

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

MAR. 7, 1955

50 CENTS

TRANSISTOR FUEL GAGE



MULTIPLEX FUEL GAGE



PRESSURE RATIO INDICATOR



New Honeywell Aircraft Instruments for the Jet Age

THE very nature of a jet engine and the new supersonic speeds and altitudes achieved by jet aircraft have created a need for a complete new group of instruments—instruments for the Jet Age.

It is natural that Honeywell, a leader in the aeronautical controls field, would meet the challenge to develop and manufacture a line of these new instruments. Some of them are shown on this page:

The completely *Transistorized Fuel Gage*, which meets the requirement for high accuracy, yet provides the utmost in reliability.

The *Multiplex Fuel Gage* system, which saves precious weight and space by driving two or more indicators with one power unit.

The *Pressure Ratio Indicator*, which provides accurate take off power checks and more economical cruise performance for jet engines.

The *Exhaust Gas Temperature Indicator*, which measures the exhaust gas tem-

perature within 5°C. safeguards engine life and insures adequate thrust.

The tiny *Thermistor Liquid Level Switch*, which guards fueling operations and operates fuel warning lights.

More instruments for the Jet Age are in design at Honeywell—because Honeywell Aero is tuned to the demands of the Jet Age.

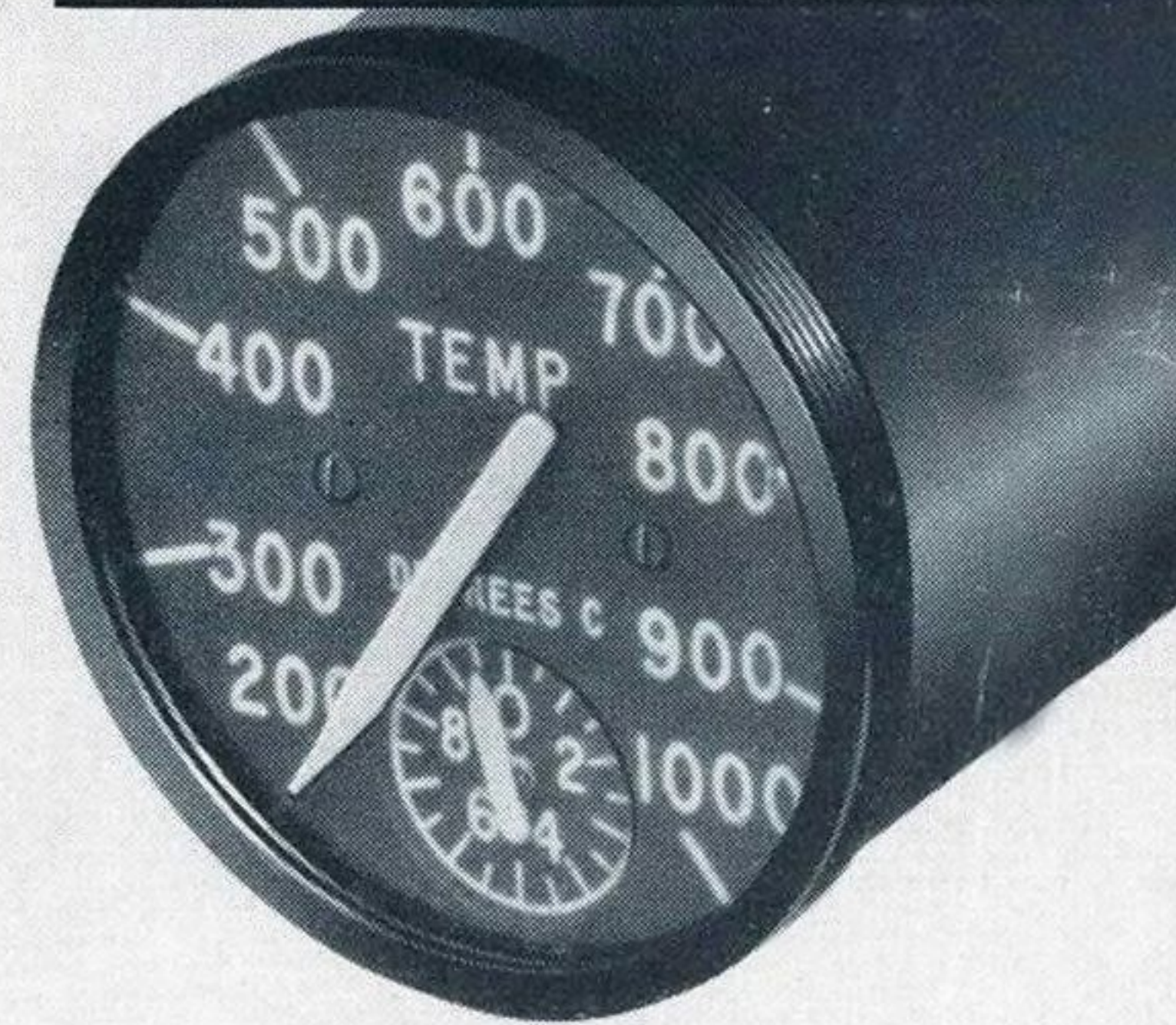
For complete information on Honeywell aircraft instruments, write on your business letterhead to Dept. AW-3-28 at the address given below.

