tests are being conducted on an American Airlines' Convair 240 which has the entire exhaust systems of both engines ceramic-coated, and on another PAA Stratocruiser which has one powerplant's collector ring as well as the header assemblies covered with the enamel.

Report is that future exhaust systems for Boeing B-50s and C-97 Stratofreighters will incorporate ceramics for protection.



PAC engine overhaul means singing, surging power



PAC engine overhaul means more time between overhauls



PAC quality workmanship sets the standard of the industry



PAC testing methods mean increased efficiency of operation

Engine Overhaul Efficiency...

... is not only essential to safety standards, but can increase operational profits as well. For example, Pan American reports that one run is getting 1500 hours between overhauls on R-2000 engines. PAC engine overhaul efficiency also helps Pan American's giant 4360 - 3500 hp engines to get 900 hours between overhauls. Maintenance men

and Air Force Engineers throughout the country consult with PAC engineers and craftsmen to study these methods. Incidentally, Pacific Airmotive is the only privately owned concern in the country authorized to overhaul these 4360 engines. The CAA has also approved the 25% saving of test-run time, as pioneered by PAC engineers.

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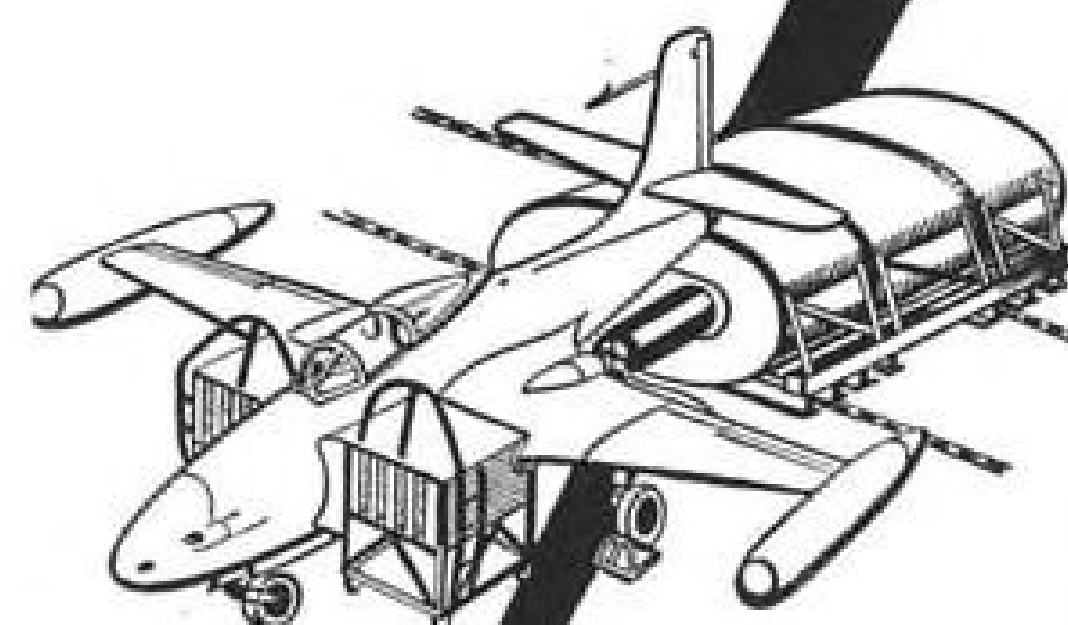
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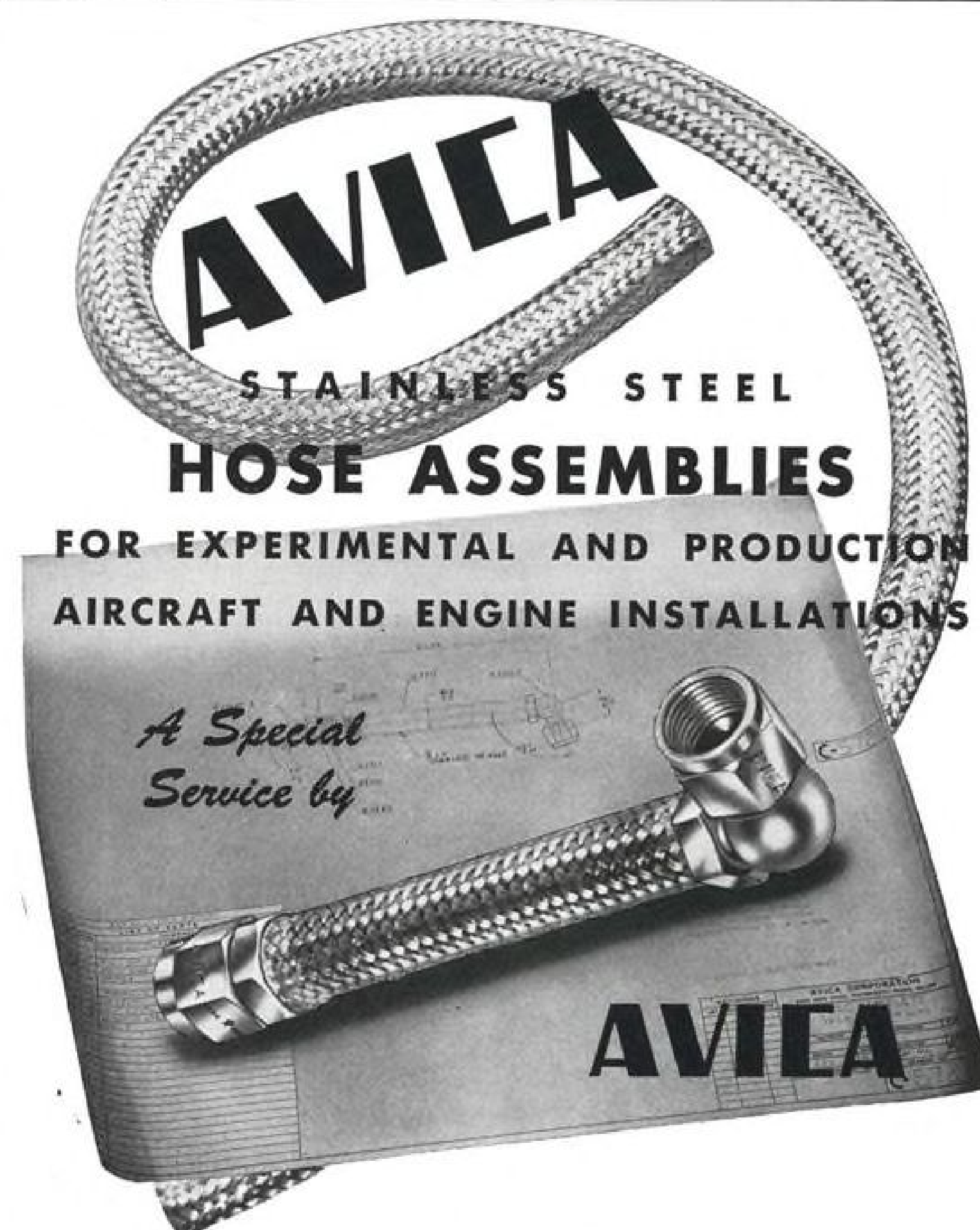
Ozone Handling Technique Studied

Improvements in the technology of ozone manufacture were announced recently by Clark E. Thorpe of Illinois Institute of Technology. Scientists working at IIT's Armour Research Foundation have demonstrated that ozone can be handled and manufactured safely, and thus have opened the door to possible quantity production of the substance.

Ozone, dark blue in its liquid state, can be considered as concentrated oxygen (it has three oxygen atoms per

molecule instead of two). And it has two major current values to aviation: It can be decomposed directly (and almost too easily) to oxygen for altitude flying, and it can be a more powerful oxidizer for rocket fuels. In the latter application, liquid ozone has a higher density than liquid oxygen, which means that more weight of oxidizer can be stored in a given volume of missile tankage. With respect to boil-off losses during standby for firing, less tank insulation and less tank topping would be necessary. This is because liquid ozone boils at a higher temperature than liquid oxygen does.

Exhaust velocity improvement is on



AVICA is equipped to produce ON SHORT NOTICE Flexible Hose Assemblies with special or non-standard end connections to suit your requirements, using AN 1 and 2 wire braid synthetic hose or Stainless Steel Hose with brazed or mechanical end couplings. Special thread fittings; hoses with integral "Y", "T" or "Elbow" connections at any angle from 90° to 165°; parts for fuel, pneumatic and hydraulic systems; fittings for mock-up and experimental installations.

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the order of 1500 fps. In the V-2 rocket engine, for example, the mixture of oxygen and alcohol delivers a jet velocity of about 6500 fps. Using liquid ozone instead of liquid oxygen would step this up to about 8000 fps., and increase rocket speed and range about proportionately.

Ozone research at Armour Research Foundation has been under the sponsorship of the Air Reduction Co., Inc.

Jet Turbine Blades Tested in Flight

(McGraw-Hill World News)

London—What is believed to have been the first strain testing of jet turbine blades in flight took place recently at the development airport of Rolls-Royce Ltd., at Hucknall, Nottinghamshire.

According to EMI Factories Limited (which supplied part of the equipment), this testing is carried out as follows:

Electrical resistance elements are built into the turbine blades and electrical connections made to a radio transmitter in the aircraft by means of special mercury slip-ring contacts. When the jet engine is running, any strains which are set up will appear as an electric signal which is transmitted to the ground, where it is recorded on magnetic tape so that it may be examined under laboratory conditions.

It was found impracticable to use a high-speed camera for a flight period of about 1/3 of an hour. Magnetic tape recording proved to be the only suitable method for obtaining an accurate record of these signals, which may include frequencies up to 20 kc./sec. A standard EMI studio type tape recorder has been used by R-R for the purpose.

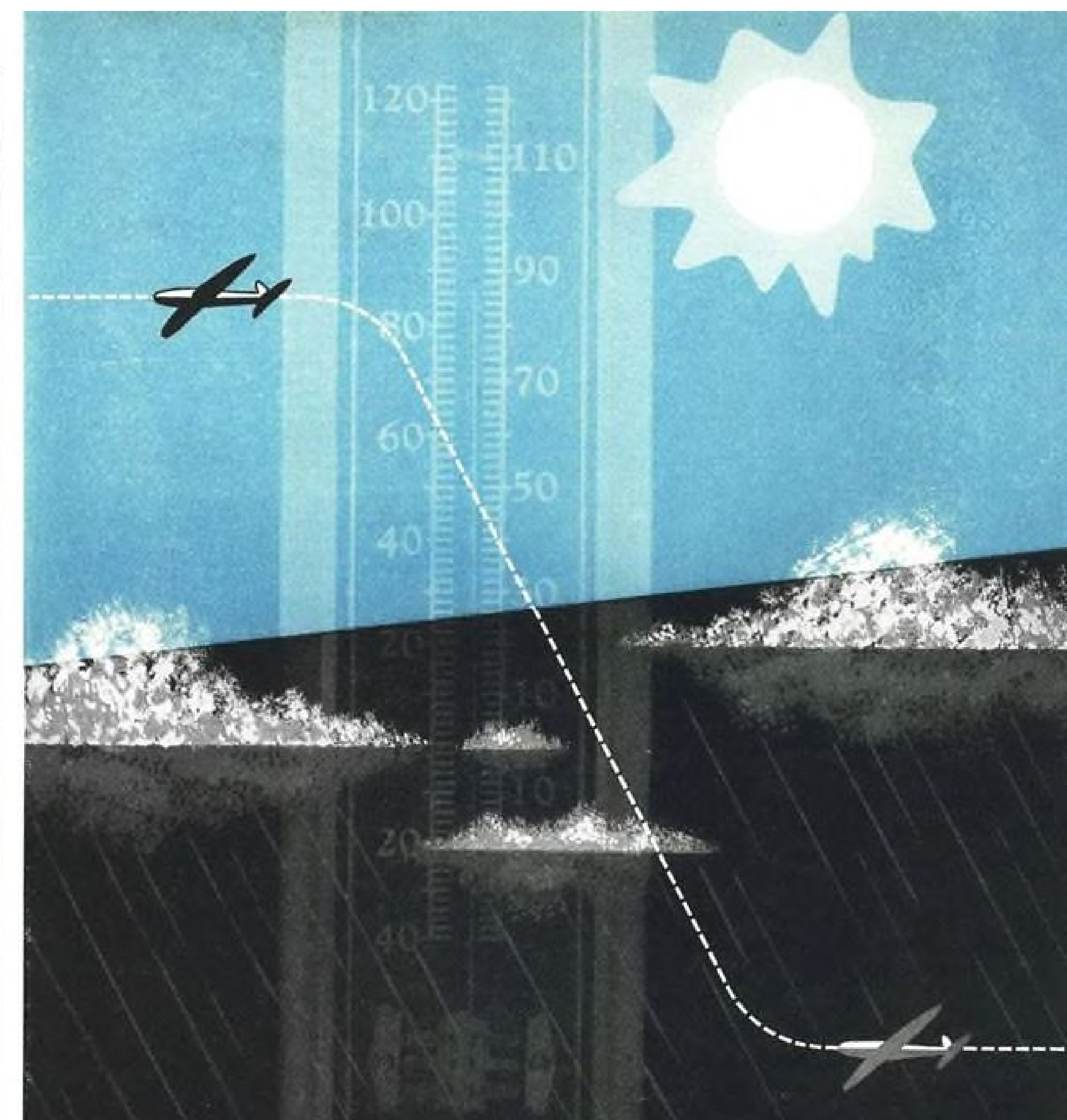
New Tunnel-Drives

The expanding scope of high-speed windtunnel research is pointed up by a recent order of a 180,000-hp. drive.

This huge electric motor unit and a companion 110,000-hp. drive will be built by General Electric Co. for installation in two supersonic tunnels at the National Advisory Committee for Aeronautics' Ames Lab at Moffett Field, Calif.

The 180,000-hp. installation will power a new 8-ft. supersonic tunnel, will be capable of a peak one-hour output of 216,000 hp., and comprises four 45,000-hp. variable speed ac. induction motors mounted in tandem on a single shaft for driving either of two compressors.

The 160,000-hp. drive, comprising two 45,000 units and one 27,000-hp. unit, will replace the 27,000-hp. unit in the present 16-ft. tunnel. Three props on a single shaft will create the wind for 350- to 920-mph. speeds.



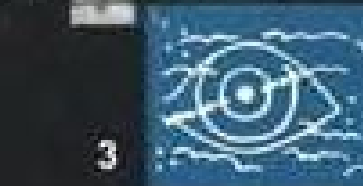
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IS NOT ENOUGH...

To operate effectively, controls must function smoothly no matter how rapidly temperatures change. The Vapor principle of stabilized pulse modulation plus split second timing is the only way the highest degree of controlled accuracy can be accomplished. Vapor Rador Thermostats are extensively used for . . .

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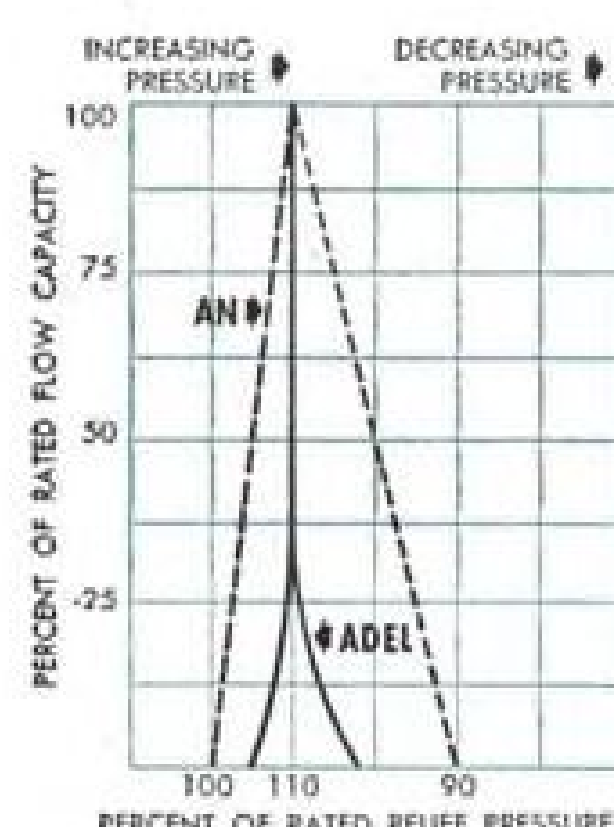
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	LINE SIZE			
	$\frac{1}{4}$ "	$\frac{3}{8}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "
AN Standard	1.2	3.5	6	16
ADEL	6	10	14	32



ADEL 3,000 psi Class CD poppet type relief valves provide maximum flow capacity for a given line size. All conform strictly to AN 6279 Envelope. Extremely compact, light weight construction permits savings in weight of up to twice that of competitive valves. Zero internal leakage requirements are met at a pressure 30 psi less than dynamic cracking pressure, and 30 psi less than dynamic reseating pressure as defined by MIL-V-5523. Pressure variation from cracking point to maximum rated capacity is far less than that required by AN standards.

Make comparisons and see for yourself why these outstanding valves are unexcelled for high pressure aviation hydraulic performance.

ADEL also produces the most complete line of AN Standard aircraft Clips and Clamps available.

For complete engineering specifications and counsel, address: ADEL DIVISION, GENERAL METALS CORPORATION, 10775 Van Owen St., Burbank, Calif.

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NACA Reports

► An Analytical and Experimental Investigation of the Skin Friction of the Turbulent Boundary Layer on a Flat Plate at Supersonic Speeds (TN 2305)—by Morris W. Rubesin, Randall C. Maydew and Steven A. Varga.

The analytical portion of this report is intended to be a review of existing approximate methods for the computation of skin friction and heat transfer of a flat plate in supersonic flow. Further, the report investigates the effects of certain arbitrary boundary conditions imposed by these existing computation methods.

The experimental portion of the report presents additional data on high-speed, turbulent-boundary-layer, skin-friction characteristics and compares these data with the calculated results of all theories.

The analyses show that there are extremely large variations existing in the predicted average coefficients, and that these variations exist because of differences in the assumed mathematical boundary conditions.

An interpolation formula was developed from extended Frankl and Voishel analysis for the average skin-friction coefficient of an insulated flat plate. This formula gave results which agreed with previous experimental data to within 5 percent in the range of Mach numbers from 0 to 2.5. However, when the typical boundary-layer velocity distribution obtained by experiment was compared with one calculated by the extended Frankl and Voishel analysis, the profiles were not coincident. This indicates that perhaps the excellent agreement of the experimental average skin-friction coefficient with theory was fortuitous. —DAA

► A Theoretical Method of Determining the Control Gearing and Time Lag Necessary for a Specified Damping of an Aircraft Equipped with a Constant-Time-Lag Autopilot (TN 2307)—by Ordway B. Gates, Jr., and Albert A. Schy.

This paper is an extension of an earlier Tech Note which discussed a method for calculating overall variations of airplane stability due to the installation of a particular linear autopilot. Purpose is to present a rigorous method to obtain combinations of control gearing and time lag which will provide specific amounts of damping.

The derived method is applied to a typical airplane equipped with an autopilot which applies rudder control in proportion to the angular acceleration in yaw.

The results thus obtained by this method are shown to be in excellent agreement with airplane motions calculated by the much-longer step-by-step procedure.

The investigation shows that for some values of control gearing, more than one range of time lag exists for which the assumed autopilot-aircraft combination will have specified damping. The width of these ranges decreases with increased time lags; beyond some value of lag, the ranges cease to exist.

The analysis is strictly applicable only to systems with constant-time-lag characteristics.

However, if a frequency-response analysis of any given autopilot indicates that a constant-time-lag assumption is valid for a limited range of frequencies, the method can be used. For such conditions, application of the method is discussed at some length towards the end of the presentation. —DAA

► Effects on Longitudinal Stability and Control Characteristics of a B-29 Airplane of Variations in Stick-Force and Control-Rate Characteristics Obtained through Use of a Booster in the Elevator-Control System (TN 2238)—by Charles M. Mathews, Donald B. Talmage and James B. Whitten.

The increasing use of control boosters in aircraft has led NACA to make flight investigations of a boost system installed in the elevator-control system of a B-29 airplane. On this airplane, elevator-force variations were felt to be most critical from consideration of handling qualities. The B-29 was chosen as the test airplane because it was representative of a large craft having inherently satisfactory elevator-force variations, but having elevator forces that are somewhat high in relation to the present handling-qualities requirements.

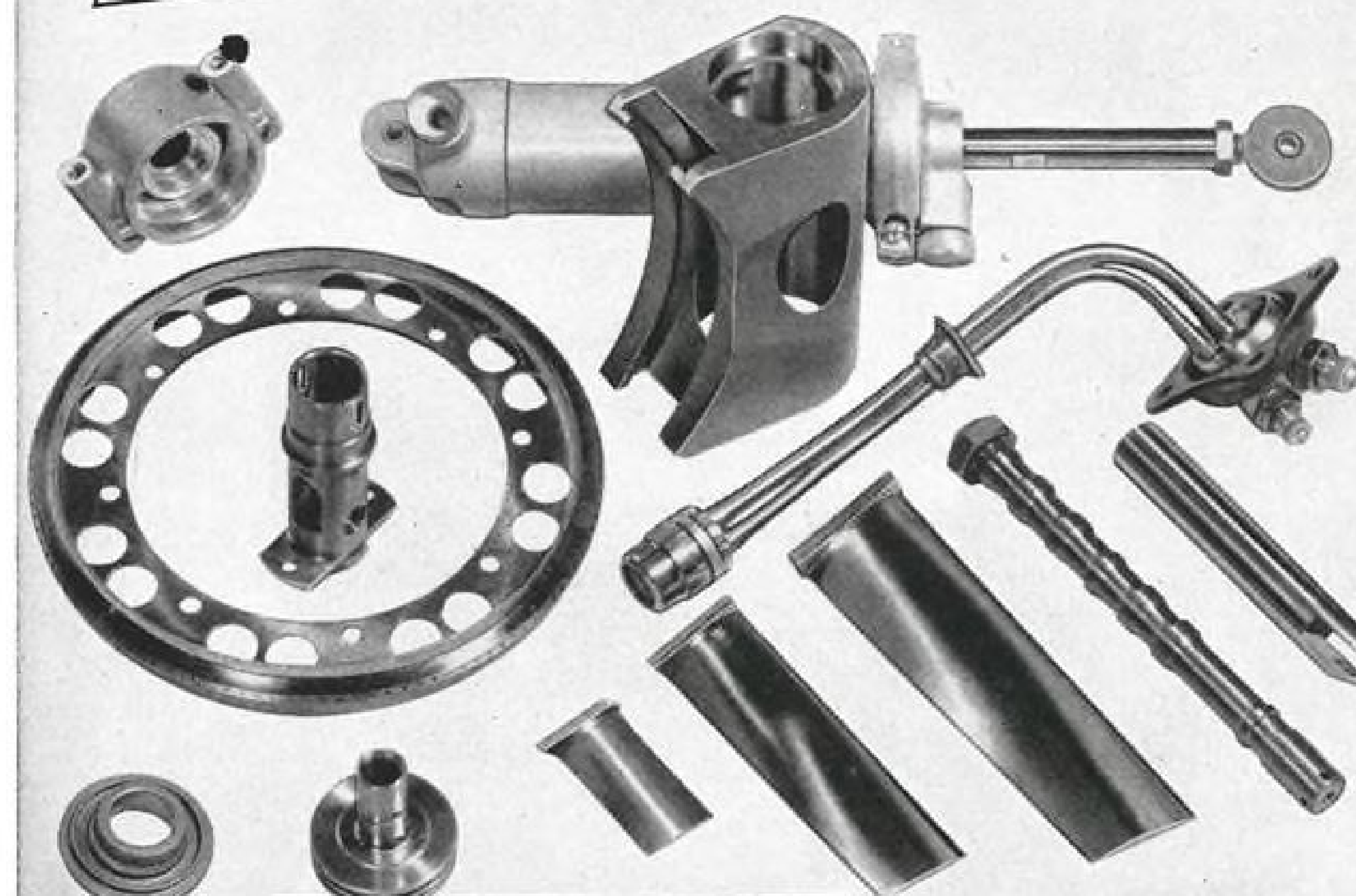
The test booster system had provision for varying the magnitude of the aerodynamic force feedback over a wide range (in contrast to the alternate approach where stick forces are created mechanically), and the effects of the magnitude of the pilot's stick forces on the handling qualities of the airplane were investigated.

The maximum rate of control motion could also be varied to study its effects on handling characteristics of the test aircraft.

Specific test results on the B-29 airplane are presented. It is indicated that large airplanes may have satisfactory handling characteristics with a booster having much lower available control rates than those normally used by pilots.

However, the NACA warns that this statement applies strictly to the test airplane. —DAA

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For more than 20 years Ex-Cell-O has been an important parts supplier to the aircraft industry. Ex-Cell-O precision, a byword in piston-powered aircraft, has continued to play an important role in the development of jet power. Today, leading manufacturers of turbojet engines, reciprocating engines and airframes rely on Ex-Cell-O for precision parts and sub-assemblies requiring unusual accuracy and uniformity of dimensions, finish and hardness.

Since the introduction of jet-powered planes Ex-Cell-O has developed special machine tools for the volume production of compressor parts and fuel system parts and sub-assemblies, including nozzles.

Ex-Cell-O's aircraft parts production facilities are being used now in cooperation with the defense program. If you are working with this program too, perhaps Ex-Cell-O can help you.

ABOVE: Typical precision aircraft parts manufactured by Ex-Cell-O. All details of assembled units were manufactured at Ex-Cell-O to customers' specifications.

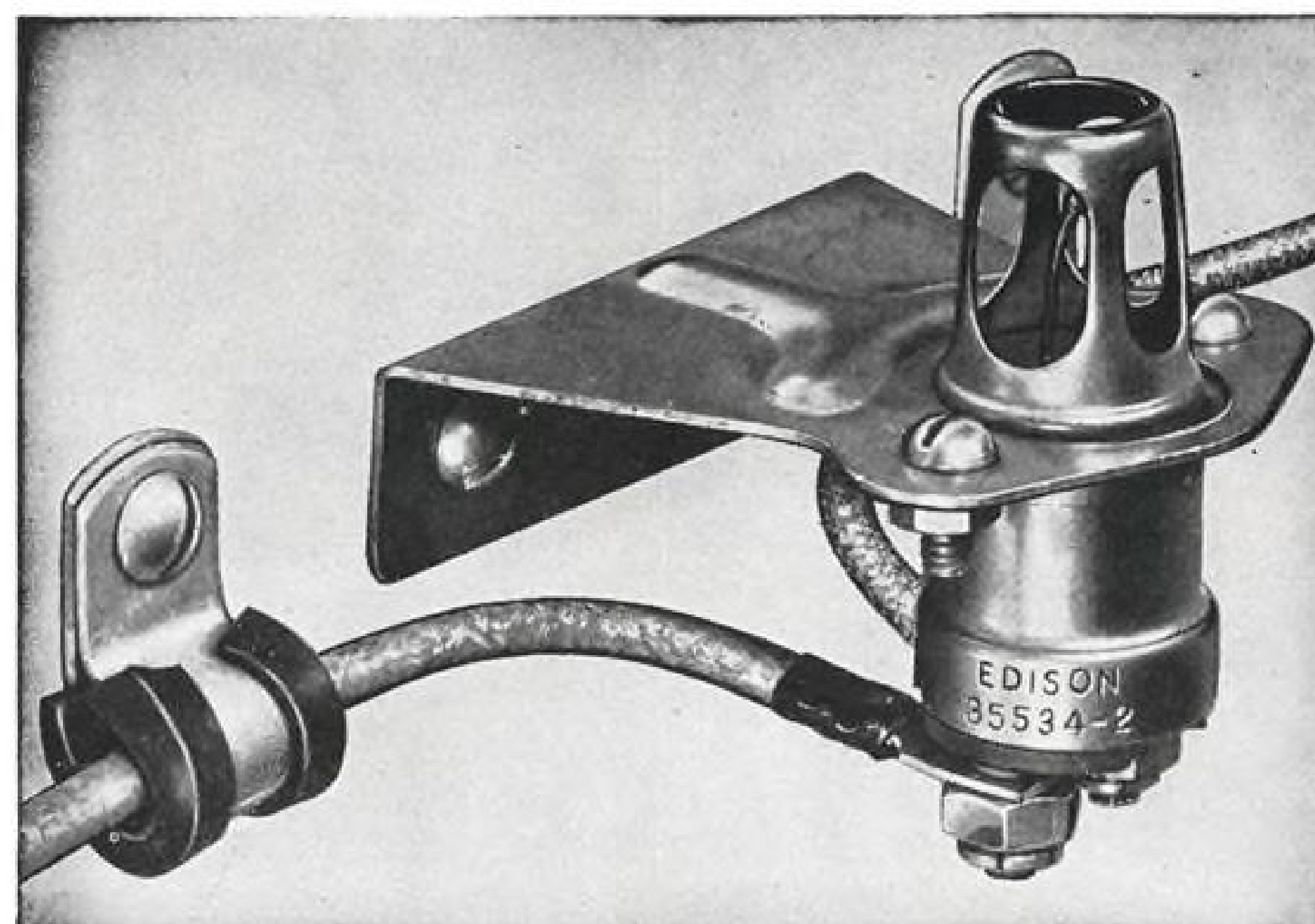
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AVIONICS



NEW INTERCOM clears the air.

AMC Redesigns Plane Intercoms

Complete redesign of the intra-plane communication system for bombers, fighters and transport aircraft has been announced by the Air Materiel Command.

AMC's Electronics Laboratory engineers teamed with those of the RCA Laboratories at Camden, N. J., to redesign all the audio components of the now-standard intercom system.

► **Pre-Amplifiers**—Individual small amplifiers at each crew station have replaced the central large amplifier formerly used. These small units act as pre-amplifiers when the crew member is talking and as a signal booster for his earphones when he is listening.

Voice distortion and instability have been reduced by two devices. First, a moving coil dynamic microphone and earphones have replaced the carbon mike and magnetic diaphragm earphones now used.

Second, the frequency range of the set has been increased to include the frequencies between 250 and 6000 cps. Former range was from 300 to 4000 cps.

These two changes are responsible for cutting down voice distortion and instability by 95 percent, says the AMC.

Noise-canceling has been incorporated into the microphones to reduce distant sounds, such as engine and propeller noise. Either hand, oxygen mask, or boom mikes are used, depending on the operating conditions.

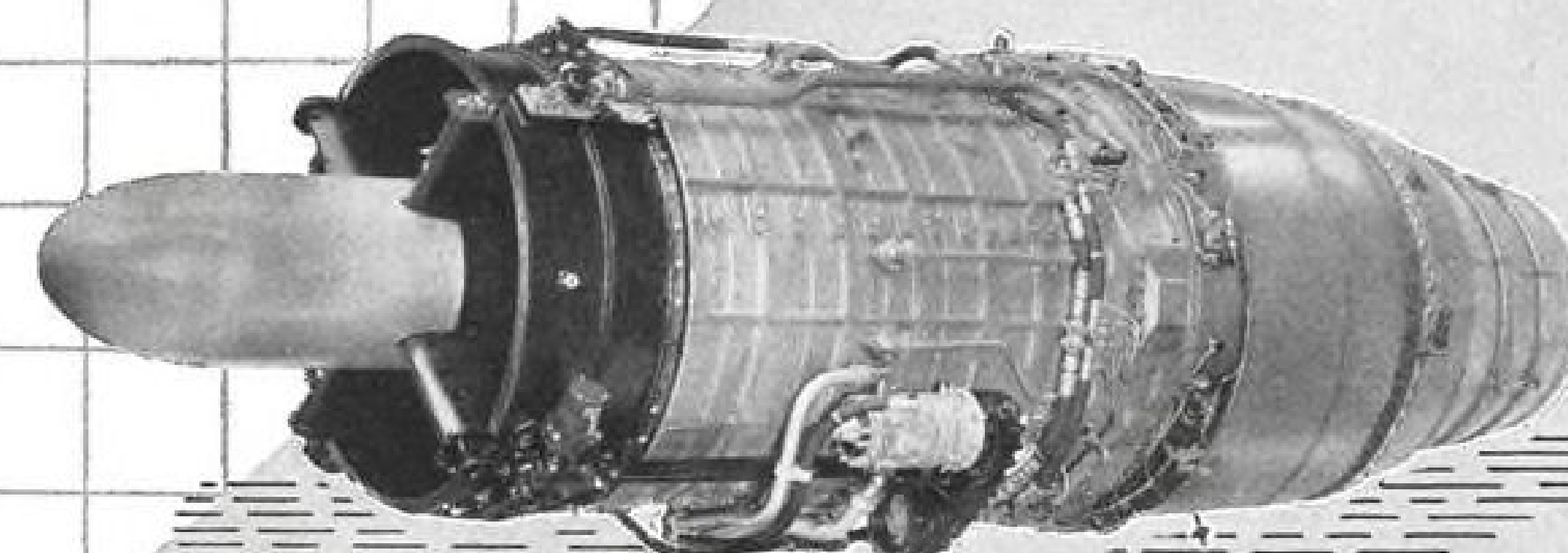
► **Ear-Savers**—Earphones, the source of sore ears after several hours of flight, have been redesigned completely to

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2 the shove-off



3 safe landing

U. S. Air Force Photos

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The Pioneer Parachute Co., the world's leader in parachute manufacturing, is proud that it has been able to contribute so much to the production of thousands of parachutes of all sizes which form the vital link in the NON STOP CARGO AIR EXPRESS.



PIONEER PARACHUTE COMPANY, INC.

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CABLE ADDRESS: PIPAR, Manchester, Conn., U. S. A.

make them more comfortable. The earphone itself is larger and flatter; an outer plastic shell houses glass fibers which are covered with latex rubber. A nylon cap over the assembly keeps the cold bare rubber from contact with the skin, and prevents the ear from sticking to the rubber due to suction.

The usual covered metal bands have been replaced by a snap-on netting. Two plugs and cord used for the earphones and mike have been reduced to one plug and one cord.

A helmet with built-in earphones is optional equipment. According to AMC, the new system will probably depend on earphones only during take-off and combat. At all other times, a speaker system probably will be used.

Designation of the new set is AN/AIC-10; eventually it is slated to replace all intra-plane communication sets now in use on fighters, bombers and transports.



Bendix Makes Tiny Airborne Amplifier

A tiny airborne amplifier, further emphasizing the avionics subminiaturization trend, has been developed by the Bendix Radio div. of Bendix Aviation Corp.

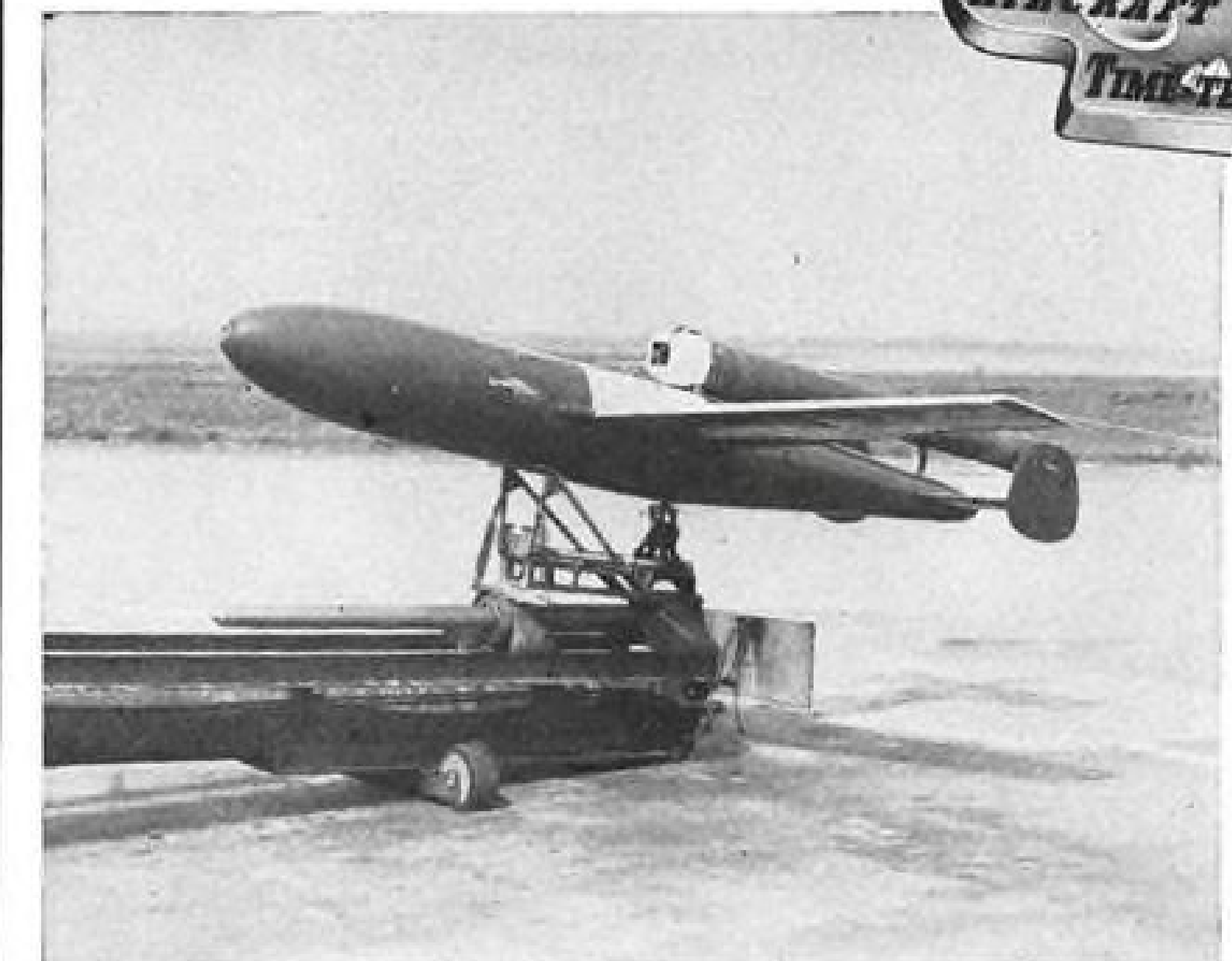
The amplifier is of the band-pass type with a rated gain of 130 db. It weighs less than two oz. and requires 35 component parts. (Equivalent amplifiers require as many as 240 parts and weigh 14 times as much.)

Bendix says that a new circuit technique has been developed which permits reduction of electrical components by a factor of six. Capacitors and resistors have been reduced in number to the point where component failures will be minimized and reliability improved.

Tubes are permanently wired into the amplifier; the entire unit is designed to be replaced in the event of tube or component failure. Its plug-in design means that replacement of the unit is a matter of seconds.

"We Use Glidair Finishes 100%"

...Globe Corporation
Aircraft Division



Navy KD2G-2 remote-controlled pilotless target aircraft. Must withstand temperature range of 0-120°F. Navy specification requires 25 hours of service life, regardless of repeated immersions in salt water upon landing.

The Reasons: QUALITY, PERFORMANCE, SERVICE

For eleven years, Globe Corporation, Aircraft Division, has used Glidair Aircraft Finishes *exclusively* on target aircraft for the U. S. Navy. Now, with stepped-up production on its new pulse jet-powered pilotless model, Globe depends more than ever on Glidden... for Glidair primers and lacquers that exceed government requirements... for prompt, sure deliveries... and for technical service that helps speed production.

To get the *right* finish for any aircraft application—civilian or military—plus expert technical guidance, contact your Glidair representative, or write:

THE GLIDDEN COMPANY

AVIATION SALES HEADQUARTERS • 11001 MADISON AVE., CLEVELAND 2, OHIO

Exclusive Export Distributors:

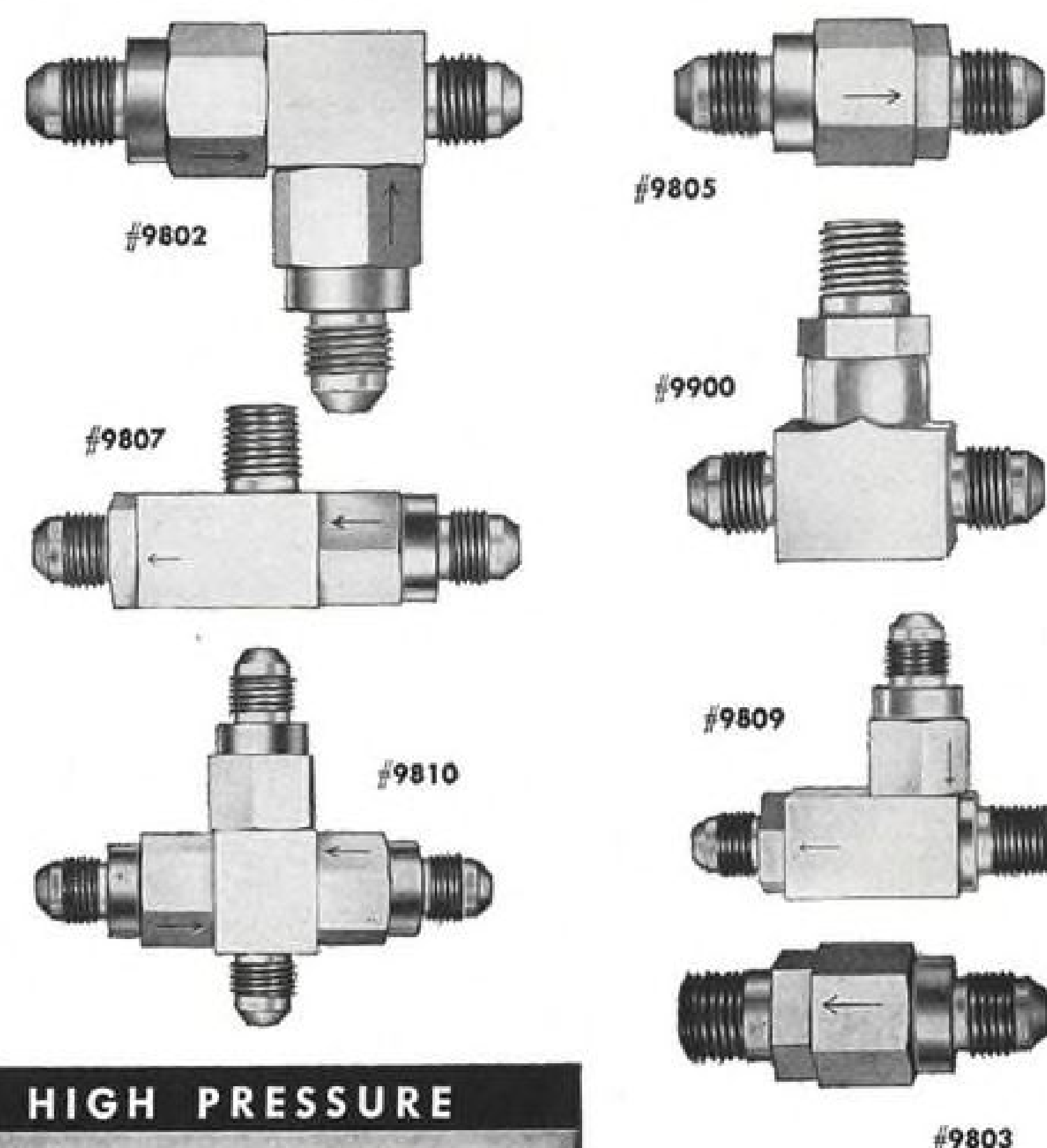
AVIQUIPO, INC., 25 Beaver St., New York 4, N. Y.

GLIDAIR

Aircraft Finishes for every purpose



ARO meets your needs for PRECISION OXYGEN CHECK VALVES



HIGH PRESSURE

AN No.	Style	ARO Part No.
6014-1	A	9395
6015-2	B	9812
6016-2	C	9814
6017-1	D	9816
6018-1	E	9755

LOW PRESSURE

AN No.	Style	ARO Part No.
6030-1	A	9805
6031-1	B	9809
6032-1	C	9807
6033-1	D	9802
6034-1	E	9810
6036-1	G	9803
6037-1	H	9900

Now—a complete line of precision-made oxygen check valves developed by Aro in accordance with AN drawings and Performance Specifications AN-V-13a and AN-V-15a.

These valves have been thoroughly tested by Aro according to the AN Performance Specifications, including extreme temperature tests, and have passed all tests within the specification limits.

Low Pressure Oxygen Check Valves constructed from Dural for lightness, and anodized for corrosion resistance. High Pressure Oxygen Check Valves constructed from high-strength Dural for lightness and strength, and anodized for corrosion resistance.

ARO has the modern facilities and know-how—years of experience in engineering and producing high-precision aircraft products. Send for complete information. The Aro Equipment Corporation, Bryan, Ohio.

ARO

AIRCRAFT PRODUCTS

VACUUM PUMPS, OXYGEN REGULATORS, AIR AND OXYGEN SYSTEM ACCESSORIES.

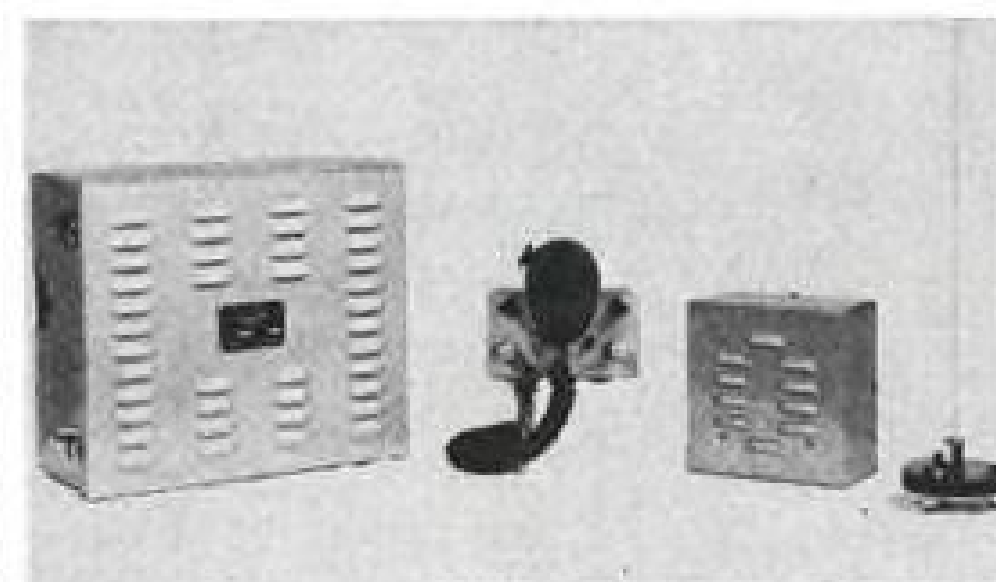
NEW AVIATION PRODUCTS

Tough Duty Seal

A new type of flexible, mechanical seal, designed to permit effective sealing of shafts under severe corrosive and temperature conditions, has been developed after two years of research and testing by Crane Packing Co.

Designed for use on rotating shafts in centrifugal pumps, turbines, positive displacement pumps and other applications the new part performs well in the presence of corrosives "never previously handled" by conventional seals of this type, Crane states. It can be used at temperatures up to 500F.

This high performance, the company says, can be chalked up in most part to the use of a Teflon "wedge-ring" in place of leather or synthetic rubber rings. Teflon, a du Pont plastic, is highly inert to corrosive chemical action, is flexible and withstands extremely high temperatures. As the company explains it, the wedge-ring enables its new seal to combine the chemically inert properties of Teflon with flexibility and positive sealing features essential to effective mechanical sealing. Address: 1800 Cuyler Ave., Chicago 13.



New Airport Radio

A mobile, VHF-AM two-way radio package, complete with antenna, power supply unit, control head, speaker and hand microphone, has been placed on the market by Communication Co., Inc.

The equipment, Model 278, will operate off any 6v dc. power source. It sends and receives over the 116-132 mc. band and has an output of 3-4 watts.

Built specifically for permanent installation in airport vehicles, it embodies design features based on information gathered from airport managers throughout the country, Comco says. The set meets the need for a compact, low-drain installation of this type, drawing only 7.5 amp. at standby and 15 amp. while transmitting, the company claims.

The main chassis, which can be mounted where desired in the vehicle, carries receiver and transmitter sections and radio power supply. This latter is a

ENGINEERS

wanted at once

for

LONG-RANGE MILITARY AIRCRAFT PROGRAM

by

NORTH AMERICAN AVIATION, INC.

Los Angeles, California

Columbus, Ohio

Unusual opportunities for Aerodynamicists, Stress Engineers, Aircraft Designers and Draftsmen, and specialists in all phases of aircraft engineering. Engineering skills other than aircraft may be adaptable through paid training program. Also openings for

Recent Engineering College
and Technological Graduates

Long-range military program offers fine chance for establishing career in aircraft while aiding defense effort. Transportation and established training time paid. Salaries commensurate with experience and ability.