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Honeywell
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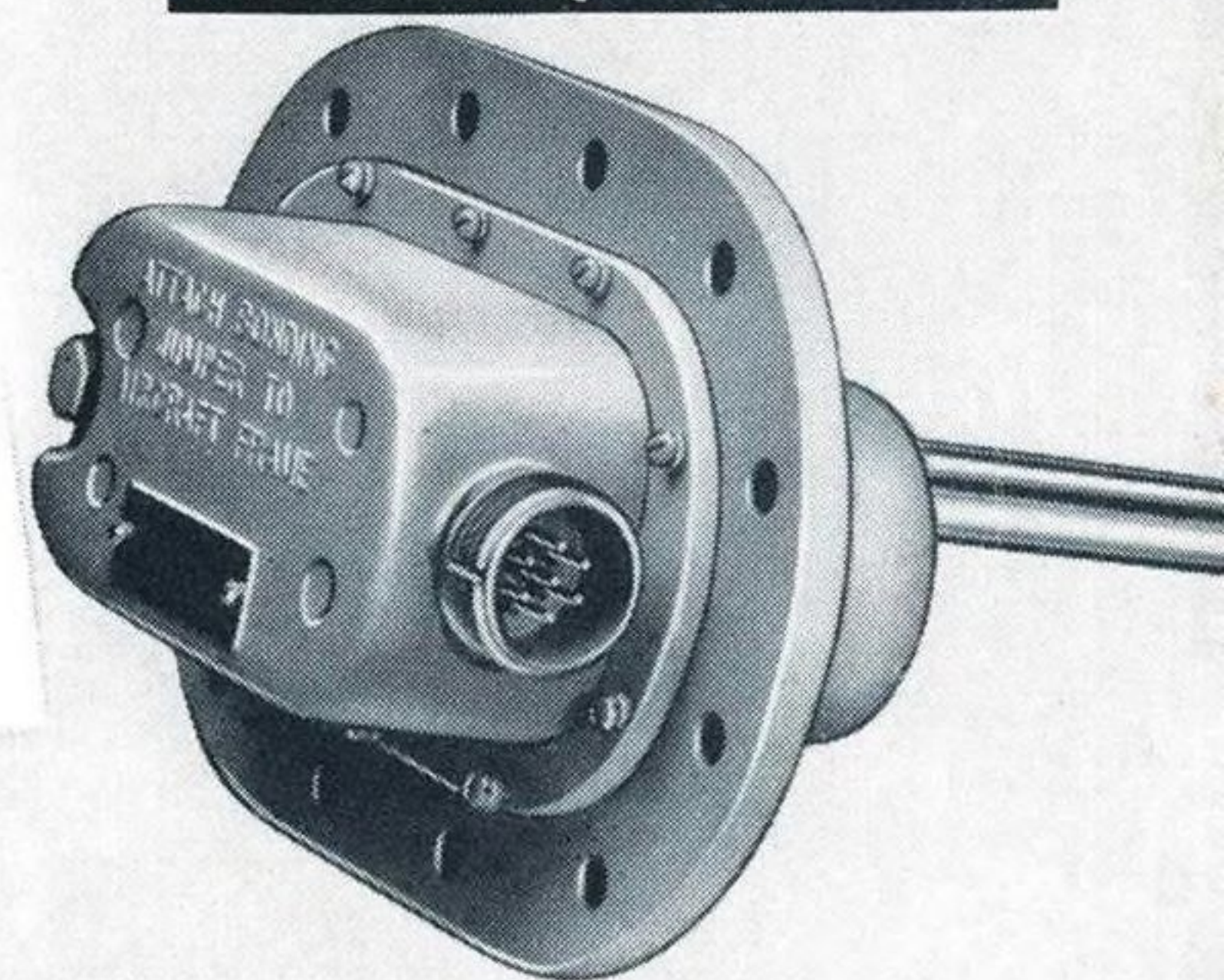