Please include summary of
education and experience
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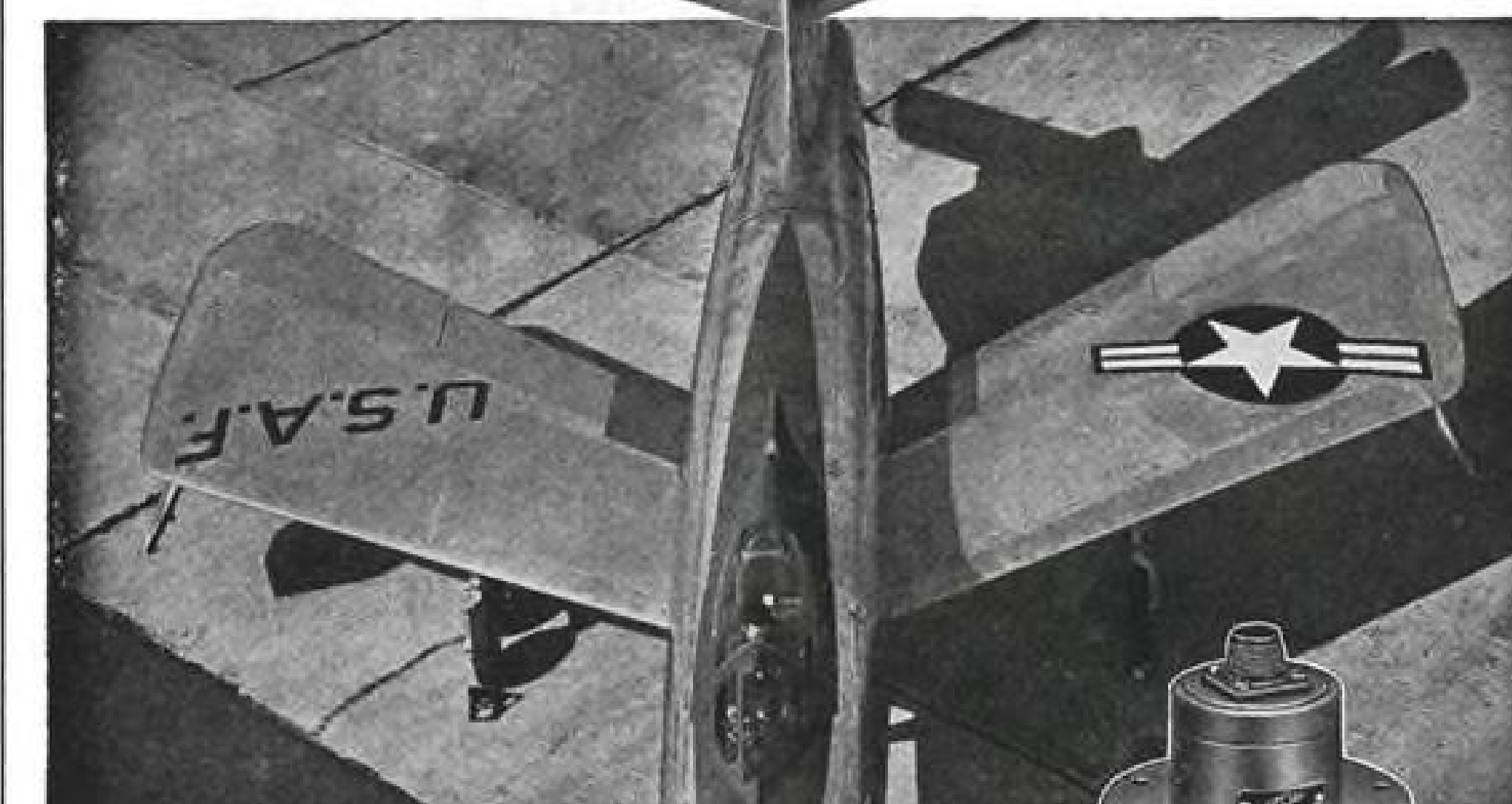
Engineering Personnel Office
SECTION 3

NORTH AMERICAN AVIATION, INC.

Los Angeles International Airport
Los Angeles 45, Calif.

or
Columbus 16, Ohio

AEROTEC FLOAT SWITCHES...



Custom Built
for

REPUBLIC'S LATEST JET FIGHTER

Republic's XF91 Interceptor utilizes 20 Aerotec Float Switches to assure dependable indication and control of propulsive fuels.

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

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

Whether the application calls for float switches, valves, diaphragm or bellows pressure switches, Aerotec's representatives throughout the country, specially picked for their knowledge of the aircraft industry, are ready to offer assistance on any automatic aircraft control problem you may have.

Address all inquiries to The Thermix Corporation.

Project & Sales Engineers

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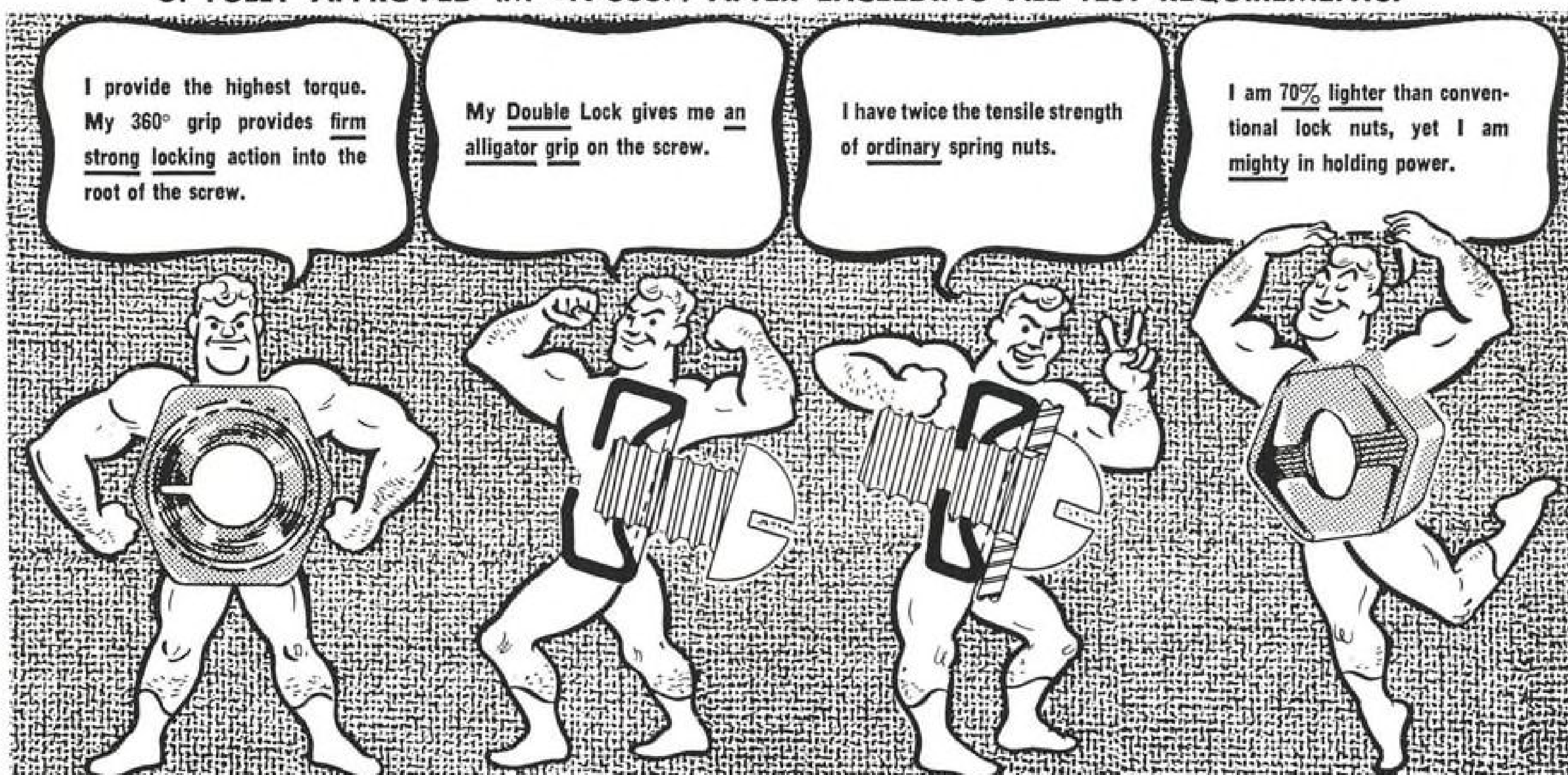
HEX-LOX* THE ONLY SHEET SPRING LOCK NUT MADE

APPROVED FOR AIRCRAFT NON-STRUCTURAL APPLICATIONS

★ ★ ★ ★ EXCEEDS REQUIREMENTS OF M-N-3337 ★ ★ ★ ★

WHAT HEX-LOX* NUT PROVIDES

1. THE ONLY SHEET METAL NUT WITH A 360° GRIP.
2. THE ONLY ONE-PIECE SPRING LOCK NUT WITH DOUBLE LOCKING FEATURES.
3. THE ONLY SPRING LOCK NUT THAT CAN'T SHAKE LOOSE WITH THE MOST PUNISHING VIBRATION.
4. WEIGHS 70% LESS THAN CONVENTIONAL LOCK NUTS.
5. FULLY APPROVED (M -N-3337) AFTER EXCEEDING ALL TEST REQUIREMENTS.

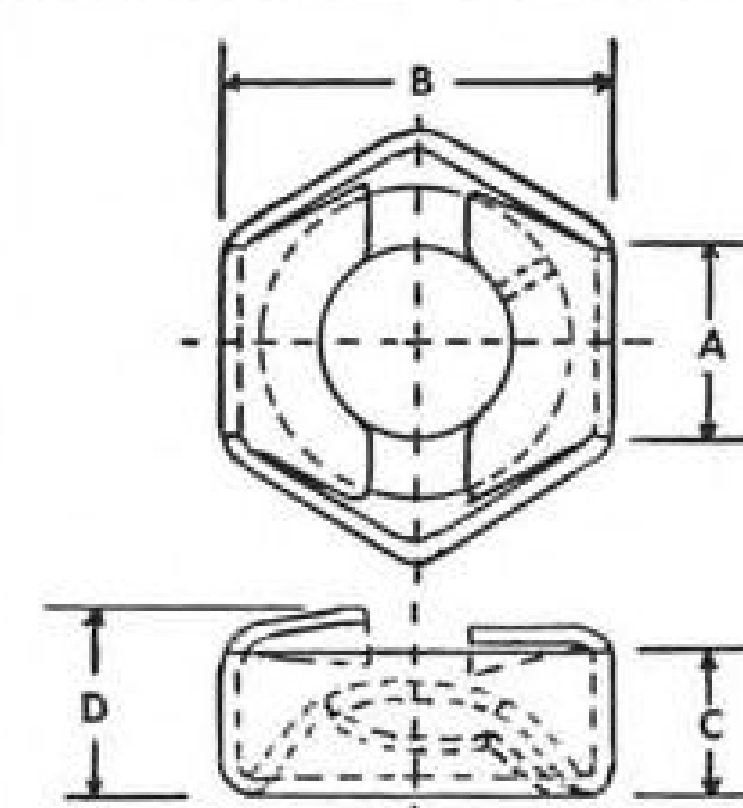


Hex Lox* Nuts are superior to all other sheet spring nuts.

- Highest Installation Torques
- Highest Prevailing Torques
- Highest Back-off Torques
- Excel in Vibration Tests
- Excel in Tensile Strength

*Registered U. S. Patent Office

This nut can now be first choice for all aircraft non-structural and secondary assemblies. Weighs 70% less than conventional lock nuts. Remember, it's the only sheet metal nut with a double spring lock. Unexcelled by any other. And it's in production NOW in all five popular sizes.



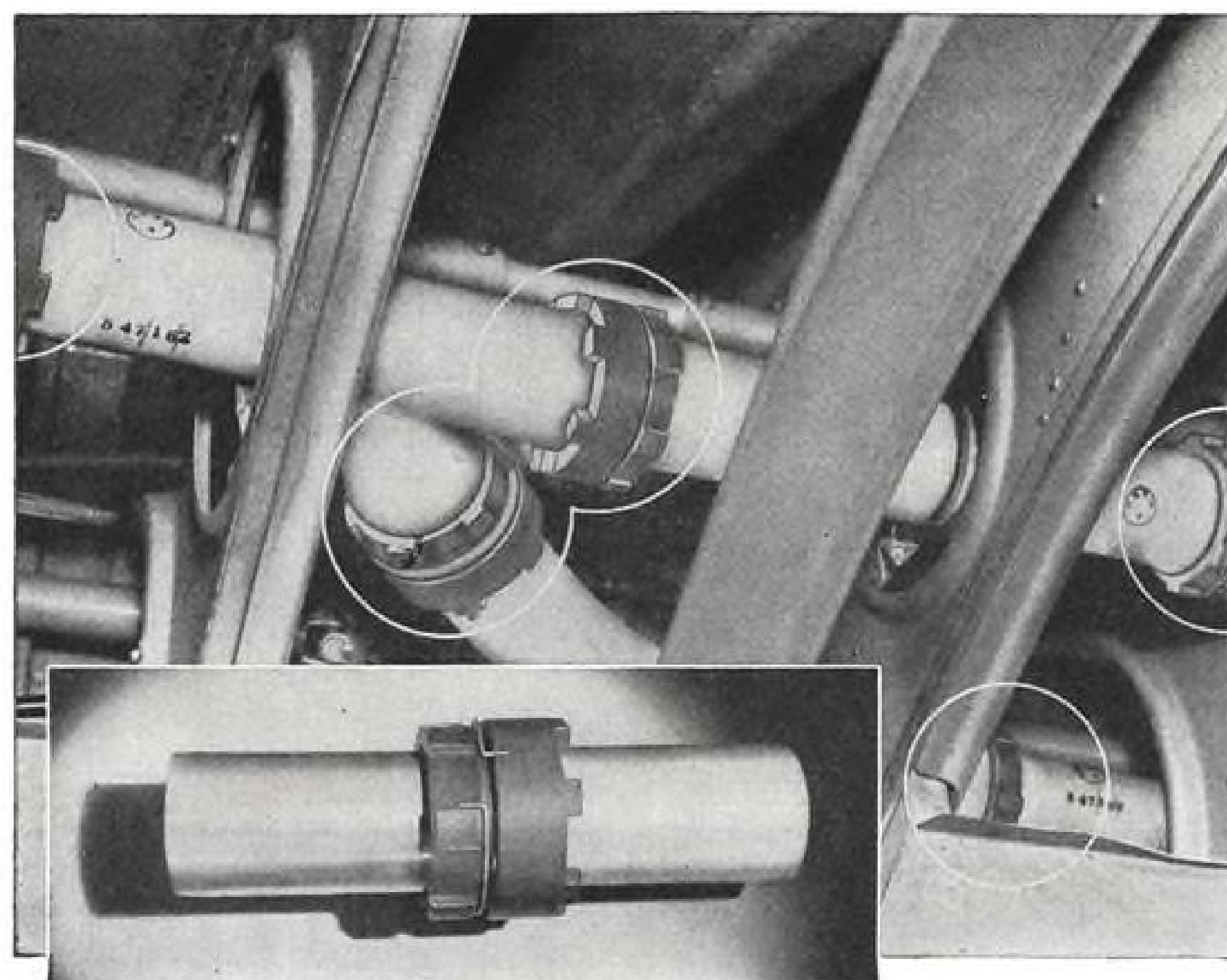
MATERIAL SAE-1060

SCREW SIZE	PART NUMBER	A	B	C	D	MATERIAL THICKNESS T
1/4-20	M 350-1	15/64	7/16	5/32	.200	.020
10-24	M 350-2	3/16	3/8	1/8	.1875	.020
10-32	M 350-3	13/64	3/8	1/8	.165	.016
8-32	M 350-4	11/64	11/32	1/8	.155	.016
6-32	M 350-5	9/64	5/16	3/32	.140	.016

P R E S T O L E
1345 MIAMI STREET



C O R P O R A T I O N
TOLEDO, OHIO, U. S. A.



FR PIPE CONNECTOR *Does the Job!*

In service use over extended periods, often under extreme conditions, FR pipe connectors continue to maintain a satisfactory joint which rarely requires servicing. This lightweight connector does the job of a heavyweight and, in addition, offers certain advantages not shared by any other pipe coupling method.

THE DESIGN OF THE FR PIPE CONNECTOR provides:

- ✓ Greater Pressure Resistance
- ✓ Wide Temperature Range (-65°F. to +165°F.)
- ✓ Low Weight and Compactness
- ✓ A Reasonable Degree of Flexibility Both Axially and Radially
- ✓ No Restriction to Flow
- ✓ Vibration Resistance
- ✓ Simple Application
- ✓ Ready Serviceability

Additional information will be sent on request. Address inquiries to Dept. AW-51.

* PATS. APPLIED FOR



FLIGHT REFUELING INC.
Specialists in Aircraft Fueling Systems and Equipment
Danbury, Conn., U.S.A.

single, heavy-duty, non-synchronous vibrator type which eliminates dynamometers and other rotating equipment, Comco points out. The speaker is carried in separate case, and control head with microphone is separate from main chassis. Weight of the entire installation comes to 25 lb.

Another version with the same performance is the PM-278 (portable-mobile) model which combines all equipment, including speaker and controls, in a compact carrying case provided with a handle. This unit can be used for temporary installation in vehicles or wherever 6v. dc. current is available. Weighing 19 lb. complete, it is set up for service by connecting two battery wires and the antenna.

A third version, Model FX-278, with a slightly higher output of 4-5 watts also is produced by the firm and is designed for base station or emergency use. All parts, except antenna, are compactly arranged in the same portable case with handle used for the PM-278 described above. This set, however, operates on 115v. ac, 60c. current. The firm's address is 300 Greco Ave., Coral Gables, Fla.

Fixing Frequencies

A frequency standard, suitable for running gyros, small motors, controlling inverters, stroboscopes and other equipment, is being marketed by American Time Products, Inc.

The device has an output power of 10 watts at 115v. at any specified frequency from 50 to 500 cycles. Accuracy is $\pm .001$ percent in room temperature ranges. Sets also can be furnished having high accuracy over a wide temperature range if specified. Input power for the unit is 45 watts at 110v. from 50 to 500 cycles.

The unit measures 8 x 8 x 7 1/4 in. and weighs 14 lb. Address: 580 Fifth Ave., New York 19.

ALSO ON THE MARKET

Important development in Aerovox's line of tubular capacitors is Type 123Z "micro-miniature" sealed in vitrified ceramic-metal can and measuring only .175 in. dia. and 3/8 in. long. The capacitor is rated at 200v. dc., .01 mfd., and can operate at 100C. temperature, says company, Aerovox Corp., New Bedford, Mass.

"Firm-grip" metal grating has "toothed" surface to prevent slipping where excessive oil, grease, water and icy conditions exist. Particularly suitable for platforms, catwalks, stair treads and the like. Made by Bustin Iron Works, Inc., 110 East 130 St., New York 35.

PRODUCTION



MACHINE TOOLS at Air Force storage plants in Omaha and Marietta, Ga. (above) . . .



MOVE OUT to speed industry mobilization. Half the reserve has been liquidated.

Tool Reserve Speeds Mobilization

Over \$2-billion worth of stored equipment already shipped to manufacturers from two AF plants.

Dayton—Machine tools valued at over \$2 billion are being shipped out of the two Air Force storage plants at Marietta, Ga., and Omaha, Neb., to serve as a formidable extra asset in the mobilization of U. S. industry for increased air power production.

Air Materiel Command's Production Resources Division has put a conservatively estimated value of \$10,000 a tool on the 20,000 tools which have already been sent out from storage to USAF contractors' plants. About the same number remain to be shipped.

► **Tools for Engines**—Aircraft engine makers are getting many of them as they tool up to boost powerplant production. Approximately 2000 tools are going to Allison, 1200 to the Chev-

rolet plant at Tonawanda, N. Y., where Allison J-35-A-23 jet engines were to be built. (Now it is planned to build Wright R-3350 piston engines there because of the postponement of the four-engine Boeing B-47C into which the Allison engines were to go.)

Ford is getting nearly 3000 tools for its Pratt & Whitney R-4360 piston engine production at Chicago.

The Tumpene Co., which is the contractor handling the shipments of tools from Government Aircraft Plant 1 (Omaha) and Plant 6 (Marietta), reports that shipments have been flowing at the rate of 600 to 700 a week from Marietta and about 500 a week from Omaha. Shipments are going to active contractors for Air Force, Navy and

Silicone RUBBER PARTS

Only Silicone rubber parts retain their physical, chemical, and dielectric properties at temperatures ranging from -110° to +500° F. In addition, they feature excellent resistance to many chemicals, weathering, oxidation, moisture, ozone, and other factors that damage or destroy organic rubbers.

Today, Silicone parts are meeting the exacting demands of innumerable applications in the aviation, automotive, electrical, and other original equipment manufacturing industries.

Stalwart Rubber is equipped to produce a wide range of precision parts from Silicone rubber stocks to meet individual specifications.

Write today for
Catalog 515R-1
for complete
information.



125-SR

**STALWART RUBBER
COMPANY**

5362 Northfield Rd. • Bedford, Ohio



are businessmen

COLD-

BLOODED?

OF COURSE NOT! Literally, their normal body temperature is 98.6—same as laborers, engineers or any other group of people. And, figuratively, they're no more, or no less, cold-blooded—as a group.

We all know unreasonable generalizations can be dangerously false. Common sense and on-the-job experience show us the value of dealing specifically with ideas, problems—and *people*.

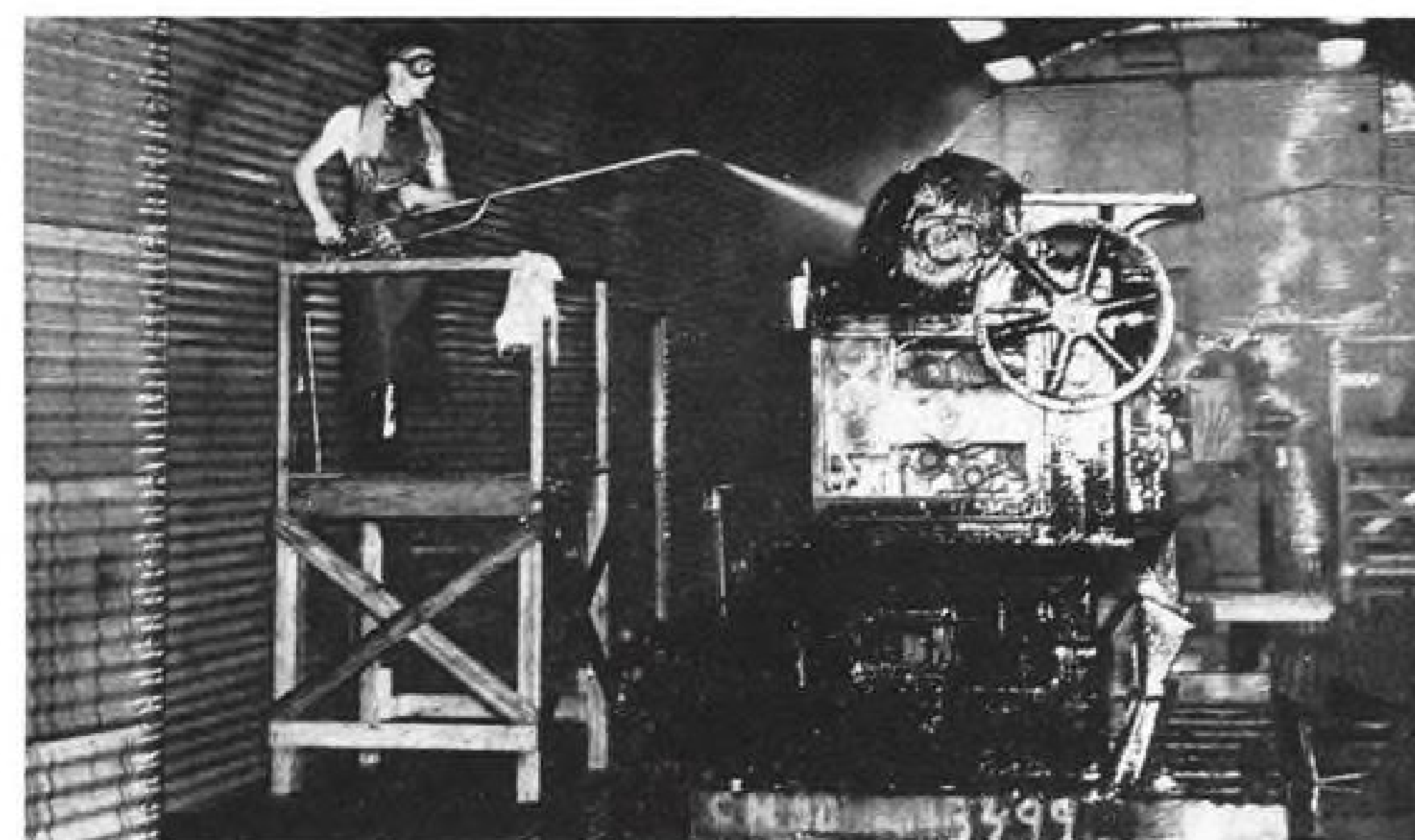
Let's not make the big—and costly—mistake, then, of generalizing on religious or racial groups. Adopt and *carry out* these common sense principles:

1. Accept—or reject—people on *their individual worth*.
2. Don't listen to or spread rumors against a race or a religion.
3. Speak up, wherever we are, *against* prejudice. Work for understanding.



Published in the public interest by:

McGraw-Hill Publications



EXTERNAL SURFACES of tools are cleaned by high-pressure solvent spray before . . .



DISMANTLING GEAR HOUSING for thorough cleaning of shafts and interior parts.

Ordinance as they are needed, and are not being held for Air Force contractors exclusively. But the bulk are going to Air Force contractor plants.

► **Half Ready**—Approximately 50 percent of the stored tools had been processed for preservation and now are ready for use with minor repairs or none at all. Many of the others require more extensive rebuilding. In most cases, the rebuilding is not being done by the original manufacturers. These firms are heavily loaded with new, additional machine tool orders and asked that the rebuilding jobs be assigned to other plants.

Giving an extra push to the movement of tools out of Marietta is the fact that Lockheed Aircraft Corp. is moving in as fast as the tools are moved out—and would like to move in even faster. A recent check at Marietta indicated that Lockheed already had well over 1000 workers, and was well under way on its first program to modernize World War II B-29s.

Principal modifications on the B-29s will be installation of new engines, up-to-date electronic equipment, and complete airframe overhaul. But the B-29 is only a temporary program until the

Marietta plant can be phased into planned B-47 jet bomber production, along with the Boeing Wichita and Douglas Tulsa plants.

► **Preservative Pays Off**—Preservatives used on the stored tools have proved very satisfactory, a spokesman for the Tumpane Co. reports. Importance of a thorough job of cleaning the tools before applying the preservative has been emphasized by discovery of a few tools—that had not been well cleaned—where corrosion has gone on under the preservative.

First preservation programs used a heavy gooey material, designated by service nomenclature as ANC-52 and AXS-673. More recently a very thin coating material designated AXS-1759 and similar to the commercial product known as "Rust Avoid," has been used. This newer preservative is understood to have a lanolin base, and is soluble in operating oil. The preservative itself has sufficient lubricating quality, so that a five-hour test run of a machine tool using the preservative as a lubricating oil was successful, the Tumpane spokesman said.

► **First Choice Important**—A spot check with a few manufacturers on machine

*A Report
to Aviation
Engineers . . .*

Cornelius

**PNEUMATIC
EQUIPMENT
FOR
AIRCRAFT
IS READILY
AVAILABLE**



The 27 volt DC compressor illustrated above weighs 16¼ pounds and pumps 2 CFM of standard air at 3000 PSI discharge. Same compressor with hydraulic motor weighs 11½ pounds. Cornelius compressors are readily available and our large facilities are at your service.

The Cornelius Company
Minneapolis 1, Minnesota

*Pioneers in Pneumatic
Systems for Aircraft*

CECOSTAMP

MODEL "L"

30" x 24" CECOSTAMP showing special notch for keying dies in ram and anvil bolster plate. Equipped with special foot treadle

(At right)
66" x 60"
Four-Column
CECOSTAMP



Wider Range of Work: The Model "L" CECOSTAMP can handle a wider range of work than previous models.

Easier Operation: Concentration of controls makes for ease of operation.

More Accurate Operation: Valve porting and valve rigging give smoother, surer ram action.

Greater Safety: Operational hazards have been largely overcome. Controls are centralized for safety and ease of operation.

Lower Maintenance Costs: New shock absorbing features have been incorporated to cushion vital parts.

Write for a copy of Bulletin 30-L-O

CHAMBERSBURG ENGINEERING COMPANY

CHAMBERSBURG • PENNSYLVANIA

tools they have received from the program indicates satisfaction in most cases. Importance of selecting the proper tool to do the job is one of the points most emphasized by the Air Force. There are number of cases of manufacturers ordering from Air Force descriptions machine tools which proved unsuitable on arrival.

Some manufacturers have indicated a desire to send their machine tool specialists to the GAP storage facilities to select their own tools. Until now, there has been reluctance by USAF to complicate the shipment program further by this procedure but it is understood that there have been a few cases in which it has been permitted in connection with very large shipments requests.

The tools remain the property of the government while in use by the defense plants, and are subject to return to the government at the end of the emergency.

PRODUCTION BRIEFING

► **Rotor-Craft Corp.** has completed move into new quarters at 1850 Victory Blvd., Glendale 1, Calif. Former address was Grand Central Airport. Need for additional space for work on military copter projects necessitated change.

► **Taylorcraft, Inc.**, has been granted exclusive rights to install and use in light planes diesel engines up to 500 hp. embodying patent inventions of licensee Diesel Power, Inc. Immediate development is planned by the Conway, Pa., personal plane maker.

► **Curtiss-Wright Propeller division** received safety awards in six of its departments for completing more than one million man-hours without a single lost-time accident. Awards were made by New Jersey Department of Labor and State Safety Council.

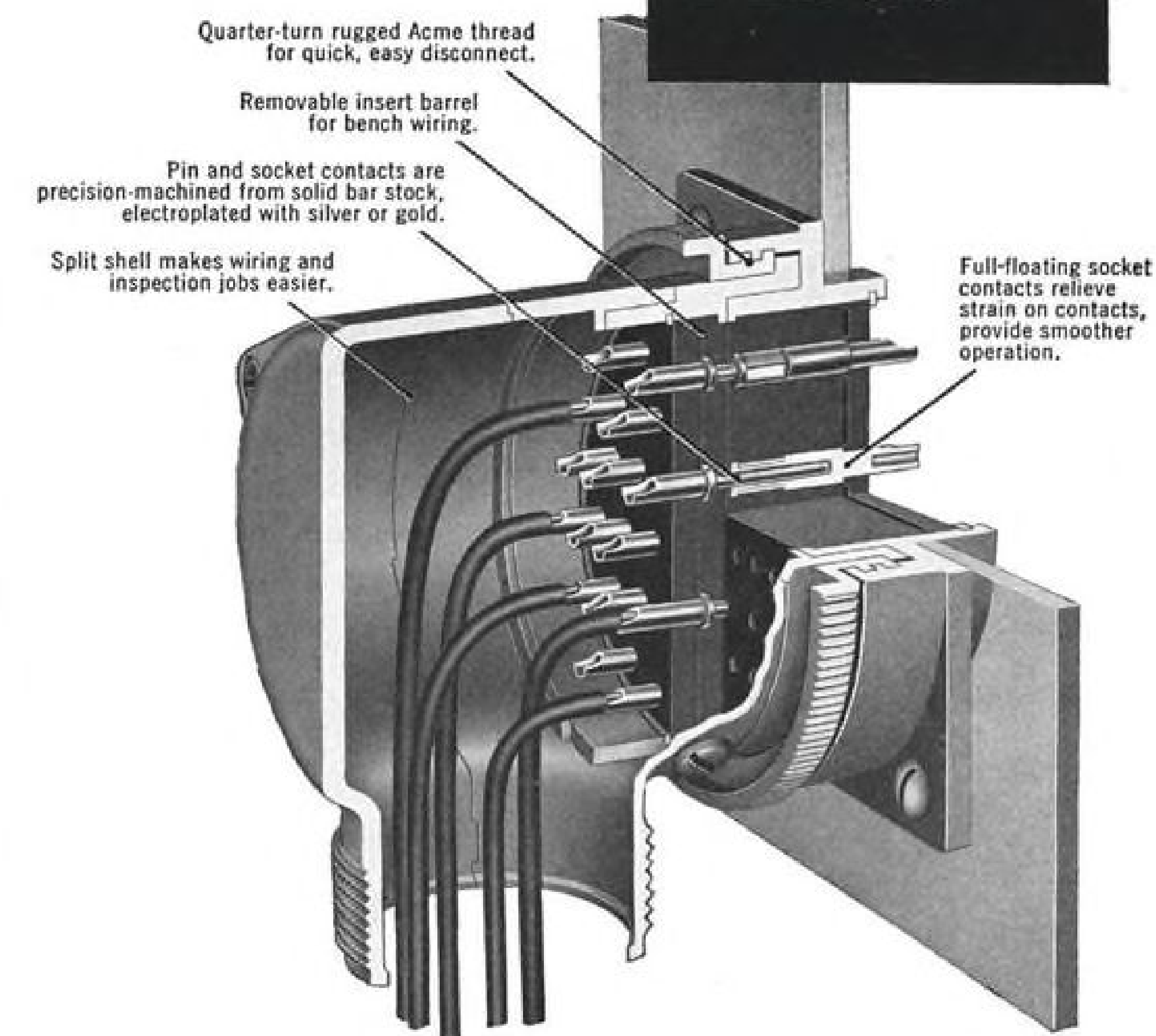
► **Aviation Accessories, Inc.**, Ft. Worth, has expanded aircraft electronics production facilities with completion of a 20,000 sq. ft. building.

► **Independent Pneumatic Tool Co.**, Aurora, Ill., has purchased Armstrong-Whitworth & Co., Pneumatic Tools, Ltd., Gateshead-on-Tyne, England. The British firm, employing 750, becomes an affiliate of the purchaser's English subsidiary, Independent Pneumatic Tool Co., Ltd.

► **B. F. Goodrich Co.**, Akron, Ohio, expanded its de-icer departments by several thousand square feet, and employment here has reached 452. It is estimated that 550 will be employed when peak output is attained.

*Here's why those in the know
—demand*

CANNON PLUGS



Quarter-turn rugged Acme thread for quick, easy disconnect.

Removable insert barrel for bench wiring.

Pin and socket contacts are precision-machined from solid bar stock, electroplated with silver or gold.

Split shell makes wiring and inspection jobs easier.

Full-floating socket contacts relieve strain on contacts, provide smoother operation.

Recognition of Cannon's 36 years of sound engineering and fine, uncompromising construction has built the demand for Cannon Plugs. Here we take an inside look at the lightweight Type "K" 90° connector, forerunner of the Army-Navy Series. More features of the "K" were incorporated into the "AN" design than any other connector. Constantly improved over the years, Type "K" is now used for numerous applications such as aircraft, radio, television, sound, phone recorders, motion pictures, geophysi-

cal research and widely used throughout the electro-mechanical and electronic instrument fields.

The design and construction details in the Cannon "K" Series are typical of the care Cannon takes in producing more than 18,000 precision, multi-contact connectors to serve the exacting needs of industry.

We will gladly send you engineering bulletins describing each of the many basic types of Cannon Plugs if you will briefly describe your applications.

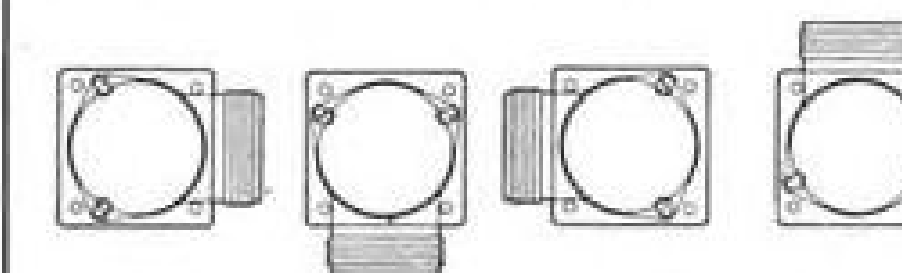


Diagram at left shows how the four positions of cable entry on the large 90° "K" endbell make the wiring job easier. Smaller Type "K" connectors have three positions.

CANNON ELECTRIC

Since 1915

Cannon Electric Company
Los Angeles 31
California



Factories in Los Angeles, Toronto, New Haven. Representatives in principal cities. Address inquiries to Cannon Electric Company, Department E-110 P. O. Box 75, Lincoln Heights Station, Los Angeles 31, California

Type "K" and "RK" connectors are available in 7 shell types having 8 diameters. Inserts have more than 190 contact arrangements. Some of these have Coax, Twinax or Thermocouple contacts as standard. Integral cable clamps available in all "K" plug types.



*Ease maintenance,
speed repairs
with* **DOT**
wire harness bands

Wires can be added or replaced one-handed, without removing the bands. Spring tension prevents accidental opening. Resilient, moisture-proof lining insulates wires, cushions them against chafing. Lining will not pull loose. Illustration shows band with swivel-type attaching clip. Other types available for mounting with rivet, snap-fastener or snap-on clip. Made in 7 standard sizes from $\frac{3}{16}$ " to 2" diameter.

Monadnock, with a wealth of fastening experience, welcomes inquiries from manufacturers who seek reliable development and production facilities.

MONADNOCK
MILLS San Leandro
California
subsidiary of UNITED-CARR FASTENER CORP.

AF Invitations

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

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

Procurement field office locations: Boston Army Base, Boston 10, Mass.; Government Aircraft Plant No. 4, Ft. Worth 1, Tex.; 1660 E. Hyde Park Blvd., Chicago 15; Wright-Patterson AFB, Dayton, Ohio; West Warren and Longo Aves., Detroit 32; 155 W. Washington Blvd., Los Angeles; 67 Broad St., N. Y. 4.

INVITATIONS

Gasket, washer, 1-9 items, bid invitation No. 51-1653, issue date 9 Apr., delivery starting within 60 days, complete within 120 days.

Tester assembly, 1-2 items, bid invitation No. 51-1654, issue date 16 Apr., delivery starting within 120 days, complete within 180 days.

Eve. terminal, 1-12 items, bid invitation No. 51-1655, issue date 16 Apr., delivery starting within 60 days, complete within 120 days.

Cap. connector, elbow, 1-66 items, bid invitation No. 51-1656, issue date 16 Apr., delivery starting within 60 days, complete within 120 days.

Cradle assembly, 223 each, bid invitation No. 51-1659, issue date 19 Apr., delivery starting within 90 days, complete within 120 days.

Adapter, bushing, elbow, 1-83 items, bid invitation No. 51-1660, issue date 20 Apr., delivery starting within 60 days, complete within 150 days.

Washer, 1-14 items, bid invitation No. 51-1661, issue date 20 Apr., delivery starting within 60 days, complete within 120 days.

Bolt, 1-68 items, bid invitation No. 51-1662, issue date 20 Apr., delivery starting within 60 days, complete within 120 days.

Bolt, 1-54 items, bid invitation No. 51-1664, issue date 26 Apr., delivery of 25 percent within 30 days after date of award, 25 percent within 60 days, 25 percent within 90 days, 25 percent within 120 days.

Bracket, clip, clamp, 1-63 items, bid invitation No. 51-1665, issue date 26 Apr., delivery of 25 percent 30 days after date of award, 25 percent within 60 days, 25 percent within 90 days, and 25 percent within 120 days.

Barrel, eye, fork terminal, 1-15 items, bid invitation No. 51-1667, issue date 27 Apr., delivery of 30 percent 30 days after date of award, 40 percent 60 days after date of award, and 30 percent 90 days after date of award.

Screw, 1-59 items, bid invitation No. 51-1668, issue date 27 Apr., delivery starting within 45 days, complete within 120 days.

Screw, 1-58 items, bid invitation No. 51-1669, issue date 27 Apr., delivery starting within 45 days, complete within 120 days.

Shipping containers, 1-2 items, bid invitation No. 51-1678, issue date 4 May, delivery starting within 60 days, complete within 180 days.

Tape, 1-15 items, bid invitation No. 51-1673, issue date 30 Apr., delivery of approximately one-sixth of the total quantity of each item within 45 days, and one-sixth every 60 days thereafter until completed.

Ferrule, gasket, seal, clamp, 1-7 items, bid invitation No. 51-1676, issue date 30 Apr., delivery of 25 per cent within 60 days, 50 per cent within 90 days, 25 per cent within 120 days.

STALL INSTRUMENTATION SYSTEMS
for
All Types

A SAFE FLIGHT
pre-stall warning
system automatically
endows any airplane with
perfect stall characteristics for
maximum performance and safety.

SAFE FLIGHT
INSTRUMENT CORP.
WHITE PLAINS,
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ARDE ASSOCIATES
*Aircraft and
Rocket Design
Engineers*

Use Arde's Engineering Manpower
and Facilities to expand your capacity for

- AIRCRAFT & ROCKET
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AUTOMATIC PILOT AND FLIGHT PATH CONTROL EQUIPMENT

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AUTOSYN* AND MAGNESYN* REMOTE INDICATING SYSTEMS FOR:

Fuel Flow
Fuel Pressure
Hydraulic Pressure
Liquid Level
Manifold Pressure
Oil Pressure
Position
Temperature
Torque Pressure
Water Pressure
Fuel Flow Totalizing Systems
Manifold Pressure Gauges
Electric Tachometer Systems
Warning Units

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Accelerometers
Airspeed Indicators
Altitude Horizon Indicators

Dual Radio and Magnetic
Compass Indicators
Gyro Flux Gate* Compasses
Magnetic Compasses
Rate of Climb Indicators
Turn and Bank Indicators
ODR Components

POWER SUPPLY EQUIPMENT

Alternators
Control Panels
Fault Protection Systems
Generators
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Line Relays
Overvoltage Protectors
Reverse Current Cutouts
Voltage Booster Dynamotors
Voltage Regulators
Power Failure Indicators

AIR PRESSURIZATION AND ICE ELIMINATION EQUIPMENT

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De-Icer System Timers
Oil Separators
Pumps
Valves

Pressurization and Control Units

ENGINE STARTING EQUIPMENT

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Induction Vibrators
Relay Switches
Starters

ENGINE CONTROLS

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Controls
Automatic Engine Boost
Controls

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Differential Pressure Switches
Oxygen Regulators
Gear Boxes
Flexible Drive Shafts
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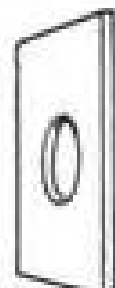
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DILL LOK-SKRU •• THE BLIND Anchor Nut or Rivet

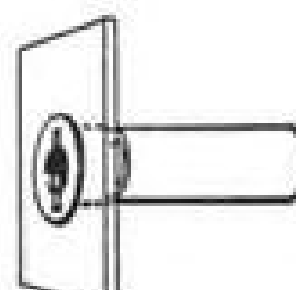
Complete
Installation
in Seconds



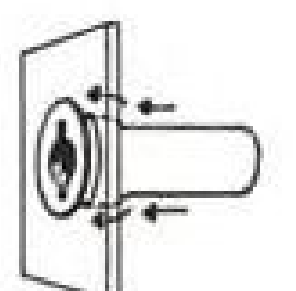
1 Drill one (1) hole.



2 Insert Lok-Skru with either Hand or Power Lok-Skru Tool.



3 With Lok-Skru Tool draw barrel over shoulder of Lok-Skru and flush with metal. This provides a Blind Anchor Nut for Secondary Attachments.



4 TO FASTEN ATTACHMENTS insert standard Machine Screw through hole in attachment and into Lok-Skru. As machine screw is tightened into Lok-Skru it is securely locked by means of the "Specially Crimped" locking-end of the Lok-Skru.



Crimped internal threads of Lok-Skru provide secure locking device for attachment screw.



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EQUIPMENT

ATA Engineering & Maintenance Trends

Meeting Seen Increasing in Value

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Usual test of the effectiveness of an aviation technical meeting is how much new or confirmed knowledge those attending take away with them. As the annual Air Transport Assn. Engineering and Maintenance Conference in Chicago this year broke up, additional benefit was pointed out by one of the delegates of a major airline.

He said: Cost of the meeting to an airline is more than justified in the searching analysis it makes of its own operation preparing for the conference."

How thoroughly the participants had prepared for the conference this year was repeatedly shown during the sessions, the final report on which follows.

Propellers

In discussing steel-bladed propellers, engineers agreed that increasing shell thickness contributed very little to making the blades less critical. Increasing the weight of the blade requires heavier hub and reduces blade pitch change time by up to 50 percent.

Opinion was divided on the use of torque wrenches for tightening prop shaft nuts—NWA uses the tool on all its propellers, UAL and PAA on the Boeing only. PAA claimed that in spite of this, nuts still loosened, causing problems for the carrier.

► **Dynamic Balancing**—Concerning dynamic propeller balancing, Douglas stated that it was desirable on the DC-3, from the passenger and crew viewpoint, because the fuselage was responsive to propeller vibration frequencies, as was the control column. Prop unbalance is no problem on DC-4 and -6 aircraft provided it is within the limits recommended by the manufacturer.

In reply to Hamilton Standard's question whether manual termination of feathering is operationally feasible, EAL replied that it had used manual termination for two years, found the cut-out switch unreliable and had no experience with feathering timers. Douglas also vetoed the timer as being too indirect. Ham Standard replied that the military uses it extensively and successfully and USAF agreed.

Still on the feathering subject, Lockheed spoke against year-round oil dilu-

tion relative to reducing sludge formations in the prop dome and hub. Nor does it know of any instance when prop dome sludge prevented feathering.

Covering other aspects of propellers, Ham Standard made these recommendations: Anodizing is preferable to acid etch to detect blade nicks. Indexing of rotating cam gear every 2000 hr. to equalize wear quadruples gear tooth life.

And it was agreed by the carriers that putting new seals in at every overhaul was the only practical way to reduce external oil leakage on the 43D60 propellers.

Engines

Much of the engine discussions involved oil. Airlines disagreed on the question of changing oil between engine changes or running it the full engine time.

EAL changes oil every 400 hr. on its Connies, re-refining drained oil. But after exhaustive evaluation, EAL's overhaul neighbor at Miami, PAA, concluded that changing oil is unnecessary on the P&W R-2000 and R-2800 engines. Current evaluation of the R-4360, though not complete, indicates that the same may be true.

► **Detergent Oils**—A cautious and gradual approach to the development of additive and detergent oils for aircraft engines will result in great strides being made during the current year, engineers believe. Among problems encountered to date have been deposits of metallic salts in the combustion chamber, result in pre-ignition; and oils which kept the engine beautifully clean didn't provide valve guide lubrication. P&W has approved one detergent oil.

The comments on detergent oils gained relevancy in light of the agreement that oil sludge is one of the major contributors to engine failure. When chunks of deposit break loose, anything can happen. Oil dilution is dangerous because it can cause just such break-aways. A recent siege of master rod failures was attributed to this.

Development of detergent oils is directed towards elimination of sludge. Another approach is design of oil sludge centrifuges. Thompson Products said

it had tried and abandoned its project, but Wright Aero's work along this line is continuing.

Wright is also encouraging the use of "chip detectors" in engines although they do give occasional false warnings from water accumulation or electrical trouble. It is currently testing a Swedish unit (AVIATION WEEK May 15, 1950). KLM's pre-war experience with chip detectors was too many false warnings, and units have been removed.

EAL is testing the detector, but has left off the warning lights in the cockpit.

Most R-3350 engine operators agreed with Wright's present study to reduce to a minimum seal connections in the

fuel injection lines. WAC said that a configuration eliminating over 30 seals will soon be ready for test.

Wright is combatting master rod bearing failures on the R-3350 BA3 engine by campaigning against unnecessary oil dilution; devising several different types of crank pin plug configurations to prevent sludge from breaking loose during dilution (TWA is testing five different types). The manufacturer hopes soon to release use of a fine mesh screen which, experience shows, collects an amazing number of contaminants.

The problem of cracked cylinder hold-down flanges is directly related to ignition trouble, PAA believes. Plot-



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ting graphs of ignition failures vs. flange failures revealed identical curves, separated only by a time element.

The session on engines was highlighted by a complete report on the R-3350 B1 engine delivered by J. J. Ludwigsen of Wright Aero. His major points:

- **Knuckle pin hole wear**—Wear shows up at average time of 3000-5000 hr.; occasionally at 1500 hr. depending on shot peening of the part. Repair: open up hole .005 to .015 in. and use over-size knuckle pin.

- **Plating knuckle pin bore**—WAC recommends abandoning this practice; longer life can be obtained by restoring rod to original condition.

- **Cracking cylinder hold-down flanges**—In all cases of cylinders returned to Wright, removing sharp edges to give more generous radiuses will eliminate problem.

- **Piston ring groove wear**—Since most pistons go to 4000 hr., Wright does not consider this serious. Corrective action: Nickel-plating grooves, using hardened stainless steel rings. Investigation of ferrous inserts shows promise.

- **Counterweight bushing replacement**—WAC is stymied at the moment. Problem is to provide rear counterweight with high pressure lubricant which has not yet been found. WAC is currently

designing new unit with lower contact stresses.

- **Twisted tail shafts**—Modification calling for lighter impellers and heavier tail shafts has been released. Coming up are wider teeth for supercharger drive pinion and slower blower shift. Wright is sure this will solve the problem.

- **Engine roughness but no mechanical malfunction**—EAL is experiencing this problem.

KLM suggested that exhaust valves might be sticking, guides scored. WAC theorized that since trouble occurs during summer operation, oil in BMEP lines might be too thin or fuel could be vaporizing.