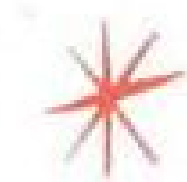
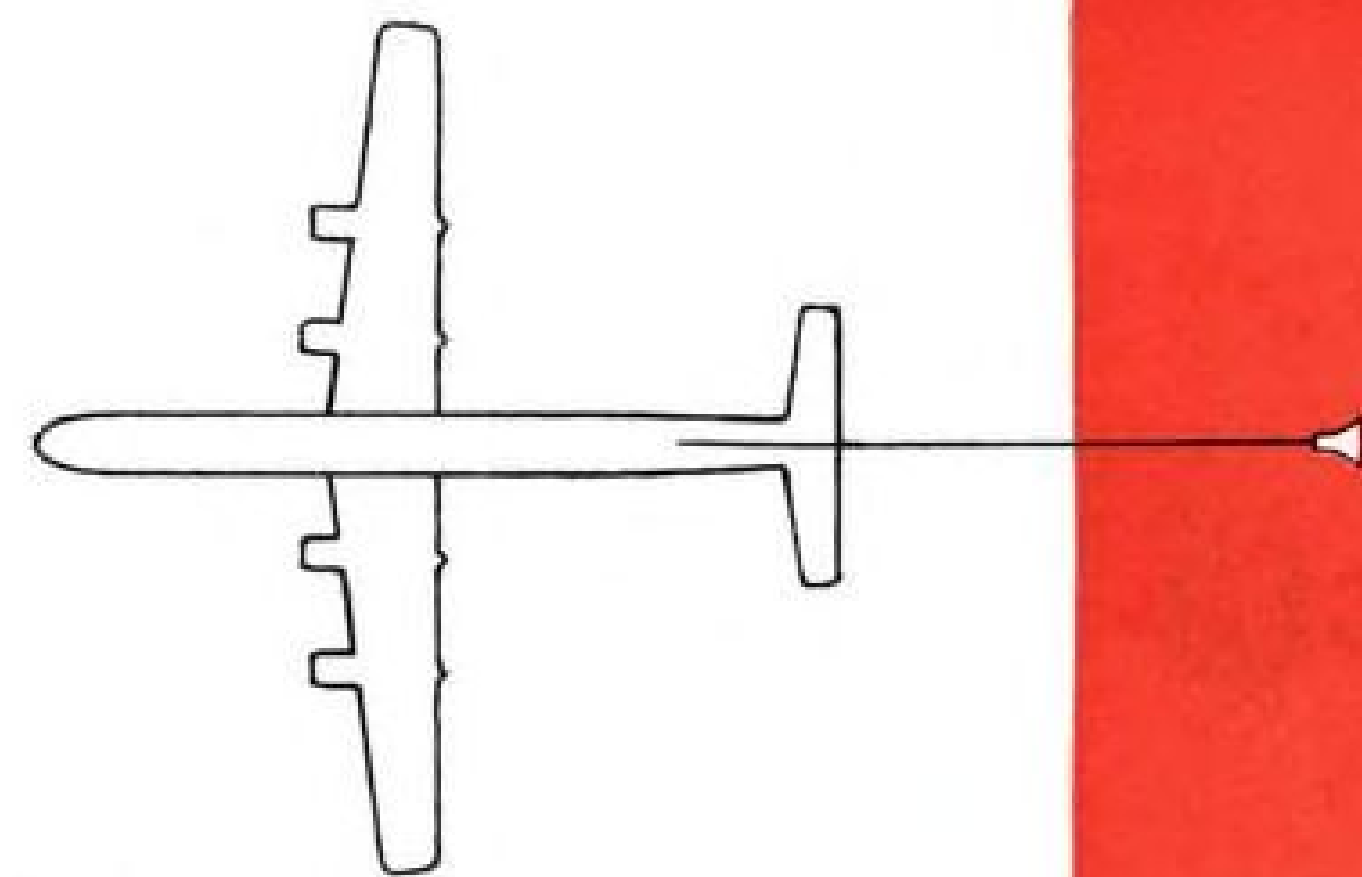
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EXHAUST GAS TEMPERATURE INDICATOR



THERMISTOR LIQUID LEVEL SWITCH





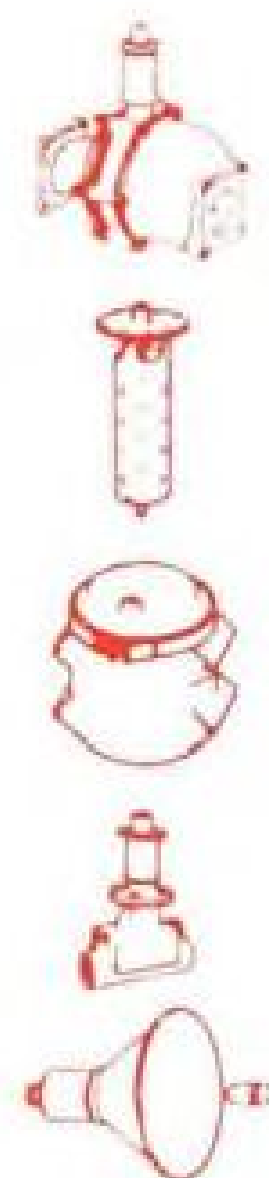
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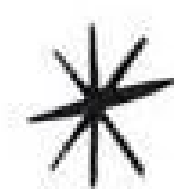
FLIGHT PRESSURE REFUELING RECEPTACLE AND NOZZLE

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For the Aircraft Industry



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We're for never blowing bubbles

THE BUBBLE TYPE CANOPY on the new Martin B-57B light bomber had to be safely pressurized at altitudes of 8 miles and higher. Ordinary inflatable seals between the bubble and cockpit might blow out from the effect of high pressure inside the canopy and low pressure on the outside.