EAL replied that they could get away from trouble by opening cowl flaps or applying primer.

- **Breather problem**—Best solution is installation of trap tanks. To avoid in-flight oil regurgitation, Wright is experimenting with return line to sump.

- **Carburetors**—PAA says it cures 99 percent of its carburetor troubles and also saves 90 man hours by removing the regulator unit only and not the throttle body. P&W urged extreme caution if this scheme is followed.

Carburetor surges on the R-2800 above 20,000 ft. are being brought under control by using a .49-in. instead

of a .47-in. bleed in the carburetor. This serves to enrich the mixture. P&W has a new setting which seems promising.

- **Exhaust System**—Jet exhaust stacks on Connies are giving good results, according to KLM which has more than 2000 hr. on them. EAL is also pleased, but ran into this problem: Jet stacks gave cooler head temperatures, so cowl flaps were closed. Result: valves burned. Solution: install limiter to prevent cowl flaps from being closed more than 90 percent of total travel. Lockheed soon will conduct jet stack tests on 049 Constellation.

Except for icing considerations, Wright said that there is no minimum temperature requirement on the R-3350 because of fuel injection.

Augmentor tubes, once a major headache of Convair 240 operators, now have a service life of from 2500 to 3000 hr. according to WAL. Close inspection and welding small cracks as they develop help to prolong augmentor tube life.

Convair stated that afterburning proved to be very detrimental to augmentors. Maintaining ignition and carburetion within reasonable limits can result in remarkably longer augmentor life.

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favorably commented on by airlines using them. EAL cited doubling overhaul period on stacks coated by Stewart Warner. Ryan Aeronautical has also done considerable work in ceramic coating. PAA estimated that stack cost increase was some 10 percent.

NWA is happy with Inconel valves on its R-436s. PAA agreed that it was desirable to have a valve and guide that stood up but complained that the flying public took a dim view of the resultant excessive smoking of the engine. UAL doubted that smoking was due to valve clearance.

Air France pointed out that the big variable in exhaust component life was number of takeoffs, not number of flying hours.

► **New Trends**—The session revealed other interesting powerplant developments. NAL, for instance, is pleased with automatic spark advance on the R-2000 (AVIATION WEEK Mar. 5). It cites savings of 17 gal./hr. on DC-4s. Dollar economy was given at 2.57 per hr. And maintenance is no problem.

Nitrided creeper gears and cast iron snap rings in R-2000 clutches are performing well, according to P&W which says they go over 6000 hr. NWA concurred.

Queried about the status of "C" cylinder tests, P&W replied that the first engine had operated 892 hr. with one cylinder change, the second 899 hr. with no cylinder change. The manufacturer added that, although the cylinder ran somewhat hotter than previous models, instrumentation showed the boss and guide temperatures to be 20 deg. cooler; therefore P&W was not concerned.

P&W stated since valve guides in the R-4360 can accommodate cylinder head warpage, operators need not worry about this condition. And reinforced magnesium blower throats, to be released in July, should cure trouble of this part cracking.

What is maximum engine overhaul time? Panagra estimated 1500 hr. for the R-2800. Wright Aero says it doesn't know where the limit is—no restricting item is evident at the present time. Variables in determining maximum engine overhaul time are: power pulled out of engine; condition of engine at overhaul and quality of overhaul.

Electrical Systems

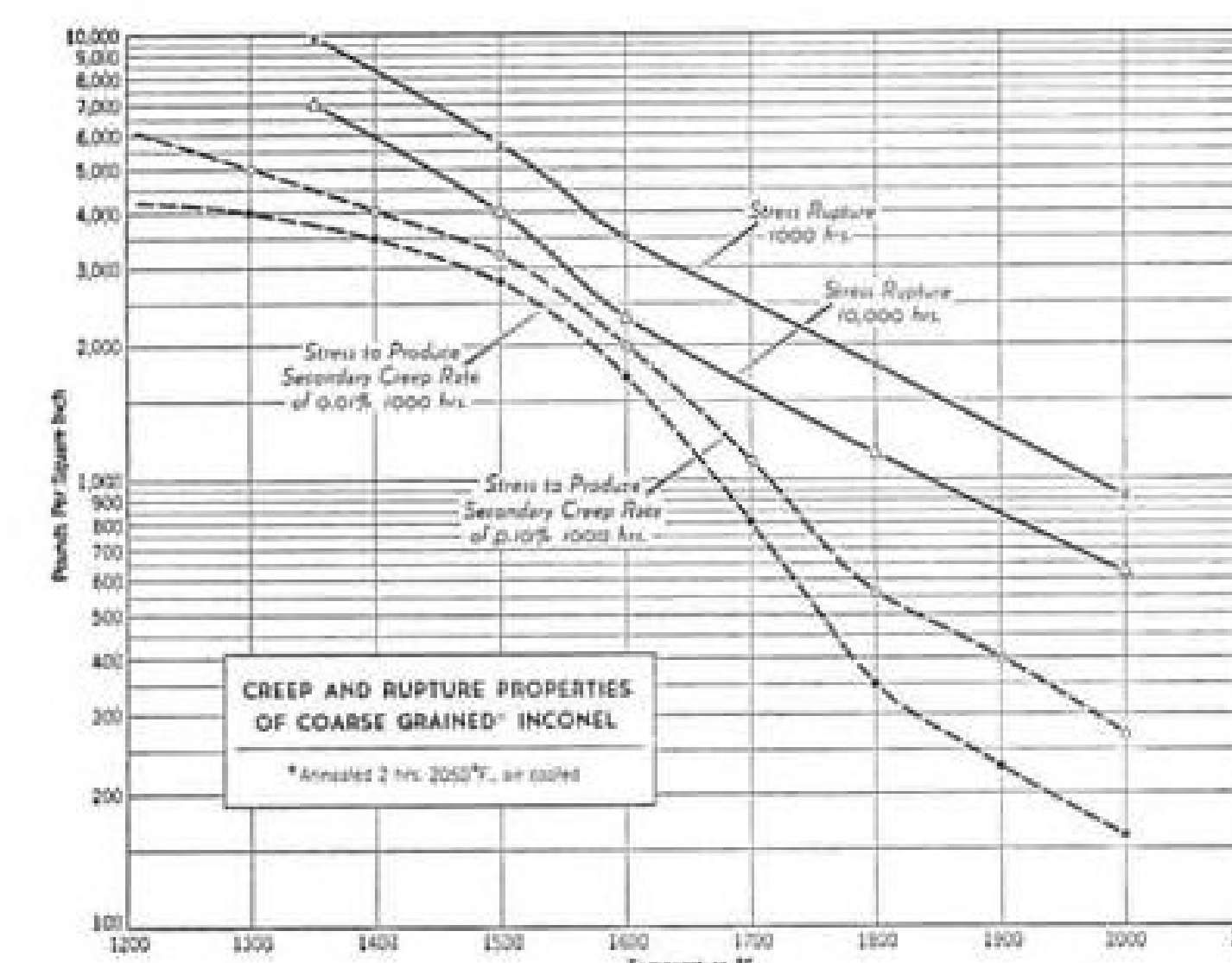
Greatly increased reliability and improved performance of many electrical components high-lighted the electrical session. One result was that vendors were not subjected to as much criticism as in previous years.

Among specific topics brought up were these:

• **Drive disconnects**—Although drive disconnects provide a positive means of

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Room temperature mechanical property ranges of INCONEL mill forms are shown in the following table:

MECHANICAL PROPERTY RANGES OF INCONEL

Form and Condition	Tensile Properties				Hardness		Impact Strength Charpy U-Natch ft.-lb.
	Tensile Strength 1000 psi	Yield Strength (0.2% offset) 1000 psi	Elongation in 2 in. %	Reduction of area %	Brinell 3000 Kg	Rockwell	
Rod and Bar							
Cold Drawn Annealed	80-100	25-50	55-35	70-60	120-170	85-85B	230
As-Drawn	105-150	80-125	30-10	60-30	180-290	90B-30C	151
Hot-Rolled	80-120	25-90	55-30	70-50	120-210	65-95	191/230
Wire							
Cold Drawn Annealed	80-105	25-50	50-25	—	—	—	—
Regular temper	130-175	115-165	12-3	—	—	—	—
Spring	165-185	150-175	10-2	—	—	—	—
Sheet							
Cold Rolled Annealed	80-100	30-45	55-35	—	—	88B max.	—
Deep Drawing & Spinning quality	80-100	30-45	55-40	—	—	65-80B	—
Strip							
Annealed	80-100	30-45	55-35	—	—	84B max.	—
Spring temper	145-170	120-160	10-2	—	—	30C min.	—

Impact Strength. Charpy tests reveal impact strength ranging from 187 ft.-lb. at sub-zero temperatures to 154 ft.-lb. at 1400°F.

Spring Properties. INCONEL is used regularly for springs at temperatures of 500 to 600°F, because of its resistance to relaxation or load loss in this range.

Low-Temperature Properties. INCONEL gives excel-

lent performance in sub-zero temperatures. Strength factors increase considerably in this range, without appreciable loss of ductility or toughness.

Corrosion Resistance. The chromium content of INCONEL raises its oxidation resistance considerably above that of pure nickel, while at the same time its high nickel content provides high corrosion resistance under reducing conditions. It is highly resistant to fresh and salt water, exhaust gases, and most organic acids and compounds.

Fabrication. INCONEL is workable, both hot and cold. It is machinable, though high-speed steel tools should be used. It can be joined by the usual welding, brazing, and soldering processes common to industry.

Applications. INCONEL is used for manifolds, collector rings, heaters, lock wires, gaskets, jet blankets and combustion liners, thermo-couple coverings, domes and transition units in jet-propelled aircraft.

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ENGINEERING PROPERTIES OF INCONEL is a Technical Bulletin on Inconel that gives a full, factual story. It is punched for ring book insertion, and will be sent, free, on request for *Technical Bulletin T-7*. And for technical help on specific high-temperature metal problems, write fully to Inco's Technical Service Section.

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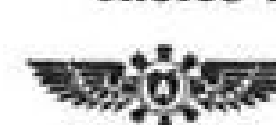


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stopping engine accessories in case of malfunction, Douglas complained that current designs do not permit reconnection in flight, and concluded that you "may actually . . . substitute one hazard for another."

• **Batteries**—TCA reported that the RAF is using alkaline electrolyte batteries almost exclusively and finds them ideal. Weight penalty is 10-15 percent.

American objections were: cost too much; need specialized ground equipment; slow discharge rate maximum.

• **DC power**—Douglas favored generator and alternator overheat warning devices; NWA says the GE units are dependable.

Guide shaft failures of Eclipse-Pioneer generators have been traced to improperly adjusted voltage regulator, according to Capital. E-P agreed.

Relative to dc. generator controls, Douglas recommends the installation of overvoltage relays and heavy duty contactors (Hartman 751-D or equivalent) capable of opening the circuit under high voltage and current conditions.

TCA is modifying its fleet to incorporate full protection against overvoltage, ground fault and feeder fault.

Consensus was, desirable as protective devices are, nothing can substitute for good primary design and installation.

• **AC power**—Best known remedy for transformer explosions and smoking upon failure is use of new sealed, internally fused transformers such as Pioneer's DW-57.

• **Lighting**—Carriers said that incandescent light bulb usage was excessive. NWA and UAL agreed that fluorescent lighting is good and replacement of lamps is almost nil.

UAL is converting all aircraft to incorporate 80-times-a-minute flashers on all identification lights and is thinking of installing a 24-lb. rotating beacon on top of the fin.

• **Switches**—The Micro Switch problem was again raised. UAL contended that the hermetically sealed unit, tested on ten DC-6s, is worth the high original cost. Many felt that corrosion of Micro Switches was not so much a fault of the switch as it was of the installation.

Most airlines agreed that micro-positioners work well if treated well. They also indicated preference for standard "enclosed" relays rather than sealed components because latter cannot be overhauled economically. PAA says merits of each depend on application.

• **Wiring**—Titeflex got the nod as being the conduit that gives the best service in engine application (not including ignition). Breeze stainless steel also came in for favorable comment.

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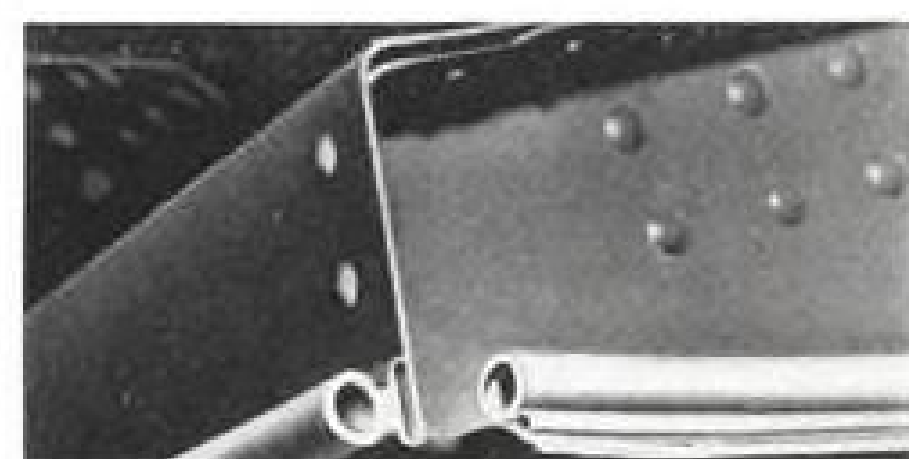
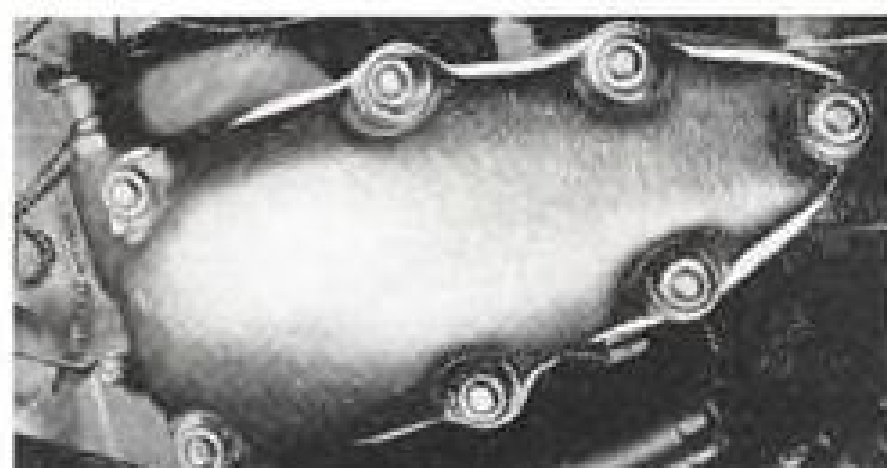
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sections. It is also the only cable which satisfactorily resists Skydrol (AVIATION WEEK May 7, p. 15). Best wire construction for this application, according to Douglas, is: tinned copper, extruded polyvinyl chloride, Fiberglas braid, extruded polyvinyl chloride, extruded Nylon jacket. Douglas has two approved sources for this cable: Surprenant Mfg. Co., 199 Washington St., Boston, and Belden Mfg. Co., P. O. Box 5070A, Chicago 80.

Douglas listed these as the three general types of fire-resistant wiring with which it has had experience: Rockbestos "Firezone"; Packard P.E. 400, and General Electric.

Firezone is the highest temperature wire known to Douglas. Composition is nickel-clad copper conductor, felted asbestos, asbestos braid silver colored finish, all silicone-impregnated and baked. Cable will withstand conductor temperatures of 750° deg. F., according to Douglas which listed the other wire maximum temperatures at 500 and 300 deg. respectively.

• **Circuit protectors**—Circuit protection is provided chiefly for wiring, airframe manufacturers agree. Some protection is now given gyro flight instruments, and internal protection for their units is provided by some equipment manufacturers.

Considerable discussion revolved about circuit breakers. Some airlines contended that tests showed manufacturers' stated limits are not met by the product. TCA argued that low amp. breakers were impractical. Spencer Thermostat replied that its is developing breakers for amperages as low as $\frac{1}{4}$ and $\frac{1}{2}$. Heineman Electric is going down to 10 milliamperes.

Consensus was that circuit breakers should be tested periodically. Some units that did not meet requirements could be made to conform after a few movements of the switch.

Many airlines and airframe manufacturers concurred that "pre-insulated" electrical terminals were desirable. Many are standardizing 100 percent on these terminals.

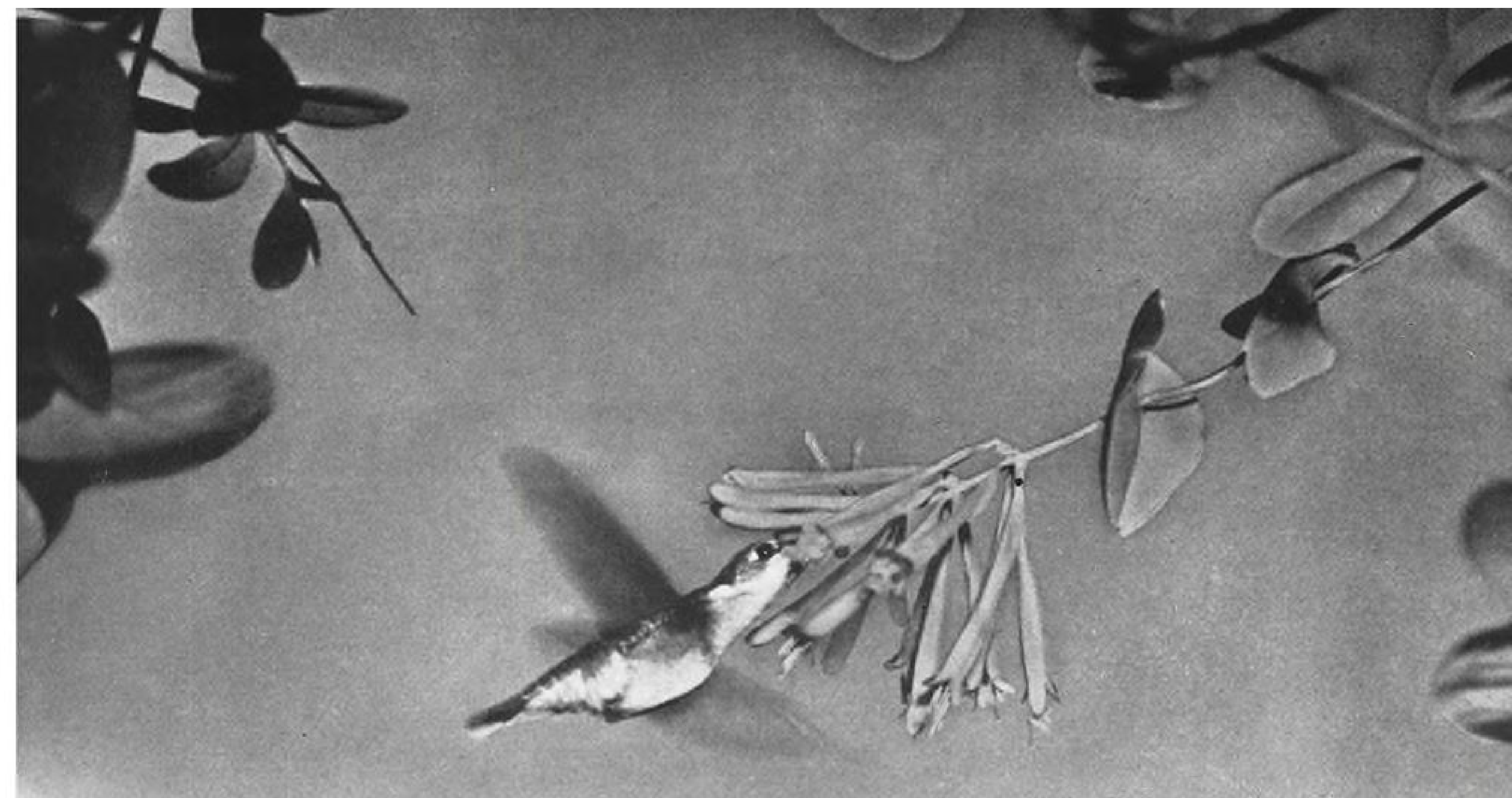
Structures & Controls, Interior Furnishings & Equipment

This session has always been characterized by the number of subjects discussed—from landing gear to water systems, from oxygen systems to paint.

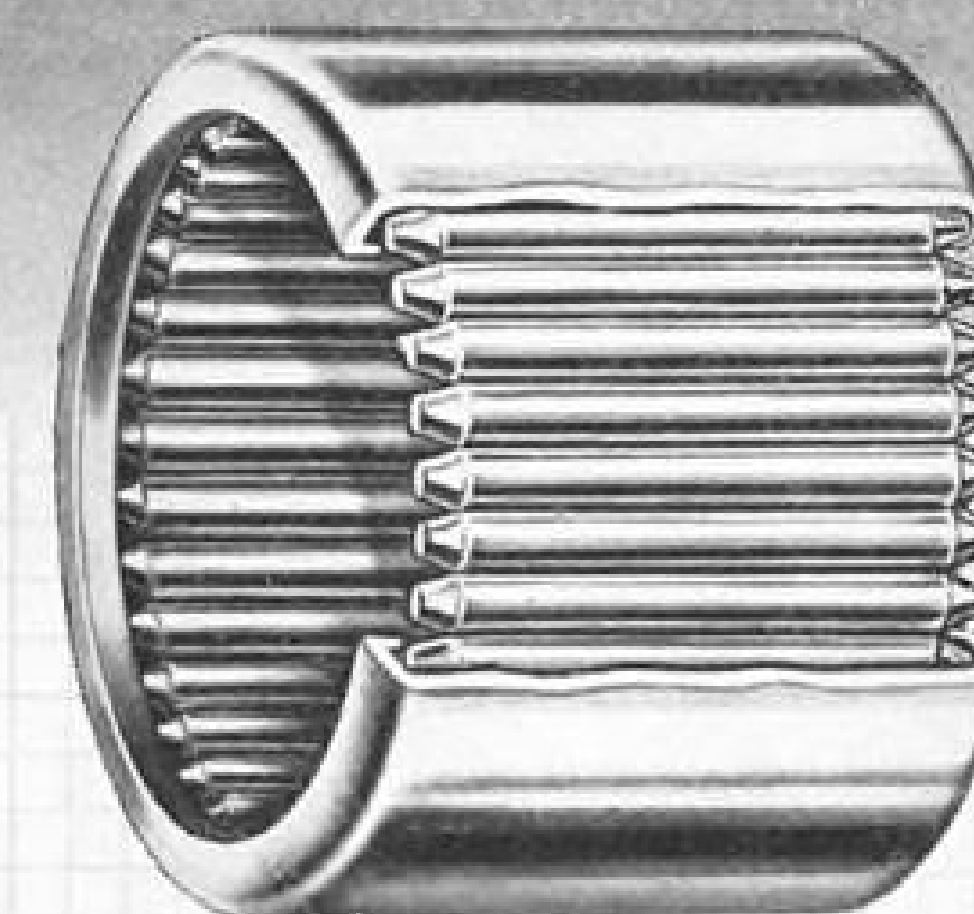
These are some of the problems and solutions:

• Generally, dents of any consequence are not tolerated in the leading edges of DC-6 aircraft for aerodynamic reasons.

• To combat corrosion in the vicinity of galleys and lavatories Douglas now



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uses a wash primer and Vinyl top coat system. These are supplied by United Chromium, Inc., or Amercoat div. of American Pipe and Construction Co.

- For floor structures, both passenger and cargo, the airframe manufacturer recommended variations of metal sheet backed up by rolled or extruded magnesium or dural sections. Stainless steel or titanium were mentioned for belly cargo compartments, and plastic sheet was proposed as covering of curved floors and cargo areas.

- A good method for treating lightly corroded aluminum is to remove contaminants with moderate amounts of weak acids, such as phosphoric and hydrofluosilicic. After etching, polishing may be necessary for appearance's sake.

- Douglas says that 75ST has proved very satisfactory on the DC-6. Being a higher-strength alloy it requires more care in design, fabrication, heat treatment and handling.

- The company has developed a ball bearing spherical staking method which it says will be more efficient than chisel method of holding bearings in place because it will allow more bearing replacements, will not induce cracks, will reduce tool maintenance cost and give control of depth of staking.

- Douglas knows of no instances of Airstair doors opening in flight where the positive detents have been provided.

- Douglas uses both Zyflo and Dy-Check methods of inspection, depending on category of part and type of inspection.

Zyflo is used for castings and forgings, machined parts, extrusions and weld assemblies.

DyCheck process is excellent to inspect questionable local spots, to determine end of a crack, to locate stop hole and for examination of smooth surfaces where removal of dye is no problem.

- As cabin ceiling and side wall lining material, Vinyl has the edge from a maintenance standpoint, and gabardine or broadcloth from an acoustical standpoint.

- To alleviate freezing of elevator, aileron and rudder trim tabs, Douglas recommends proper installation of tab drum boots on DC-4 and -6 planes.

Ignition

Highlights of the ignition session were:

- A lively and accelerated interest in analyzers; their use will undoubtedly reduce maintenance cost and time, increase regularity. TCA feels use of analyzers is justified for small airlines and on well-known equipment such as the DC-3.

- Vast improvement in spark plug design resulting in superior product costing less money. These, coupled with low

tension ignition systems, have contributed greatly to reduced ignition maintenance and malfunction.

- **Spark Plugs**—A lively discussion took place on the question of new vs. service-cleaned spark plugs. TCA says the third run plugs are the trouble makers. P&W wants either an improvement in plug cleaning equipment to permit better cleaning of current plug designs, or better plug designs to permit proper cleaning with current methods.

Engineers agreed that plugs tended to foul more readily in water injection engines than in dry ones.

- **Harnesses**—Packard has developed a new type of high-resistance ignition cable consisting of a linen thread core (previous core was nylon, AVIATION WEEK Sept. 18, 1950) impregnated with graphite. Resistance is 4000-5000 ohms/ft.

Brought out primarily for automobiles to reduce television interference, purpose of the cable is to prevent high-frequency radiation, thus reduce plug erosion. NWA engineers said that tests revealed erosion rates comparable to those obtained with low tension ignition systems, but admitted the spark was weaker. This could pose cold weather starting problems.

EAL announced that it replaces the Scintilla low tension ignition harnesses on its Connies every fourth engine change and is going to the fifth.

Scintilla has a lead now on test which will give still better service, it says. Wire and terminals can withstand higher temperatures. Wire used is 5mm, but can be converted to 7mm.

R-4360 engine operators agreed that Titeflex ignition harness on that engine was giving good service except for the mechanical problem of fitting failures.

- **Analyzers**—PAA and TCA strongly championed engine analyzers; PAA the airborne engine analyzer (specifically the Sperry unit), while TCA spoke up in favor of the ground ignition analyzer. TCA is modifying its entire fleet to use the ground analyzer. It will use Scintilla components throughout except for the analyzer itself, which will be a British unit.

Scintilla is not sold on the idea of an engine analyzer which includes vibration analysis, therefore has devoted its efforts toward development of an ignition analyzer. It added that TCA's decision justified Scintilla's thinking. TCA pointed out that its policy of airborne vs. ground analyzers was influenced by the fact that none of its planes carry a flight engineer to operate an airborne installation.

PAA offered these statistics as proof that engine analyzers save time and money.

- Savings during first year of operation on Constellations: \$7000 per plane.
- Savings on Boeing 377: \$20,000 per

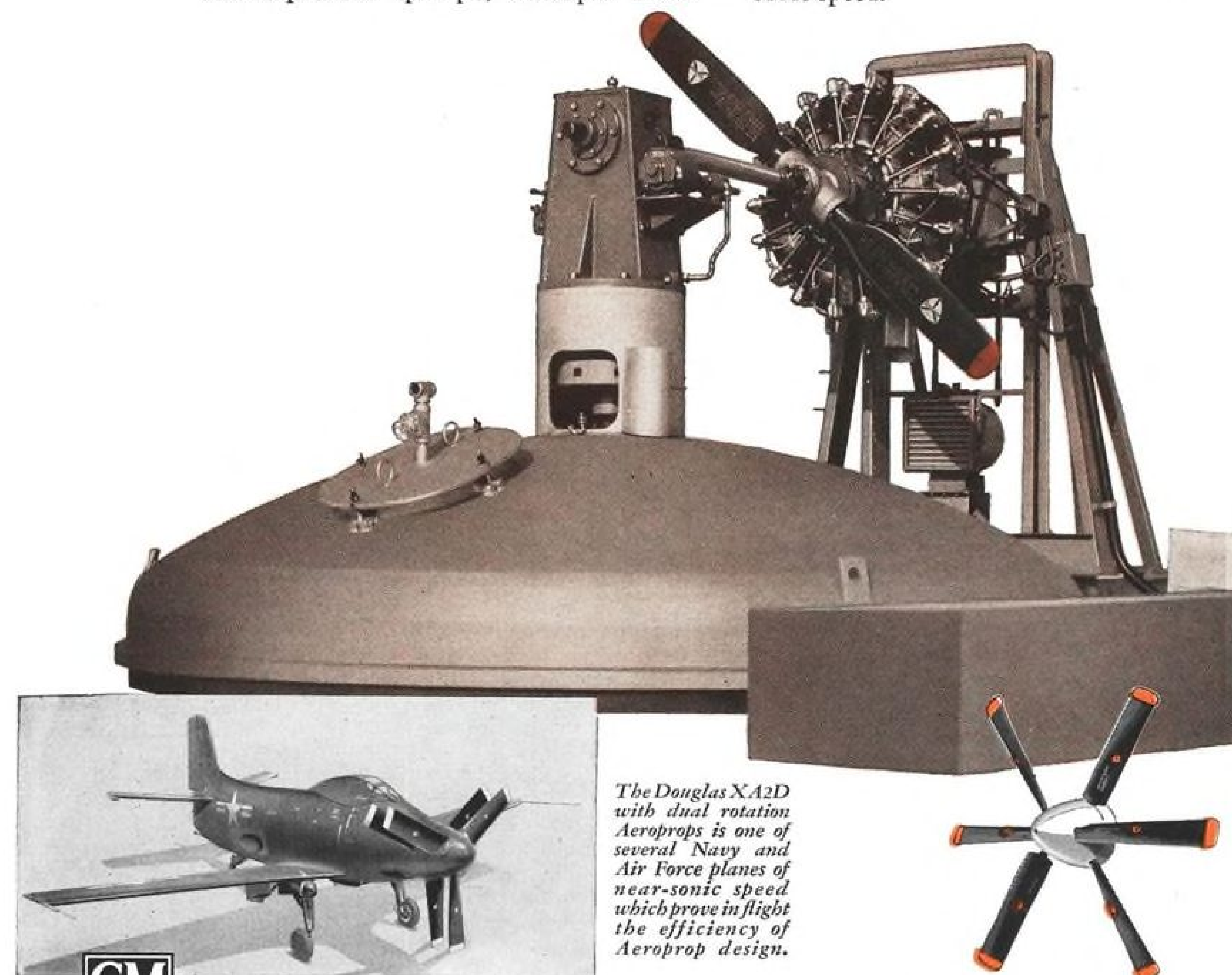
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year per plane. This is conservative estimate predicated on 3-mo. period.

- Seven out of ten ring land failures were picked up on the analyzer, meaning a cylinder change instead of a possible engine change. Analyzers saved at least 5 engines in Pacific division.

- Ignition troubles do not cause delays any more.

- Analyzer may be used to trouble-shoot heater and turbosupercharger malfunctions.

- With analyzer aboard the aircraft, flight engineers can write up troubles while plane returns to ramp (at takeoff) or have them ready and waiting for maintenance at the termination of a trip. Mechanics normally can proceed directly with correction of trouble without further investigation.

- The unit presents great possibilities for increased accuracy and widening range of applications.

Scintilla stated that it feels substantially the same savings could be obtained with its analyzer.

TCA, believing itself to be the first airline to convert 100 percent of its fleet to analyzers, estimated that it would achieve 60-70 percent of PAA's economies. PAA thought this a bit optimistic.

Primary motive behind TCA's decision on conversion was preventive maintenance. After exhaustive investigation and cost analysis, the carrier decided that ignition analyzers were economically justified, not only on the North Stars, but on the DC-3s. Reduction of plug removal alone would come close to warranting the installation. And the airline's engineers felt that the Scintilla equipment ideally suited their requirements.

TCA's costs for analyzer installation: North Star—about \$1000 and 100-120 man hours; DC-3s—about \$700 and 75-80 man hours.

PAA said that training on use of analyzers consisted of a 6-hr. course backed up by 6-hr. refresher.

Scintilla's engineers indicated that the cost of their analyzer varied considerably but cited these figures as being typical for a complete installation on a DC-6: \$1300 for equipment, 65 man hours for installation, total direct cost of less than \$2000. Scintilla added that it has established a training school in Sidney with curricula designed for both operator and the maintenance man. Course lasts five days, takes 40 hr.

C&S has a Scintilla analyzer and finds it saves considerable trouble-shooting time.

Instruments

Airlines agreed almost unanimously that standardization of instrument maintenance records as an ATA project would be beneficial to all concerned.

Several carriers including UAL, have taken steps in this direction within their own organizations.

Some precautions against Bourdon tube explosions in the cockpit are: PAA silver solders tube end; UAL and NWA make their own snubbers; another underwrites units made by Operating and Maintenance Specialties Co., Charlotte, N. C.

Vertical gyro acceleration error has reached an impasse. If erection time is decreased, acceleration error increases, and vice versa.

Engineers were in almost complete agreement that instruments should be plain black with white dials (not fluorescent), illuminated with both red and white light. Navy has already standardized on this scheme and USAF plans to do the same soon.

Advantages are: white markings on black face gives maximum contrast. Red light helps preserve night vision. White light provides visibility in lightning storms. Two systems provide protection in case of lighting failure.

Carriers using the Sperry Zero Reader say it has been trouble-free to date.

Lockheed came out strongly for high-range resistance-type thermometers for engine cylinder temperature indication, citing these reasons: saves weight; eliminates special iron-constantan cable, special pins and disconnects and balancing resistors; standardizes all temperature indicators to resistance type.

NAL's J. D. Crane made this observation concerning instruments in general: Savings in maintenance costs might well justify replacing a continuously troublesome system with more modern, trouble-free equipment.

NAL observed that although purchase and maintenance costs of electric and air-driven gyros is about the same, the former is proving to be much more reliable.

In reply to a complaint that cover glasses on the Sperry H-3 autopilot fogged up, Sperry replied that heated Nesa glass should not fog unless contacts are disturbed at installation.

Other operators noted the Eclipse 12401 and 15901 horizons experienced erection difficulties due to magnetism. TWA traced the trouble to magnetism of the ball bearings. Eclipse is trying to find non-magnetic balls—to date best are plated bronze units.

► **Automatic Pilots**—Both autopilots used by commercial carriers—the Sperry A-12 and the Eclipse Pioneer PB-10—have greatly improved in reliability during the past year. The last bugs are being worked out. "Ruggedized" tubes in the amplifiers are helping greatly.

Eclipse admits that the automatic altitude control is still a problem, but much work is being done on it to make it acceptable.

Engineers agreed that it was desirable

to check stick forces on the PB-10, although check is difficult to perform. Consensus was that check should be made at every amplifier or servo change (some restricted this to elevator axis only).

Fuel and Oil Systems

In the discussion on integral fuel tanks vs. bladder cells, the ATA consolidated mechanical interruption summary indicated that interruptions for either type were very low. Over a six-months' period, the highest rate for integral tanks per 1000 hr. of aircraft operation was .071, for bladder cells .143. However, bladder cells had a record of four consecutive months with no interruptions. For the same period, integral tanks averaged about .025. One problem of bladder installations—detecting source of a leak.

Constellations currently on the production line are having their tanks sealed with a water latex putty conforming to specs. AF 3610, Navy 52S12, and LAC 1-743. Lockheed is trying to eliminate the spray method of application to reduce amount of sealant required.

General impression of those who attended the conference was that it was better organized and more information was presented in better fashion than at any previous meeting. There was one underlying question: Is the conference becoming too big and unwieldy? Next year promises to bring about major procedural changes.

Recorder Listens To Test Pilots

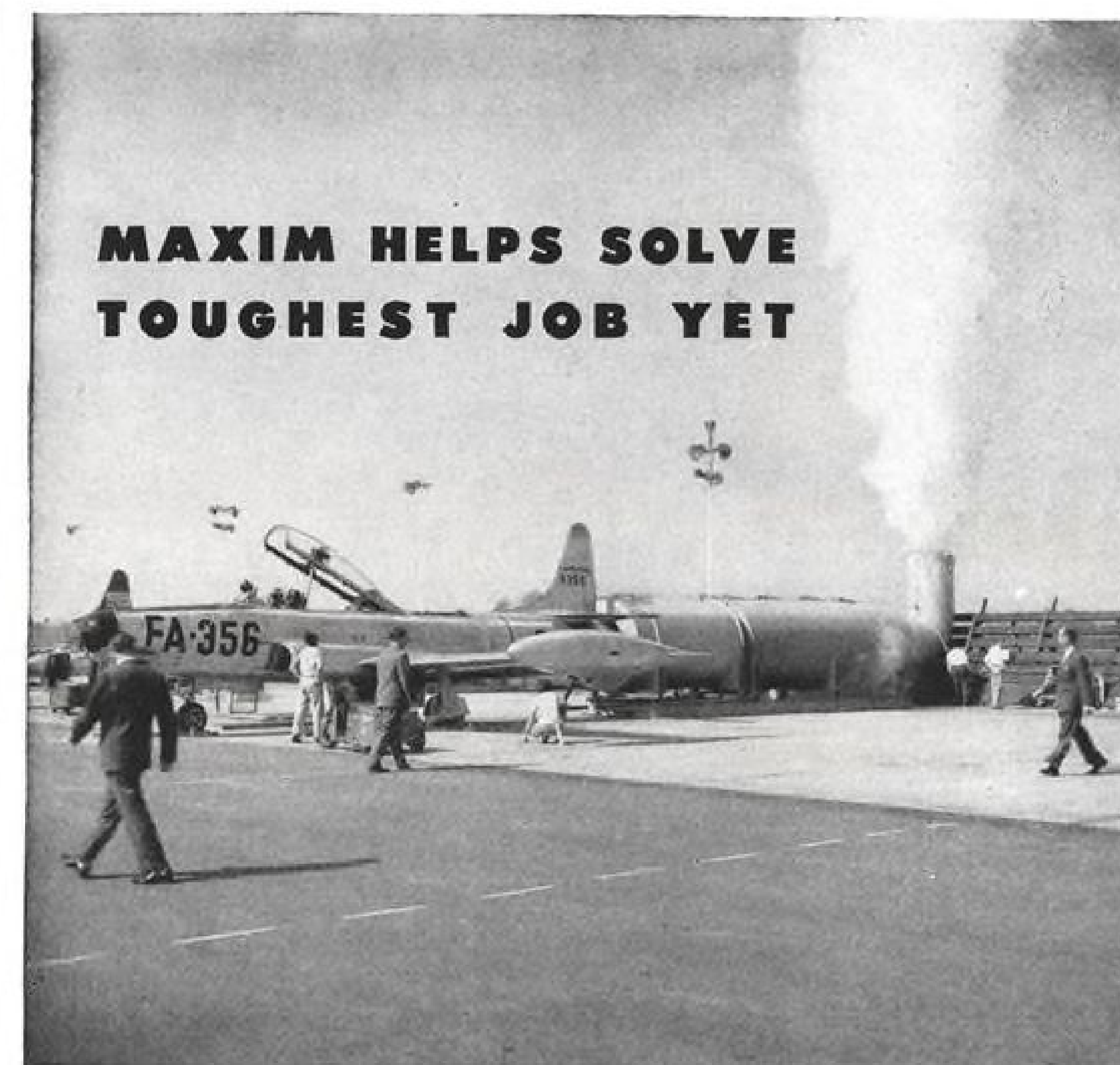
A miniaturized wire recorder, small and rugged enough to withstand being wrung out in test jet aircraft, is being manufactured by Wirek, Ltd., Edgeware, Middlesex, England.

The remotely controlled unit is a quarter the size and a sixth the weight of conventional wire recorders. It can operate continuously for an hour.

Purpose is to relieve test pilot of the cumbersome and difficult (especially during extreme maneuvers) task of writing notes on a knee pad. With the wire recorder, he can give a running commentary of his observations and reactions with a minimum of trouble. These can be used in conjunction with filmed records of flight instruments, strain gauges and other test equipment, correlation being done by means of chronometer.

The compactness and lightness of the recorder make it ideally suited to fighter installation where space and weight are at such a premium.

Hawker Aircraft assisted in the development of the miniature recorder.



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Here for the first time a jet engine installed in a plane is being silenced successfully during run-up tests. At the Lockheed Aircraft Co. in Burbank, final adjustments can now be made without the deafening roar that has been such a hazard to technicians' hearing and health.

The ship shown is the new Lockheed F-94 which has a turbo-jet engine equipped with after-burner. Maxim is proud to have worked with Lockheed in helping to solve this major problem for the industry. Maxim is proud to chalk up another "first" in the progress of silencing.



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AIR TRANSPORT

New Civil Air M-Day Plan Ready

Role of transport industry will be spelled out as soon as several key positions are filled.

By F. Lee Moore

The billion-dollar-plus civil aviation industry last week got an active war mobilization plan, an office, and a director.

Within another week or so the man and the office may be ready to start telling: how you must modify your planes for war use, what you must do with your planes and facilities on Mobilization Day, what key personnel you may keep in case of war, and what equipment and replacement parts you should hold on a stand-by basis for M-Day reserve.

Top civil air mobilization director is one-time CAA Administrator and World War II military director of U.S. civil aviation, Maj. Gen. Donald H. Connolly. He is currently Baltimore's Aviation Dept. director. Connolly now has the title of Assistant for Civil Aviation Mobilization to the Undersecretary of Commerce for Transportation. This means that Undersecretary Delos Rentzel has delegated air mobilization direction to Connolly (AVIATION WEEK May 14).

Connolly will have a deputy and three directors under him. Titles are: Director, Air Transport Division; Director, General Operations Division; and Director, Airports and Airways.

Names of the mobilization chiefs were not released last week, but here are the type of background they will probably have: Deputy Mobilizer for Connolly—a man high in civil-military coordination activities, such as Air Coordinating Committee; Transport Director—an airline president; General Operations—a man experienced in both government work and grassroots operations, like a state aviation commissioner; Airports and Airways—a top man in CAA, for civil airports and airways.

The directors will run mobilization and allocate facilities of the three phases of civil aviation: transport; fixed-base operators, overhaul and maintenance bases, business and agricultural and private aircraft; and airports and airways.

Here's what each will do:

► **Transport Director**—The Air Transport (Mobilization) director will mobilize civil air carriers. That includes both domestic and U.S. flag carriers, scheduled and large irregular.

His job: "In consultation and cooperation with the military agencies, the airline industry and the affected civil agencies, (he will) plan and place in operation a program to insure the maximum utilization of our civil air transport resources in such a manner as to provide a reserve military airlift, concurrently providing essential civil air transport for the maintenance of our productive economy."

Specifically, he will direct and execute these programs:

- Designate first- and second-line air transport reserves.
- Modify civil planes for military use.
- Set up a civil air priorities system for passengers and cargo.
- Allocate planes to the military, after determining their requirements.
- Provide standby equipment and replacement parts for M-Day.
- Set routes and other requirements for "a war air service pattern of commercial scheduled operations during war or emergency."

• Allocate personnel by establishing and operating a system of personnel allocation from the airlines to man the first- and second-line reserves; make appropriate contracts and other arrangements to operate this system.

In short, when this man is assigned, he will really run the air transport industry in mobilization.

► **General Operations Director**—The Director of General Air Operations (mobilization) will direct corporate, industrial, business, and agricultural aircraft. He will also have charge of all the plant facilities and overhaul and maintenance bases those and other aviation people use.

His job is stated about as follows: Plan and place in operation a program to insure maximum utilization of the nation's civil aviation resources, except air carriers; provide facilities available to the military for training and flight and ground crews and related technicians; provide for overhaul and maintenance of both transport and other type planes.

Specifically, he has charge of mobilization programs involving:

- Training.
- Overhaul and maintenance facilities.
- Putting business planes in the air transport reserve as required.
- Assure war use of civil planes for agri-

culture; air evacuation of urban centers; liaison and courier duty; local transport of medical supplies and personnel.

• Allocate non-transport type planes for military, after determining their requirements.

• Allocate personnel for civil overhaul and maintenance bases, including those operating under military contract. He will do this by setting up a system of personnel allocations and determining manpower requirements of all "general operations" under his directorship.

The General Operations Director will thus control mobilization of all civil planes and maintenance facilities except those of the airlines.

► **Airports & Airways Director**—The big task of the Director of Airports and Airways Mobilization is to coordinate the civil and military.

Specifically, here is the job assigned the Airports and Airways Director:

• Coordinate mobilization programs for airports and airways between civil and military interests.

• Execute a specific program for use of civil airports by both military and civil.

• Safeguard security of the airports and airways.

• Centralize responsibility for wartime operation of civil airports and airways facilities of the U. S.

• Execute contracts for joint use of airports by civil and military users so the plan will be definite before the M-Day rush. This is to be done in coordination with agencies having statutory responsibility for operation and construction of airports and airways.

This director is supposed to resolve the pulling and hauling on civil-military sharing of airports and airways. When he gets it resolved, he is to put the resolution down in black and white, so operations will be smooth when the emergency happens.

► **Mobilization Office Set-Up**—The new Civil Aviation Mobilization Office under the Commerce Undersecretary for Transportation will have six key men, according to current plans: Undersecretary Rentzel; Assistant for Air Mobilization Connolly; his deputy (as yet unnamed); Rentzel's executive assistant, Charles Longacre; and the three directors—Transport, General Operations, and Airports & Airways—as yet unnamed. Air Coordinating Committee Executive Secretary Charles O. Cary is doing a lot of the planning.

To see how Undersecretary Rentzel's office fits into the big picture in civil air mobilization, see the organization chart in AVIATION WEEK, Mar. 26, p. 65.

Aside from executive operations, the mobilization office will also have a section for gathering and preparing programs, reports, budgets, and statistics; and a legal advisor.

There are also plans to have an ad-

visory council or committee that meets when Connolly has a problem. Presumably, this will be something like the industry-government task groups that drew up the original NSRB Air Transport Survey.

The basic mobilization plan that Rentzel, Connolly, and this group will use is the NSRB Air Transport Mobilization survey, completed last month under Rentzel's chairmanship. That mobilization plan is secret in its details. But since a plan may not cover all situations, mobilization depends on the immediate situation, the men in the new mobilization office will have a lot to decide on their own from here on out. And the military agencies, CAA, CAB, and other agencies, plus private industry, will no doubt keep coming up with new ideas.

ICAO Recommends Safety Provisions

Airlines and other aircraft operators should strengthen passenger seats now to withstand a crash impact of nine times gravity (9Gs), the Airworthiness division of the International Civil Aviation Organization recommends. Present requirement is only 6Gs.

Other safety improvements recommended for investigation are:

- **Backward-facing seats;** spacing of forward-facing seats farther apart so passengers do not hit the seat in front in a crash; shoulder harness installation.

The U. S. Civil Aeronautics Board has advocated backward-facing seats for years. But most carriers oppose it; they also oppose shoulder harness and wider-spaced seating. Airlines reject these radical changes because of high cost and because they fear passengers would not like them.

Latest plausible suggestions for investigation: strengthen existing seats to 9 Gs or more; "swing-seat" design, whereby on impact shock, the seat tips back putting the passenger in prone position so his head does not fly forward into the seat ahead, and his body does not tend to come out of the belt.

The safe-seating problem comes up in the U. S. this summer at the second annual Airworthiness Review meeting Aug. 6. Here, CAB, CAA, airlines, manufacturers, ALPA and others will go over the suggestions made to date. Agenda will be published about June 1.

At the ICAO meeting, the U. S. and some other nations opposed a proposal that seat strength of 9 Gs be required. So the proposal was made a mere recommendation instead. U. S. says it is too early to make 9 Gs the final requirement; there are too many other possible suggestions, such as 12-G strength or any of the other seating safety ideas, now in development stage.

Policy for '52?

Recent Rentzel remarks give clue to transport's role in near future.

The future shape of U. S. air transport policy may be judged from recent statements of Delos Rentzel, former Civil Aeronautics Board Chairman, now Undersecretary of Commerce and high in the councils concerned with civil-military air mobilization.

His statements, including those before the Airport Operators Council and the management and board of directors of Trans World Airlines, give this picture of probable 1952 aviation policy:

- **Local service airlines.** The locals are here to stay, and they now get 5-year certificates instead of 3-year "temporary" certificates. They used to be called "feeder" airlines, but "feeding" the trunklines is now only 35 percent of their business. Most of their passenger loads are "strictly local in character and a considerable boom to business within the local regions that they served."

CAB is anxious to have manufacturers build a now modern replacement for the DC-3s and C-47s the locals now operate. Then they could come near supporting themselves. Extending the locals' CAB certificates to a five-year period is partly to "establish a more stable and interesting market for aircraft designers and result in the development of a suitable local type of transport aircraft."

- **Trunk airlines.** The Board has begun to weed out the marginal cities from trunk airline routes. This helps both the trunks and the locals. It lets the trunkline increase block-to-block speed and eliminates profit-draining stops. "And in the future when we have turboprop and straight jet transports operating on our domestic airlines, as we surely will within the next five or ten years, such a policy will make for greater technical efficiency."