B. F. Goodrich engineers had a ready-made answer to the problem—their inflatable strip seal. It has a U-shaped solid rubber base and a rubberized fabric diaphragm nested inside the base. When inflated, this diaphragm simply lifts to seal effectively. Low inflation

pressure gives full expansion with very little or no stretch. Of course, less stretch means less strain. It works like blowing up a paper bag so that dangerous stretching, like blowing up a toy balloon, is eliminated.

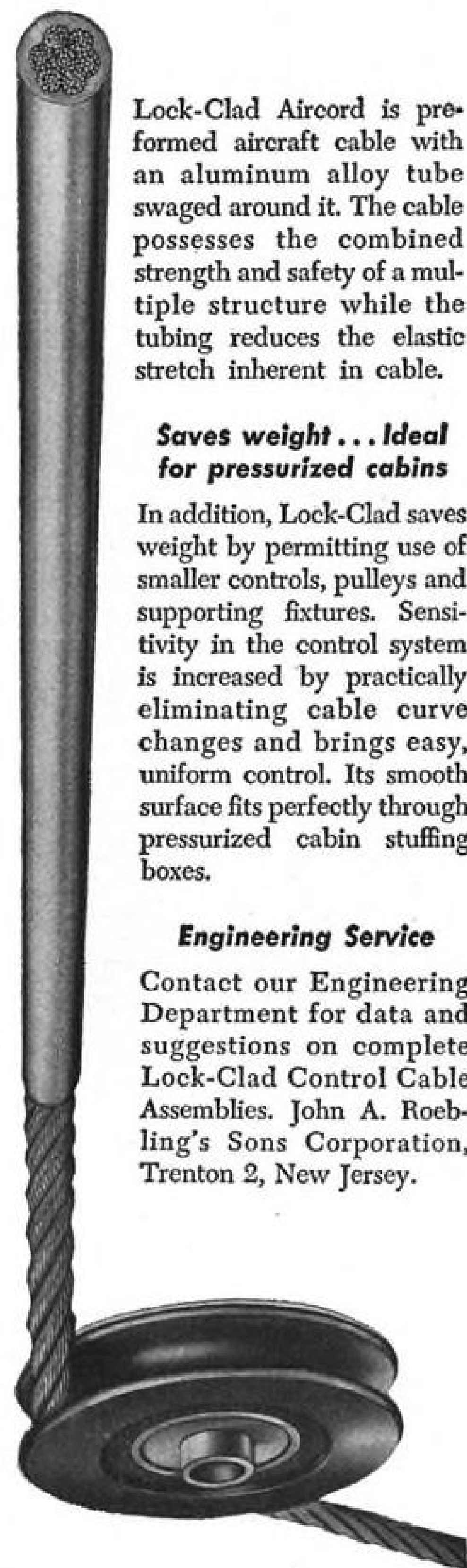
The new inflatable strip seal works almost instantly. Even at minus 65°, it inflates with approximately the same pressure that ordinary seals needed at room temperature. There are other advantages. It fits around complex curves. It seals and unseals quickly. Sliding wear and scuffing are minimized because of high clearance when seal is deflated.

The new B. F. Goodrich seal is now in use on more than a dozen makes of planes, including latest jet fighters and bombers like the F-100 and B-57.

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Aviation Week

MARCH 7, 1955

VOL. 62, NO. 10

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AIR CONDITIONING by AiRESEARCH!



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new high altitudes and
speeds for transports with
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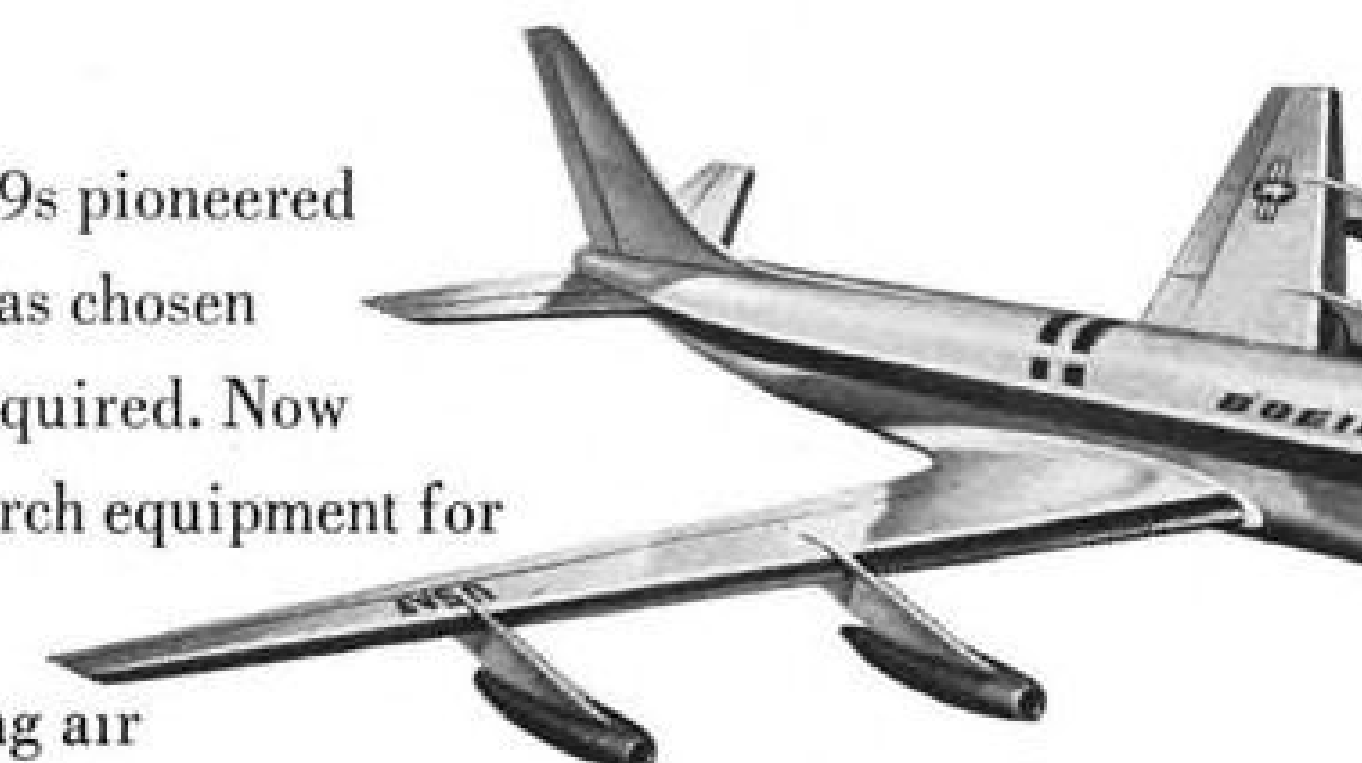
History repeats. When Boeing B-29s pioneered heavy bomber flying at high altitudes, AiResearch was chosen to supply the cabin-conditioning equipment required. Now

Boeing has again selected AiResearch equipment for its sleek new KC135s.

AiResearch has unmatched experience in developing air conditioning equipment for the majority of present day

commercial and military aircraft. It has produced more complete air-conditioning and pressurization systems and components than all other manufacturers put together.

Once more a leading manufacturer confirms that where proved designs, reliability and high performance are required, AiResearch is the choice in its field.



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Northrop's Scorpion is the Air Force's most heavily armed all weather interceptor. A rugged fighter, it is powered by two Allison J-35 jet engines with afterburners that put it in the 600 mph class and altitude capabilities of 45,000 feet.



Clifford Oil Cooler used on Allison J-35 engines.



Amplifier is small, compact, employs ruggedized tubes. Components are potted in resin.



Pulse unit is smallest of its kind and of novel design. Paper clip shows comparative size.



Northrop Scorpion's Cockpit Temperature Controlled By New Lightweight Unit

New Clifford amplifier features unitized construction, ruggedized, miniaturized components, novel pulse element

Weighing only 28¾ oz. and measuring 4" x 3½" x 3", Clifford's control box marks a number of advances in the field of aviation temperature control.

In addition to its small size and light weight, the control box design embodies several important advantages in service.

Unitized construction makes it comparatively simple to locate a malfunction in service, quickly replace the unit containing the defective component, and get the plane back into the air.

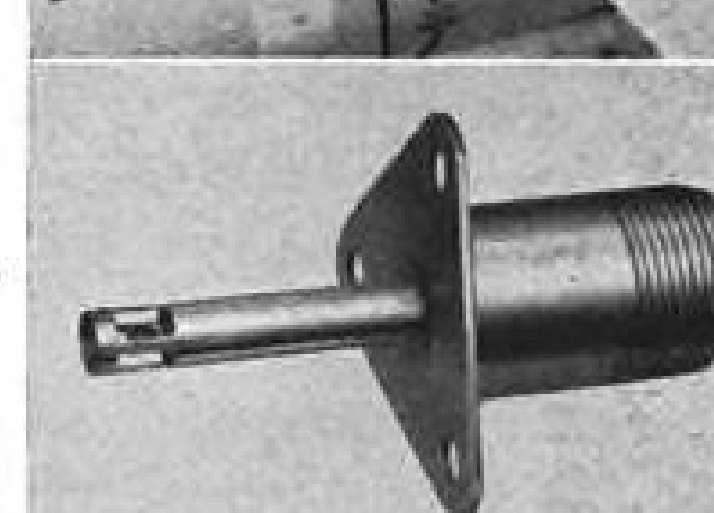
Miniaturized, ruggedized components result in the smallest, lightest control possible for the job to be done. Elements within the box comprise an amplifier, which is highly compact and potted in resin, a novel pulse element smaller and lighter than comparable units, slave relays to operate valve actuators, a power supply, a calibration unit for the electrical bridge and a radio noise filter.