- **Copter taxis.** Rentzel says: "I foresee the time when we may have a complete network of local helicopter air operations channeling our passengers from the very hearts of our cities out to our air terminals. This development is not nearly as far off as many . . . might think. . . . It must be considered as a normal expected development of air transportation."

Chief reason for copter taxis' inevitability: Airports are getting farther from, not closer to, city passenger markets; surface transport slowness from city to terminal is a killing influence on air speed advantages.

- **Instrument panel standardization.** Despite industry bucking, CAB will go through with its standardized instru-



SWORN IN: By Commerce Secretary Sawyer, Undersecretary Rentzel (left) is set to act.

ment panel regulation. Standardization will give safety within an airline; safety when airlines interchange equipment on commercial runs—a fast-growing trend; safety and efficiency on military operations like the Pacific airlift; and pilot-training cost reductions, after the initial expensive transition.

Rentzel says: "The Board does not think any airline should continue to be so individualistic that it is unable to even standardize the instrument panels on its own fleet of aircraft."

- **New routes vs. interchange.** The Board is still set against adding "any substantial trunkline route mileage." Instead, the Board will continue improving air service by pushing airline equipment interchange. "Wherever possible, we will have the pilots of one air carrier fly their own aircraft over the route and through the territory of another carrier. This is often impractical, and when the pilot must fly another airline's plane, instrument standardization is essential to safety."

- **International flights.** CAB now wants low-fare air-coach flight; first aim is to get fares to Europe "within the financial reach of millions of people who cannot now afford the fare of the present luxury services. It may mean that large numbers of American citizens will be able to travel to Europe on a one- or two-week vacation. . . ." The Board wants the regular certificated airlines to open up this market. CAB has now ruled out most trans-Atlantic charter operations.

- **Nonskeds.** The Board will keep the so-called large irregular carriers' operations truly non-scheduled. To make sure of this, CAB is still determined to put into law its proposed Part 291 of the Economic Regulations. This puts a definite numerical limit on trips the nonskeds can make per month.

But the nonskeds should be kept alive as such, to meet sudden unpredictable

demands that the certificated airlines cannot fully meet, like military air charter requirements in this mobilization period.

► **The Future**—Rentzel concludes his CAB policy statement:

"The implementation of the policies I have mentioned . . . will obviously affect the air transport and airport operations business in the near future."

Puerto Rico Nonskeds Get Tighter Controls

A Civil Aeronautics Board and Puerto Rico government inquiry of the Westair plane crash of June 5, 1950, has resulted in some new preventive rules, for nonsked airlines, according to an official communique from the office of the Governor.

These rules came out of a series of conferences with former CAA Administrator Donald Nyrop, CAA officials Ernie Hensley, William Roberts and James Shipp, and Governor Luis Munoz Marin. The Governor has ordered the following measures:

- **All responsibility rests on the U. S. federal government.** It has full jurisdiction of air transport between Puerto Rico and the U. S. The Insular Government will cooperate to carry out safety measures at the airports.

- **No two-engined planes of nonsked airlines may fly between Puerto Rico and the mainland unless they use the same route followed by Pan American and Eastern on Miami-Puerto Rico flights.** This route keeps planes within 60 miles of land. No direct two-engined flights will be authorized beyond Jacksonville. Before a two-engined flight may fly north of West Palm Beach, the carrier must get a special permit from CAA. Reserve fuel requirements are specified.

- **Before departure,** a CAA-licensed aviation mechanic must inspect the plane. Plane must carry ditching equipment. The inspection must be complete. And a CAA safety agent at Isla Grande Airport must verify the check, the fuel and oil, and the plane's weight.

► **Previous Rules**—After the Punta Salinas air disaster of June 7, 1949, the regulations were also tightened up, but not as much as after the more recent one.

Here's what the Puerto Rico Transportation Authority required after the 1949 nonsked crash that killed over 50 Puerto Rican workers: All nonsked flights had to get a special permit from Puerto Rico Transportation Authority. A CAA man had to make an inspection of the plane.

It has been customary for CAA agents to make occasional trips with the nonskeds to check their efficiency and safety. And the CAA also makes checks on the nonskeds at their home maintenance

bases. The new Puerto Rican flight restrictions mean tighter CAA control.

PAA Gains Important Inter-America Link

Pan American World Airways has at last won Presidential approval of an important new link in its system; for the first time the West Coast gets direct Latin America air service. The Civil Aeronautics Board, in a unanimous decision over a year ago, had certificated PanAm to serve between Los Angeles and Guatemala City or points south. CAB experts say they do not know why the President delayed approval so long.

Although Western Air Lines is certificated for this run, Western cannot go on through to South America, and so has never used the route. PanAm now has CAB permission to serve from Los Angeles to virtually any of its South American points.

► **Opposition**—Biggest opposition to the PanAm certification came from Braniff Airways.

West Coast-South America traffic contributed about 20 percent of Braniff's international revenues in the summer of 1948. But CAB says the public needs a direct route, and PanAm's is it; and the PanAm service won't put the Braniff route out of business, the Board holds.

CAB says it this way: "We do not believe that the route of any particular carrier would be so substantially affected as to threaten its continued operation, and we are convinced that the substantial public benefits that may be expected from the proposed operation in providing a more adequate pattern of air service between the West Coast states of our nation and the countries of Central and South America will far outweigh any adverse effects that . . . result."

The Board's decision agrees generally with the conclusion and reasoning of CAB Examiner Ralph L. Wiser. The only important difference is that the Board now certifies PanAm to Latin America-Los Angeles, but not to San Francisco. Travelers can get themselves to Los Angeles easily enough now—don't need a PanAm extension all the way to San Francisco. San Francisco accounts for 29 percent of total West Coast-Latin America air traffic, according to September, 1948, traffic data.

► **Temporary**—PanAm's certification, Los Angeles-Guatemala City and points south, is for three years. One reason the Board decided on only three years is that in the next three years, the pending pattern of inter-American service, complete with interchanges, will have had time to crystallize. Then CAB can re-evaluate the Los Angeles-Guatemala City route "in relation to the over-all pattern of routes to Latin America."

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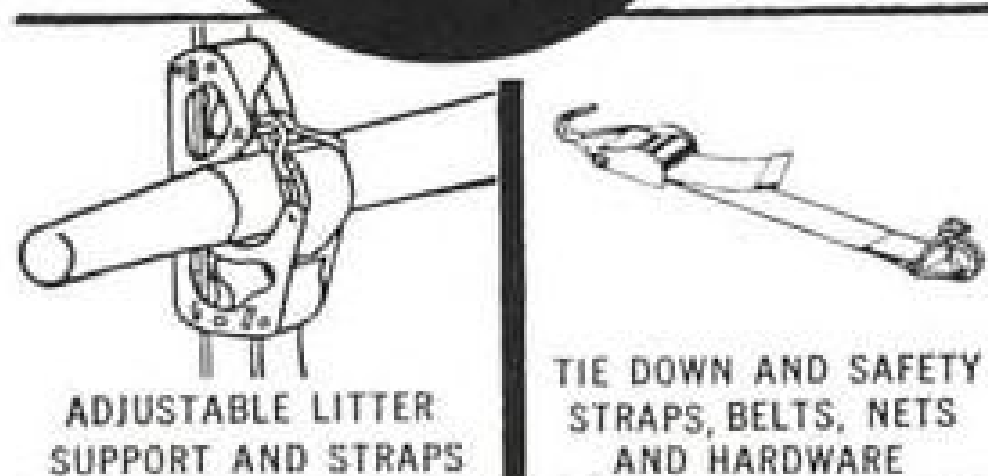
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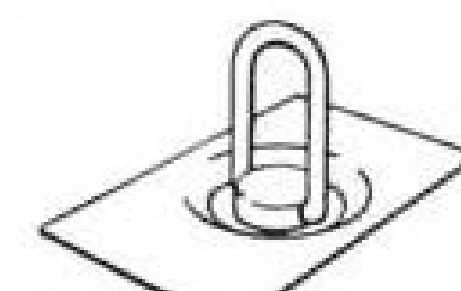
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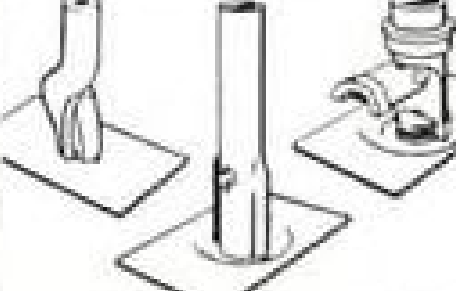
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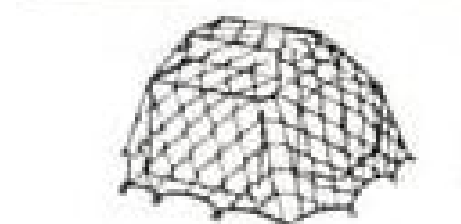
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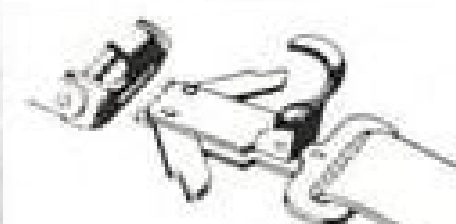
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Transcontinental Interchange Begins

This month starts the biggest test of CAB's big route-arrangement experiment—sponsoring airline interchange over existing routes, instead of giving airlines new routes.

The last link of southern air service to the west has started, as Braniff, Continental and American Airlines have begun one-plane service, Houston-Los Angeles.

Once daily, a Braniff crew starts out at 3:15 p.m. flying a DC-6 from Houston to San Antonio. Then a Continental crew flies the same plane on to El Paso, where an American crew takes over and pilots it to Los Angeles. Same thing works in reverse on the east-bound flight.

On the other triple interchange—Miami-West Coast via National, Delta and American—there are two roundtrips daily, one to Los Angeles, the other to San Francisco. On the Atlanta-West Coast Delta-American interchange, there are three roundtrips daily, one to San Francisco, two to Los Angeles.

LAA Cuts Copter Operating Expenses

Los Angeles Airways, pioneer metropolitan helicopter service, cut operating expenses per revenue mile by 12 percent this March compared with a year ago. And while expenses per revenue copter mile went down from \$1.23 to \$1.08, actual pound miles flown gained 26 percent, from last year's 7,456,493 to 9,419,944 in March this year. LAA completed 99 percent of scheduled mileage this March, compared with only 96 percent a year ago.

Here is the break-down on LAA's unit cost reduction for the period, March 1950-51:

Los Angeles Airways Copter Operating Expenses per Revenue Mile Flown		
	1951	1950
Flying operations	\$.33	\$.34
Direct maint., flight equip. ....	.17	.21
Depreciation, flight equip. ....	.12	.26
Ground ops. ....	.20	.15
Ground & indirect maint. ....	.09	.09
Advtg. & publicity. ....	.01	.01
Gen. & admin. ....	.14	.16
Depreciation, ground equip. ....	.02	.01
Total Expense	\$1.08	\$1.23

U.S., Netherlands Start Air Talks

The State Department has begun bilateral air negotiations with The Netherlands; there has been no formal agreement between them since the U. S.

denounced the Multi-Nation Air Transport Agreement of 1944.

Outcome of the talks is expected to be like the U. S.-British and U. S.-French agreements, following the "Bermuda Principles." Chief restriction would be that carriers must not put too many planes on the routes, lest everyone lose through intense competition and low load factors.

Charter Flights Get Under Deadline

The Civil Aeronautics Board will let those students booked before Mar. 23 by the travel agencies like Youth Argosy fly to Europe on agency-chartered planes this summer. But CAB's Mar. 23 policy forbidding any more "indirect carrier" chartering still stands.

Some observers say it's unlikely more than 300 of Argosy's 1000 reservations will make their trip on Argosy-chartered flights this summer. The Board says Argosy must contract with the regularly scheduled trans-Atlantic air carriers for the flights.

Cool IATA Reaction Seen to Ocean Coach

Qualified observers at the Civil Aeronautics Board and State Department say they would not be surprised at anything that the International Air Transport Assn. might decide at the current Bermuda conference. But they doubt that Pan American will get the other carriers to agree to its trans-Atlantic air coach proposal: that proposal, as approved by the CAB, is for a N. Y.-London \$405 roundtrip coach fare (\$225 one way) and \$711 regular fare (\$395 one way).

IATA members must vote unanimously to get a decision. In this period of rising costs, many carriers are set against lowering fares radically.

Besides the PanAm air coach proposal, the next hottest issue at the meeting is a IATA attempt to control fares for the whole Western Hemisphere. Right now, the only "closed-fare" areas are the Atlantic Ocean and five South American countries: Argentina, Brazil, Chile, Paraguay and Uruguay. Two big obstacles to IATA's getting control of fares are: Empire preference policy, on such as British Overseas Airways' Caribbean rates; and currency manipulation, as in Argentina.

The CAB-approved American plan for trans-Atlantic rate structure, New York-London, proposes:

• Coach-class service the year round would be kept from competing much with regular-fare service by restrictive provisions: high seating density (100 in

Stratocruiser, 65 in DC-6 or Constellation, 60 in DC-4); limit of coach service to one-fifth as many seat miles available as regular service in 1950; no free meals; no extra-section coach flights; and a minimum service standard generally.

• Regular-fare service should be \$395 one way and \$711 round trip, whether IATA accepts air coach or not.

• Alternate proposal, if IATA rejects air coach: special winter roundtrip rate (for 30-day trip) 1½ times the regular one-way fare.

Military Travel Up On Scheduled Lines

Scheduled domestic airlines are doing about \$1,750,000 a month of official military travel business. They expect this volume to increase, says Air Transport Assn. vice president and traffic secretary M. F. Redfern. The current official military travel request business compares with an average of only \$.5 million a month in the pre-Korea fiscal year ended June 30, 1950.

Air, rail and bus organizations are now negotiating fiscal 1952 military traffic contracts with Defense Department. The usual airline military discount of 10 percent from filed tariffs is expected to be renewed. Military is expected to eliminate the "rail preference clause," which favored rail travel over air.

CAB Examiner Hits 'Regular' Nonskeds

Civil Aeronautics Board Examiner Barron Fredericks says CAB should revoke the registration letters of two nonskeds—Trans American Airways and Great Lakes Airlines—for running regular route services. Regular service by a nonsked violates the Board's Economic Regulation 291 forbidding this practice, the examiner says.

Examiner Fredericks also urges the Board to stop Edward Ware Tabor and Sky Coach Airtravel from giving unauthorized transportation.

SHORTLINES

► Air France—French airline has started through-flight service, New York-Germany, leaving New York Wednesdays, with a short refueling stop in Paris.

► Air Line Stewards and Stewardesses Assn.—First convention of ALSSA starts at Chicago June 5. Affiliated with ALPA since 1947, the union now has over 3500 members.

► All-American Airways—AAA general traffic manager Crawford W. Cline has resigned. He is succeeded by Robert C. Meserve. Cline will start an airline traffic research and service agency; he plans to market a ready-reference guide and will handle other traffic and sales manuals.

► Braniff International Airways—Carrier flew a record first quarter 182,976 revenue passengers, up 32 percent from 1950. First quarter earnings were \$443,111.

► British Overseas Airways—BOAC has dropped the Latin American west coast service, Jamaica-Santiago, because of intense competition from Panagra and Braniff. Reportedly the line lost \$3,480,400 on it the first 11 months of fiscal 1950-51. Loss on the rest of BOAC's SA routes was \$2,455,600. BOAC's South American run is via Lisbon, Azores, Bermuda, Nassau, Bahamas, Kingston, and Jamaica. Lopped-off service was Jamaica-Panama-Lima-Santiago. . . . British Colonial Office will build a new airport at Singapore with a 7500-ft. runway, big enough to take the de Havilland Comets on order for BOAC.

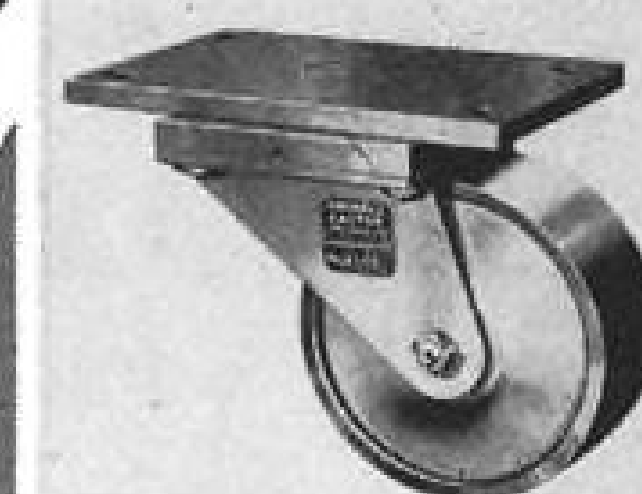
► Capital Airlines—Capital's first-quarter operating profit of \$220,149 compares with a loss of \$128,032 a year ago. This is Capital's first profitable winter in 24 years. Revenues for January-March were \$8,177,561, compared to \$5,919,605 a year ago. . . . March revenues of \$3,023,132 yielded operating profit of \$152,854.

► Colonial Airlines—Colonial started service to Binghamton, N. Y., last week, through the new Broome County Airport.

► Continental Air Lines—CAL has appointed Col. Harry C. Short vice president in charge of maintenance and engineering. He was general manager of the CAL Denver modification center. . . . Continental has started negotiations with the city of Denver for land at Stapleton Airfield; CAL plans to build two hangars and buildings as a permanent company home. The company will finance, design and build the \$2-million quarters itself.

► Mid-Continent Airlines — Directors have promoted P. H. Carr from assistant secretary to secretary of the company.

► Northwest Airlines—NWA and Scandinavian Airlines have agreed on a round-the-world two-airline route, with connections at New York and Tokyo. The new SAS Bangkok-Tokyo route was



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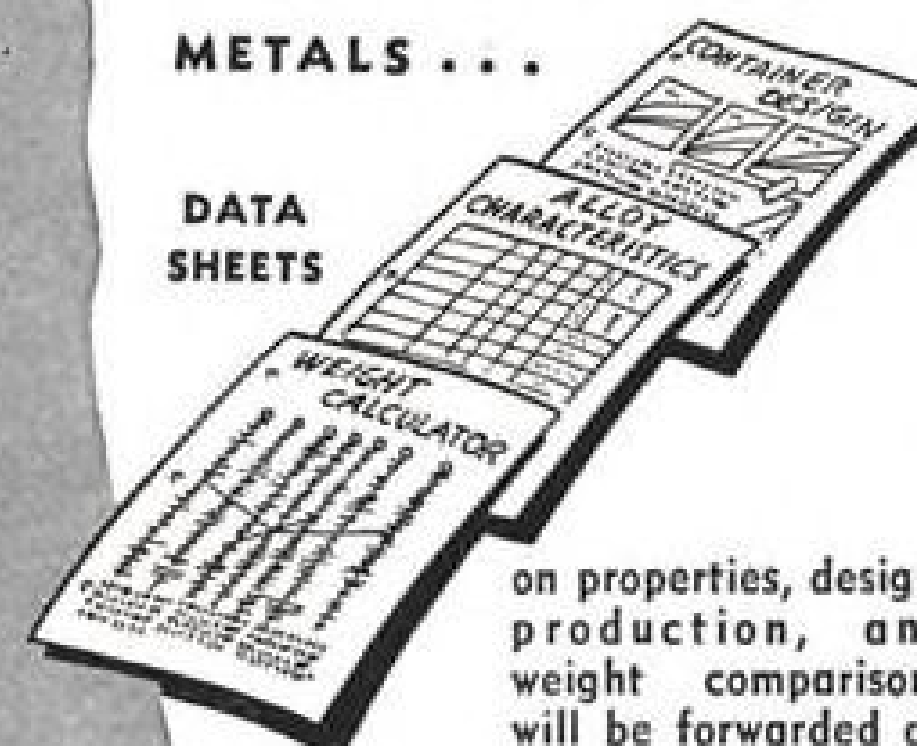
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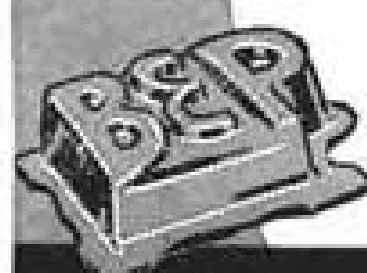
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► **Pan American-Grace Airways**—Panagra flew 12,703,000 revenue passenger miles in March—up 31 percent over 1950. March revenue ton miles came to 1,702,252, up 35 percent.

► **Piedmont Airlines**—Load factor on the local service airline was 51½ percent in April—with 14,721 passengers carried 3,347,414 revenue passenger miles. . . . Passenger miles the first four months were 11,022,964—up 79 percent.

► **Seaboard & Western Airlines**—Completing its fourth year's operation last week, the international nonsked had totted up 17,701,000 freight ton miles the past year. Four-year totals: 30,359,000 ton miles; 8,885,000 revenue plane miles; 1780 ocean crossings. On the Tokyo lift, S&W has carried 4,550,000 lb. military cargo and 5600 men.

► **Southern Airways**—Local service airline carried three times the traffic the first quarter of this year over last year. January-March traffic was 3,140,799 revenue passenger miles.

► **Trans World Airlines**—First-quarter net profit of TWA was \$150,068—its first first-quarter profit since 1945. Last year's loss was \$1,846,704 the first quarter.

► **United Air Lines**—UAL's April traffic ran 147,297,000 revenue passenger miles—up 37½ percent from a year ago. Mail ton miles were up 42½ percent to 1,360,000; express up 28 percent to 806,000; freight down 9 percent to 2,002,000. . . . UAL is doubling Honolulu-California service June 1 with two roundtrips daily using Stratocruisers. . . . Company expansion plans at Denver are delayed by a city auditor decision that the proposed city construction bond issue was unconstitutional without a popular vote, but the city council is working on a compromise. (Continental Air Lines is building its own improvements, and is therefore unaffected by similar delays.)

► **Western Air Lines**—WAL first-quarter profit of \$166,925 compares with year-ago loss of \$37,707. Total operating revenues are up 25 percent to \$3,650,830. Directors voted a 25-cent dividend payable May 15 to stockholders of record May 1. . . . Company has five Douglas DC-6Bs on order for 1952 at total cost of over \$5 million. A recent \$8 million line of credit will help finance the purchase; \$2.5 million of it retired an RFC debt. . . . Latest company promotion brochure features Western's service as the "fastest route to western defense contracts," for businessmen of 13 western states.

We Mobilize for Freedom

WHY Controls are Necessary

One of the encouraging characteristics of the American people is their dislike for government controls. This augurs well for the future of their economic and political freedom.

But for the next few years we must not only tolerate but also help to make effective a whole battery of emergency government controls over our economic life. If we fail to do this now the future of that freedom we cherish will be imperilled. It is the purpose of this editorial—the third in a special series—to explain in simple terms why this is so.

After our military victory in World War II, we rushed through a demobilization which cut our military strength to about one-tenth of its wartime peak. Our allies did much the same thing. But the Russians maintained much of their wartime military strength and built up that of their satellites. With prodigious speed we switched from military to civilian production and went on to enjoy a rousing postwar boom—the greatest in our history.

This boom was in vigorous progress when, on June 25 last year, the Russian-sponsored North Korean army attacked South Korea. Our industrial production was rolling along at almost twice its prewar level. We had labor shortages in many key industrial areas. Under the impact of heavy buying all along the line, prices were climbing.

When the North Koreans smashed into

South Korea they smashed into our national consciousness this fact: if we want a fair chance to save our national freedom from destruction by Communist aggression, we must race to restore some of the military power we had so speedily written off after World War II. And we must do it with our resources already very fully occupied with a boom in civilian business.

Program Small Compared to World War II

Compared with our military effort in World War II, the mobilization on which we are now embarked is small. At its peak, under present schedules, it will absorb no more than one-fifth of the total national production. During World War II we reached a point when nearly half of our total production went for war-making.

Moreover, our economy now is much bigger and stronger than it was in World War II. During the last decade there has been an increase of about 15 percent in our labor force. Our workers have had the training advantage of steady employment. The capacity of our industrial establishment is two-thirds again as great as it was ten years ago. Since the war no less than \$70 billion has been spent to expand and modernize it.

Given time, the industrial giant we have created could pick up in its stride the added load of production for defense that now is con-

templated. But speed is of the very essence. There is little dissent from the proposition that if we are to stand off Russian aggression successfully we have, at the outside, two years in which to get ready.

Controls Needed to Prevent Chaos

These two facts — (1) the necessity for speed in our rearmament program and (2) an economy already stretched taut by a record civilian boom—create the general necessity for government controls. If we simply pile the billions of added defense expenditures authorized since last June on top of the civilian boom, and let it go at that, two destructive developments would follow. There would be a scramble for scarce materials, notably metals, which would create chaos in those markets. And prices would go through the roof.