Physical and electrical designs are both concerned with the performance-in-service factor. Electrical input values are held to optimum levels to insure long, trouble-free service. Physical arrangement of parts promotes maximum heat dissipation.

Complete system of Clifford design and manufacture encompasses temperature sensing elements, temperature selector, and control box.

Information or consultation involving temperature control systems custom built to the requirements of specific aircraft on which you may be working is available without obligation.

Write: Clifford Manufacturing Company, 139 Grove Street, Waltham 54, Mass. Division of Standard-Thomson Corporation. 7.4.18



Sensing element consists of the mistor beads cushioned in a protective metal tube. They are sensitive, accurate, small, long-lasting and protect against environmental conditions.



NEWS DIGEST



White Undercoat Protects Bombers From Nuclear Heat Radiation

U. S. Air Force is painting the undersides of its bomber fleet white to protect crews against the effects of heat radiation from nuclear weapons. This photo shows a Boeing B-52A Stratofortress with new paint job taking off on delivery flight from Seattle for Moses Lake Flight Center, where the eight-jet strategic bombers

receive final installations and tests before delivery to the Air Force. Similar reflective white paint schemes are going on the Boeing B-47 Stratojet and Convair B-36. USAF says the paint is the same type that goes on cabin tops of commercial planes to reflect the sun's rays and help keep interiors cool.

Domestic

Increasing DC-7C orders are responsible for a \$1-million program to expand final assembly lines at Douglas Aircraft Co.'s Santa Monica, Calif., plant. Orders already announced: British Overseas Airways Corp., 10; Sabena Belgian Airlines, seven; Pan American World Airways, seven; Scandinavian Airlines System, eight, and Swissair, two.

New F-100 crash apparently will have no effect on the Air Force order returning the supersonic fighter to flight status, North American Aviation said last week. The Super Sabre crashed off the West Coast near Inglewood, Calif., less than three weeks after USAF lifted the grounding order. But NAA said it seemed to have no connection with recent fixes designed to overcome aerodynamic difficulties encountered by the F-100 (AVIATION WEEK Feb. 14, p. 13).

USAF's 93rd Bomber Wing, Castle AFB, Calif., will be first equipped with Boeing B-52 heavy jet bomber. Initial Stratofortress is scheduled for delivery to the unit in late spring.

Los Angeles Airways will add 10 southern California cities to its helicopter passenger network within the next 30 days. The new service will route LAA's seven-passenger Sikorsky S-55s from Los Angeles International Airport to Santa Ana, Anaheim, Fullerton, Pomona, North Hollywood, San Bernardino, Riverside, Ontario, Fontana and Corona.

New supersonic windtunnel with a speed range of from Mach 1.2 to Mach 4 will be constructed by Boeing Airplane Co. at its Seattle Plant. Cost of the test facility: \$2 million.

Bendix Aviation Co.'s International Division has sold more than \$2 million in aircraft accessories and components to Britain's Vickers-Armstrongs for installation on 90 turbojet Viscounts. Bendix claims the sale is the largest ever placed by a foreign airframe builder with a U. S. supplier.

New flight test facilities at Edwards AFB, to be used jointly by Douglas Aircraft Co. and Convair, are under construction and will be completed by late summer of this year. Air Force has allocated \$2.2 million for the project.

First de Havilland DHC-3 of 90 ordered by the U. S. army will be delivered Mar. 14.

Seaboard & Western Airlines has won a \$3.5-million military contract to airlift freight and personnel between the U. S. and Western Europe. The operation is scheduled to start Apr. 1.

Chance Vought Aircraft, Inc., Dallas, has received a multi-million-dollar subcontract from North American Aviation to produce aft-fuselage sections for USAF F-100s. First units are scheduled for delivery in July.

Maj. Gen. Victor E. Bertrandias, member of Capt. Eddie Rickenbacker's 94th Squadron during World War I,

two-time winner of the Distinguished Service Medal and former vice president of Douglas Aircraft Co., retired from active duty Feb. 28 as USAF deputy inspector general at Norton AFB, Calif.

Financial

North American Aviation, Inc., Los Angeles, reports a current backlog of \$1.2 billion in firm orders plus an additional \$600 million now under negotiation. NAA has declared a regular quarterly dividend of 75 cents on capital stock, payable Apr. 6 to holders of record Mar. 16.

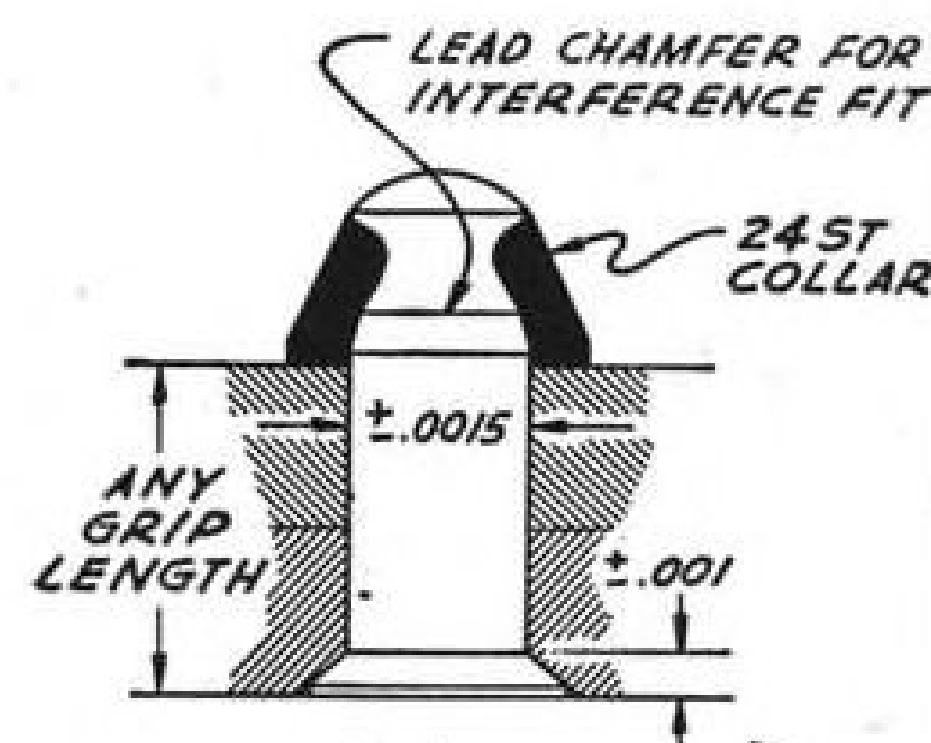
Curtiss Wright Corp., Wood-Ridge, N. J., had a net income of \$19,377,279 for 1954, climbing from \$11,402,791 in 1953. Sales totaled \$475,084,435, compared with \$438,728,482. Present backlog: More than \$750 million.

International

West German Lufthansa will take over British European Airways' two most popular flights on the London-Dusseldorf route Apr. 17. In effect, BEA is handing over half of its traffic between the two cities by giving away the flights. Informed observers interpret the move as an effort to set up a British-German "pool" agreement.

Capt. R. T. Shepherd, 56, one of Britain's leading test pilots and the first to fly the vertical-takeoff "Flying Bedstead" built by Rolls-Royce, died Mar. 1 at Nuthall, England.

IT'S A BARGAIN— this *hi-shear*



More shear pounds per dollar can be installed with the high strength HI-SHEAR rivet than any other known fastener—real economy for today's high performance aircraft.

Lowest in price, the HS47 and HS48 series rivet has the least weight and smallest size per shear pound of any high strength fastener.

These HI-SHEARS are available in two head styles — flat and countersunk; popular diameters of 3/16, 1/4, 5/16 and 3/8; and the 160,000-180,000 psi heat treat class.

Ask for the HI-SHEAR Standards Manual for complete dimensional details of the HS47 and HS48 and other styles of HI-SHEAR rivets.