Our situation during this mobilization is radically different from what it was when we rushed to get ready for World War II. Then we started with an economy that was coming out of a long depression. There was plenty of slack. Even in mid-1941 we still had over 6 million unemployed. Thus it was possible for us to expand war production greatly and also increase civilian living standards before the limits of our productive capacity made extensive controls necessary. But as we begin this new mobilization we find our economy already operating virtually at capacity. This fact is of key importance in understanding why this relatively small defense program so quickly requires the imposition of controls.

The selection and administration of controls thus far has been badly bungled. The threat of price controls, for example, was broadcast so vigorously and for so long that our people were virtually asked to raise prices and thereby do much to defeat the controls. Adequate taxation directed so as to attack inflation at the source and thus give direct price control a chance to operate has not yet been provided.

Indeed, we could readily assemble a long and devastating catalog of the deficiencies of

the government's control program. But that would not dispose of the necessity for controls—by priority, by allocation, and, as a stop-gap, by direct prescription of selling prices—if we are to carry out our mobilization successfully. That is the only means by which a clear right of way for defense production can be cut through the highways of trade and commerce now jammed with civilian boom business.

Hope In The Wilson Plan

Since he became Director of Mobilization, Charles E. Wilson has added a new element of order and hopefulness to the mobilization program. He has laid out a plan which, if we are spared all-out war, would do three things by 1953. First, it would produce the weapons needed by our army and our allies to meet an immediate threat. Second, it would create the capacity that would enable us to move at high speed into weapons production for all-out war—if necessary. Third, it would create the additional production capacity that would restore by that date our ability to resume the climb of the American civilian standard of living.

In technical and industrial terms the Wilson Plan seems to be feasible. If it is successfully carried out, we should be able to begin getting rid of controls rapidly by 1953. But to carry out the program successfully, it must now have vigorous support from everyone. That does not mean mere agreement that it is a good plan. It means that we must conform to the controls that are necessary to make the plan work. In developing this support, the business community is in position to exercise crucially important leadership.

As has often happened in our national history, we are confronted by a paradox. We must accept emergency controls for the time being to insure survival of the freedom that they infringe. But, as we do this, we may find some comfort in the reflection that while controls from Washington are hateful, controls from Moscow would be infinitely worse.

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AVIATION CALENDAR

- May 21-24—Tenth annual conference of the Society of Aeronautical Wright Engineers, Hotel Jefferson, St. Louis, Mo.
 May 23-25—National conference on airborne electronics, sponsored by Dayton chapter, Institute of Radio Engineers, Biltmore Hotel, Dayton, Ohio.
 May 25—Spring meeting, board of governors, Aircraft Industries Assn., Carlton Hotel, Washington, D. C.
 May 26—Second annual maintenance and operation clinic, Reading Municipal Airport, Pa. Weather date, May 27.
 May 27—Spring roundup and open house, San Fernando Valley Airport, Van Nuys, Calif., sponsored by Van Nuys chamber of commerce and Los Angeles Department of Airports. Included in program will be midget races.
 May 27-30—Third annual Wright memorial glider meet, South Dayton Airport, Dayton, Ohio.
 May 28-29—Annual membership meeting of the Aeronautical Training Society, Mayflower Hotel, Washington, D. C.
 May 30—Dedication of Broome County Airport, Binghamton, N. Y.
 June 8—Fourth annual forum of the Corporation Aircraft Owners Assn., Hotel Statler, Washington, D. C.
 June 13—Semi-annual meeting of the Aviation division, Society of Mechanical Engineers, Royal York Hotel, Toronto, Ont.
 June 13-16—Aviation Writers Assn., convention, Hotel Commodore, N. Y.
 June 15-July 1—International aviation display, Grand Palais and Le Bourget Airport, Paris.
 June 18-July 6—Three-week Air Age Institute course, Parks College of Aeronautical Technology of St. Louis University, East St. Louis, Ill.
 June 21-22—Second annual local air service seminar, Purdue University, Lafayette, Ind. For details write Jim Ray, 1507 M St., N.W., Washington, D. C.
 June 23—1951 British National Air Races, Hatfield Aerodrome, Hertfordshire, for light, heavy craft, and jets. Entry blanks available from National Aeronautic Assn., 1025 Connecticut Ave., N.W., Washington 6. Closing date for receipt of entries is May 1.
 June 27-28—1951 annual summer meeting, Institute of Aeronautical Sciences, IAS Western Headquarters Bldg., 7660 Beverly Blvd., Los Angeles.
 July 4-12—National soaring contest, Elmira, N. Y.
 July 17-18—European ignition conference, sponsored by Lodge Plugs, Ltd., Savoy Hotel, London, England.
 Aug. 22-24—Western convention of Institute of Radio Engineers and Seventh annual Pacific electronic exhibit.
 Oct. 2-4—Seventh annual aircraft spark plug and ignition conference, sponsored by Champion Spark Plug Co., at Toledo.

PICTURE CREDITS

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2174	35787-10	Bushing
814	35814	Blower Assy.
3967	35817	Spring
280	35855	Cap
2446	35924	Washers
4200	35932	Gasket
14	36759	Rod Assy.
182	46400E	Liner
30	48346	Cylinder
1475	48360	Bearing
53	48362	Shaft
175	48363	Shaft
100	48389	Fitting
209	48390	Retainer
56	48392	Sump
533	48447	Bushing
107	48457	Adapter
390	48461	Gear
149	48468	Bearing
90	48468B	Bearing
389	48469	Bearing
470	48470	Bearing
75000	51506	Plug
395	54847	Clamp
71	57006	Cover
78	76236	Gear
565	81397	Tube
10736	84185	Cover Assy.
261	84235	Pipe
155	84281	Spacers
1351	84282	Adapter
1178	84289	Bearing
113	84487	Housing
87	84567-B	Stud
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14	105265	Rod Assy.

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20	TA12B	Transmitter
150	DA-1F	Dynamotor
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35	MR-9B	Control Box
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11000	1667	Bulb
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700	TFD 8600	Thompson fuel booster pump
125	D-7818	Adel anti-icer pumps
170	2-P771-A	Pesco fuel pump
250	AN4014	AN4102-1 Erie Meter Systems D-3 hand wobble pump
300	1H260k and KA	Pesco Hydraulic hand pump
478	D9530	Adel selector valve
233	D9530-2	Adel selector valve
428	D9560-2	Adel selector valve
744	D10044	Adel selector valve
2200	AN 4078-1	37D6210 Solenoid United Aircraft etc.
2000	AN 3096-4	Grimes Light assembly
800	AN 3096-5	Grimes Light assembly
380	AN 3096-6	Grimes Light assembly
75	EE 709-M2	Air associates Motor
115	P4CA2A	Parker Primers
80	AN 3213-1	Scintilla Ignition switch
568	A-9 (94-32226)	Ignition switch
687	RS-2	Mallory Selector boxes
490	AN 6203-1	Vickers Hydraulic Ac- cumulator
88	572-3A	Eclipse Distributor Valve
90	JH-950R	Jack & Heintz Starter Motor for JH5 starters
492	S841 (94-32253)	Electric box
12	FA122	Flasher Exterior lights Wallace & Tiernan
1000	13018A	Interphone Box
244	D10051	Selector Valve (Adel)
135	10996A	Instrument Panel for Republic Seabee
144	K14949E	Windshield Wiper Kit (Marquette Metal Products)
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COCKPIT VIEWPOINT

Accident Investigation Is Serious Business

The federal investigation of an airline accident should be one of the most solemn obligations of all concerned. These affairs must usually be judged mainly on circumstantial evidence so great care must be exercised to arrive at the correct solution.

Legally speaking, when reasonable doubt exists as to the cause, the only plausible verdict should be an indictment of all possible factors.

► **2-0-2 Report**—Recently, CAB made public its official report of a Northwest Airlines Martin 2-0-2 accident at Minneapolis on Mar. 7, 1950. This report, based largely on circumstantial evidence, attributes the accident solely to an attempt of the pilot to make a visual approach in bad weather. Many competent aviation people have interpreted the facts differently and reach different conclusions.

In the accident in question a Martin 2-0-2 made an instrument (ILS) approach at Minneapolis during a period of snow and high winds. Previously, pilots had reported a great deal of turbulence along the approach path.

It is a known fact that many factors can cause the ILS to veer from its intended course. Two such factors were present at the time of the crash: snow, and a plane taking off on the instrument runway. The takeoff was an NWA Boeing 377 which reportedly also ran up in position, then passed over the ILS transmitter at exactly the instant the Martin passed the outer marker on final.

Either one, or both, of these factors may have displaced the ILS localizer. Who really knows?

The Instrument Landing System consists of two radio "beams"; the localizer for direction, the glide slope for altitude. Either or both courses may be displaced, the one up or down, the other right or left. The entire cockpit-indicated accuracy of the ILS therefore hinges on the monitoring devices. CAB's official report states: "Both the glide path and the localizer transmitters are guarded by monitoring devices. These devices automatically turn the transmitters off if they do not operate within accepted limits."

This statement is known to be erroneous. The localizer monitor at Minneapolis was, and is, not automatic.

The localizer monitoring devices used by the CAA ring a bell and turn on a warning light in the control tower. The operator on duty may immediately turn off the ILS, or, if his attention is elsewhere, he may not. Beyond this, however, the monitors offer no proof of what is happening in the vicinity of the outer marker since they are not located there. And considerable evidence shows that several conditions existed which could have caused localizer displacement.

The Martin collided with a flagpole and subsequently crashed. The pole was located 650 feet off the runway centerline and 126 feet below the glide path. A pilot's only check on the height of the glide slope is his altimeter. At the time of the accident there was a great deal of turbulence in the approach area. The weather phenomena associated with turbulence, plus other possible errors in the altimeter, could easily account for 126 feet. If the ILS was displaced in any way, all factors in the cockpit could have checked normally with the plane in a dangerous position.

► **Reasonable Doubt**—The foregoing analysis may, of course, not be the real answer either. But each step is believed technically and operationally logical and the conclusion stated is believed to be more than a possibility. The official report not only fails to recognize this, it refutes it. The Board contends that the pilot disregarded the ILS and attempted a visual landing. By this conclusion the CAB has failed to consider "reasonable doubt."

Until all navigation devices are equipped with fully automatic monitors there will be reasonable doubt connected with the crash of any aircraft using a navigation facility. Omniranges have been known to be displaced plus and minus 30 deg. and neither ground monitors nor cockpit warnings have indicated any error. Same is true of ILS.

The prime reason for an accident investigation is that the knowledge gained may be used to prevent similar mishaps. If a wrong solution is arrived at, or if possible causes are disregarded, the preventative measures may also be wrong. When this happens aviation has gained nothing but false security.

—R. C. Robson

SIDELIGHTS

(Continued from page 8)

that President Croil Hunter would be replaced. These are denied by Wall St. Hunter has been in New York for conferences with financial people, including Merrill Lynch, Pierce, Fenner & Beane, and he is expected to continue his duties as at present.

CAA

If CAA specifies new and lower maximum gross weight on C-46s, it will apply only to passenger versions. Cargo C-46s will continue at 48,000-lb. . . . A new interpretation made on instrument rating requirements for pilots (CAR, Part 20:42-1) provides that a pilot may fulfill simulated instrument flight time requirements with a safety pilot who does not have an instrument rating, as long as the flight is not made under contact conditions, and as long as the safety pilot is not giving instrument instructions . . . It looks at this early date as though CAA at its airworthiness meeting in August will require smoke detectors for baggage compartments of airliners, but won't specify type. Another indication is that CAA will require cargo compartments in all new transports to be lined with thin gage stainless steel and be made accessible from the inside.

Human Bomb Gets a Year

A Federal Court jury in Dallas said Dapper Jack Todd, Dallas underworld explosive expert, was guilty of boarding an American Airlines plane with nitroglycerine in his pocket in January. He was fined \$100 and sent to prison for a year.

Here & There

Transportation Assn. of America, railroad-inspired, is still asking backing from all transport interests for over-all transportation legislation . . . Most of the mail moving between New York City & Newark will be taken off trains and moved by trucks for an experimental period . . . Civil Air Patrol, based at Bolling AFB, Washington, reports 45,220 active seniors and 32,990 15-to-18-year-old boy & girl cadets, in 52 wings . . . U. S. Chamber of Commerce's 1951 policy platform urges (1) federal development of new transport plane types; (2) federal modernization of airway navigation aids; (3) a civilian pilot & technician training program, utilizing private industry where possible; (4) maintenance of as many planes as possible by the civilian aircraft maintenance industry; (5) development of small airfields; (6) encouraging aviation education; (7) simplification of regulation by local governments to promote private flying; (8) federal economic & safety regulation of non-scheduled carriers . . . National Production Authority in Washington issues a booklet, "ABC's of CMP," outlining operating procedures for manufacturers and others, which is available at NPA or at Commerce Dept. field offices elsewhere.

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EDITORIAL

Kicking Your Public Around

A theme song in the long fight of the scheduled airlines against the nonskeds has been that the independents kick the customers around.

This unbusiness-like technique is not an exclusive feature of the nonskeds, if we read our mail correctly. Our mail includes two letters that are shockers. One was partly responsible for an editorial here Apr. 7 warning the scheduled airlines against letting their public service standards decline.

The other shocker was written to us by a well known Air Force general, now retired. We think he tells his story well and we quote a major portion of it. The general says:

Reference your editorial, "Beware of Prosperity," . . . here is another "scattered complaint." Early in February my wife and I planned a trip to Florida to begin in March and return in April. We didn't particularly care about the dates—certainty of reservations was the important thing, we being old folks. The return routing confirmed on our tickets, which had been paid for and stamped in New York Feb. 9, called for departure from Jacksonville via Eastern Air Lines Constellation Flight 614 in the morning of Apr. 4.

Having been tipped off by friends that EAL was clearing passengers on a first come basis regardless of confirmed reservations, we arrived in Jacksonville the night of the 3rd and stayed at a hotel to be certain of being in plenty of time for our scheduled departure the next morning.

Upon calling EAL reservations that night to check in, I was told, as I had been warned, that our names would be placed on the waiting list. I emphasized that we had our space confirmed for nearly two months, and I refused to accept any position on the waiting list.

After some more discussion, the young lady at the other end of the line agreed to honor our tickets.

At the airport the next morning we had to stand in line for 15 or 20 minutes while new tickets were made out and sold; others examined and okayed; and baggage weighed and checked. Finally, the plane was announced and a mad scramble ensued to get aboard. Several teen agers, carefully coached by their elders, elbowed their way past the rest of us and rushed up the stairs of the plane to secure the seats of their preference. My wife and I could not get seats until the steward, a very courteous and efficient young man, noticed our disappointment and asked if we would like to sit together in "Sky Parlor." We would and did even though it is a tiny room for four people forward of the regular passenger compartment.

After 20 minutes the loud speaker announced that the plane was oversold by two and would not take off until two people voluntarily disembarked. About ten minutes later there was a similar announcement and about ten minutes after that we did take off, two people having left the plane.

Up to this point I had attributed the confusion to EAL's sloppy manner of doing things, but after conversation with one of the pilots, I came to the conclusion that overselling by EAL is SOP, justified, as he put it, by the fact that "too many empty seats are carried otherwise."

Now, I do not hold that Eastern or any other airline should be required to operate at a low load factor if they can sell the space. I realize that "no shows" are the bane of an airline, but I think it a hell of a way to run an airline deliberately to place people with long-confirmed space in competition at the airplane with people who are there on a standby basis. That it is not necessary to do this is evidenced by American Airlines and National Airlines who always honor reservations and who do things in a snappy and efficient way.

The second letter is similarly documented, describing similar unbusiness-like practices. The writer is H. W. Richardson, editor of a leading business magazine, Construction Methods, who wrote his original letter to the carrier involved. He says:

I do not like the way Eastern Air Lines shoved me around last week on what should have been a routine and pleasant flight from Evansville to Washington. I held Chicago & Southern ticket for continued flight from Paducah to Washington via C&S Flight 10 to Evansville, EAL Flight 452 to Louisville and EAL Flight 402 to Washington. This reservation had been requested and confirmed by C&S at Paducah Apr. 17.

Everything was fine until I landed at Louisville on 452 about 10 minutes late. I saw my baggage being transferred to 402 while I went in to check the desk. The desk cleared me but when I got back out to flight 402 I was told there was no room for me. I protested that the desk had just cleared me a moment before, but that made no difference, the plane was full and, therefore, I could not come aboard. The ground man hurriedly checked the tickets the steward had already cleared, with the thought that perhaps there might have been a standby there. But they reported that all passengers were accredited, and I was told I could not get on.

About then 402 took off and I was left standing on the ramp and someone checked 452, found space on that plane, so all I could do, with my baggage already rolling, was to ride that very uncomfortable and slow flight. The prospect of missing a dinner appointment with my brother in Washington did not cheer me. We bumped over the mountains on a rough flight and landed in Washington not far off schedule but, of course, all my plans had gone haywire.

If Eastern or any other airline is going to start ignoring confirmed reservations like they did during the hectic war days of several years ago, I think I will just give up flying and go back to rail travel. Of course, as my business calls for 45,000 to 55,000 miles a year, I like to fly any time I can, but I am certainly not in a mood to take any nonsense like this from the big carriers.

Fortunately, Eastern's policies are in the minority, we believe. There are various legal aspects to honoring confirmed reservations which most lines understand. These would encourage attention to the public by carriers.

Eastern and American cooperate in a joint standby counter at Washington which, we have observed, seems an intelligent and well-operated project. Here, any standby asking New York transportation is put on the next available plane—whether American or Eastern—and regardless of whether he holds an Eastern or American ticket. Each line honors the other's tickets on this run. American, at least, honors all reservations before admitting standbys. It is difficult to see how this procedure of honoring reservations up to a reasonable deadline could cost American—or Eastern—empty seats.

These letters are important. They are a warning—to those who will listen—that the industry cannot kick the public around. If it does, it can expect inevitable retaliation. That includes more competition. Beware of prosperity.

Progress—Study in Contrasts

"Slick Airways cordially invites you to be present for the arrival of our giant new Douglas DC-6A, the largest, fastest commercial airfreighter in the world, on its maiden flight from Los Angeles to New York. Slick's DC-6As will soon provide the only OVERNIGHT delivery service between New York and California. . ."

From a telegram sent us by Slick Airways May 9

"Schedules of all New York Central freight cars between cities of its system and to off-line points are listed in a 'timetable' now being distributed by the railroad. The booklet shows schedules of cars by ELAPSED DAYS to and from about 200 freight stations which originate, terminate or transfer about 98 percent of the Central's less-than-carload tonnage."

From the New York World-Telegram & Sun, May 9
—Robert H. Wood



MISSIONS...and *MIRACLES!*

U.S. Marines Watch In Awe As Big Bridge Floats Down
World's First Air Dropped Bridge Spans Carried By 119's To Chosin Reservoir Battle

HQS, FEAF CARCOM, (A.T.) The world's first air drop of a bridge was made today by aircraft of the FEAF's Combat Cargo Command, was eight spans totaling 16 tons were parachuted near Kotori-Ri in North Korea.

United States Marines, fighting bitterly against hordes of Chinese Communist Troops in the frozen north, gazed up in awe as the huge C-119 "Flying Boxcars" of the 314th Combat Cargo Wing broke through an overcast and spilled out the huge pieces of equipment. Large 100 foot parachutes supported the spans as they drifted slowly down, landing near the determined leathernecks.

Mission successful, pilots returning to this lift base, state

These Col. A. office Evacu Air D of the by the cal that large since Comb estab remain ber o airlif lity in highly of th Since in Kor ed ri Natio woun casual Korea ed by enemy ed and flight, caring swelled recent in a for ing th 30 Sep ber

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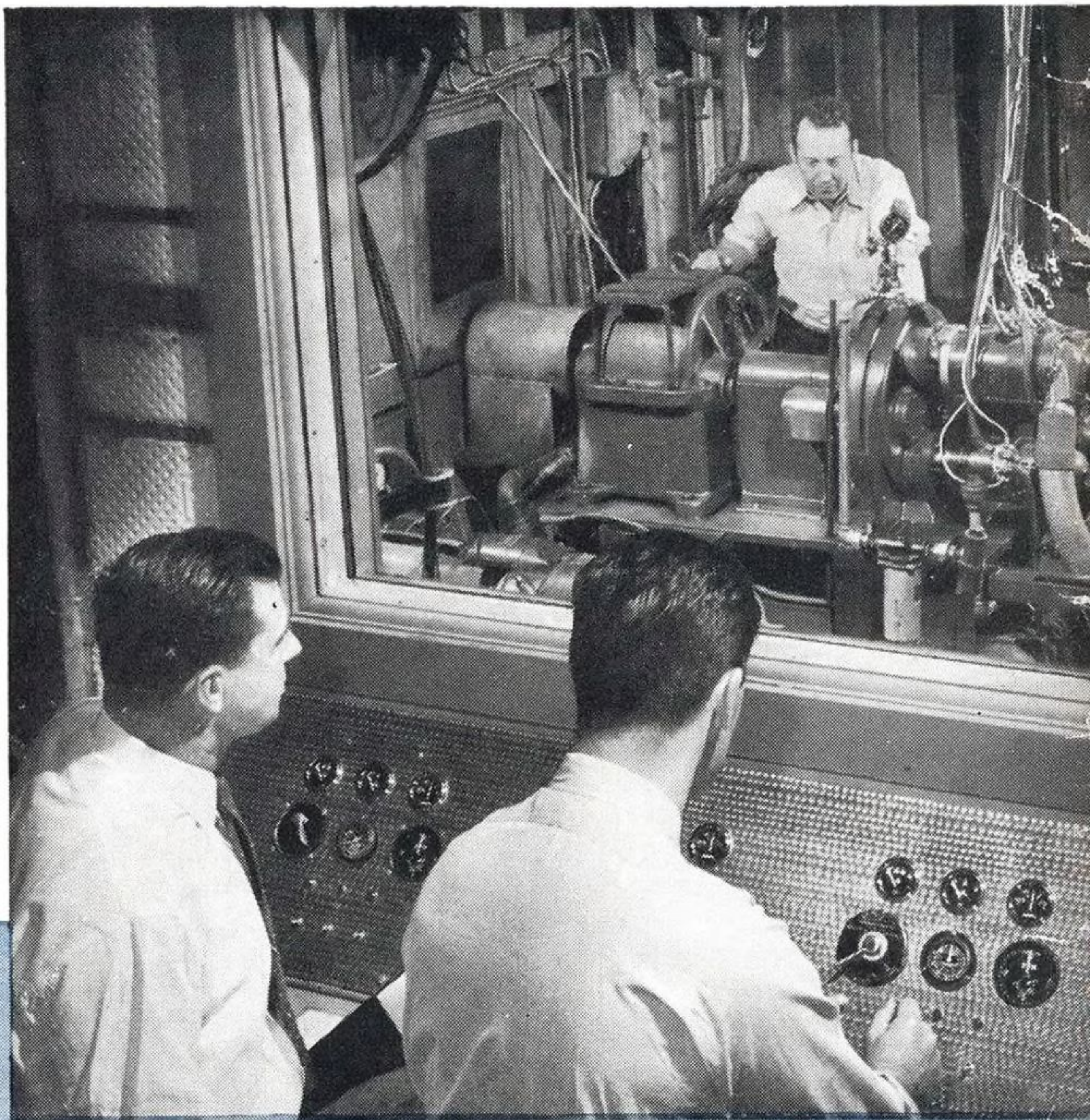
ENGINE AND AIRPLANE CORPORATION
FAIRCHILD
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Fairchild Engine, Guided Missiles, and Stratots Divisions, Farmingdale, N. Y.

Flight testing an idea



Complete electrical systems for any given aircraft can be simulated on this network analyzer.



Radial-type engines help this test stand duplicate aircraft power systems for testing purposes.

Even ideas are flight tested at General Electric. Both before and after an aircraft electrical system is built, G-E's aviation divisions check it out under actual operating conditions to save you expensive "de-bugging."

Your power distribution system, for example, is first "flown" on the analyzer. Electrical circuits for your plane are cranked into the board and the idea is worked over until the analyzer OKs it.

A model then gets a long rugged workout in the Aircraft Systems Test Lab to iron out final kinks. When design is "right," production begins. Finally, individual component parts are tested before installation in your aircraft.

Project engineers are chosen for experience as well as scientific "know-how." Pilots, navigators, flight engineers, military and transport, are represented. George Phillips, for instance, shown "flying" a distribution network, is an ex-Air Force maintenance officer.

This combination of theoretical analysis and practical testing by men who know aviation problems means trustworthy electrical systems without extensive "de-bugging" after installation.

For aircraft electrical equipment that will give you long trouble-free service, call your General Electric aviation specialist or write Apparatus Dept., General Electric Company, Schenectady, N. Y.



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