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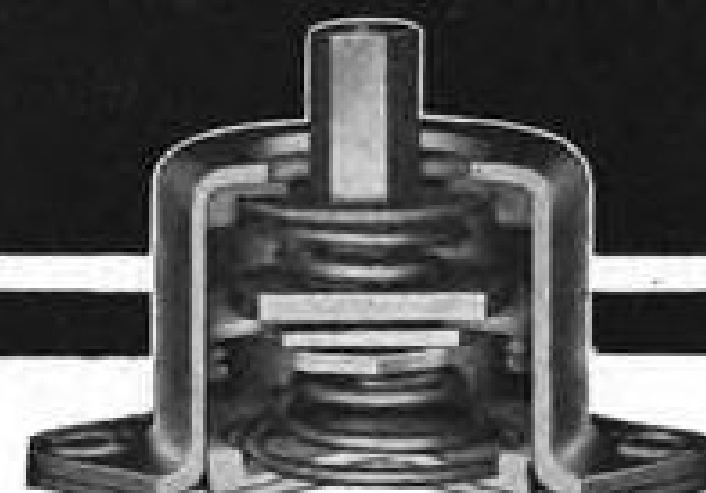
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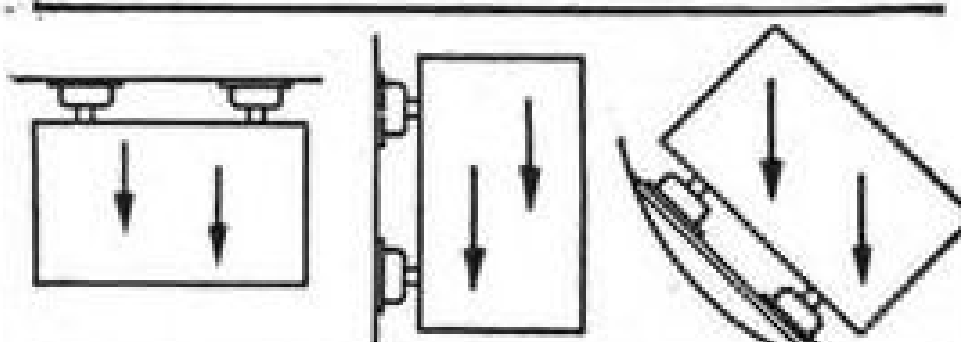
7—Boeing Airplane Co.; 9—(top) Convair, (bottom) Chance Vought; 16, 17—McGraw-Hill World News; 18—Boeing Airplane Co.; 21, 22—USAF; 28—ARDC; 40, 41, 44—North American Aviation.

NEW ALL-ANGL BARRY MOUNT

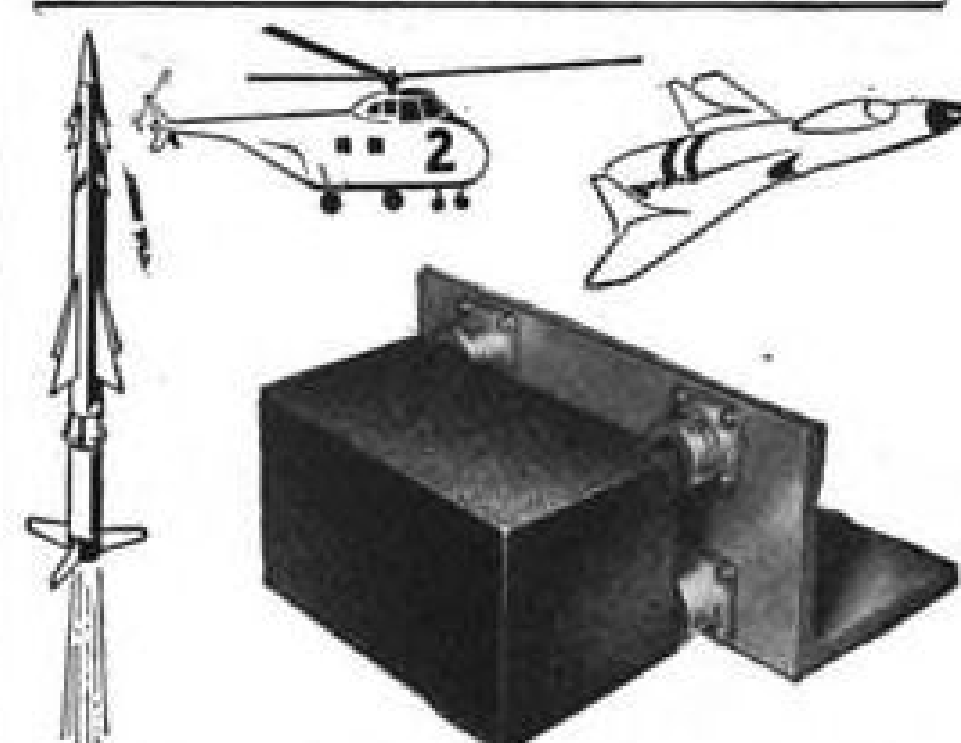


ALL-ANGL BARRY MOUNT
Cup diameter1 inch
Maximum load3 pounds
Weightless than 1 ounce

WORKS AT ANY ANGLE



IN MANEUVERS THROUGH EVERY POSITION



WITH HIGH DAMPING IN ALL DIRECTIONS

Now you can forget all limitations on mounting positions for delicate apparatus. You can design for easiest installation and best space utilization, because the new Barry ALL-ANGL vibration isolator works in any position. Upside down, on a bulkhead, at any slant—position means nothing to this new BARRYMOUNT® isolator. Damping is exceptionally high in all directions; transmissibility at resonance is less than 3. The ALL-ANGL mount is interchangeable with other miniature BARRYMOUNT isolators.

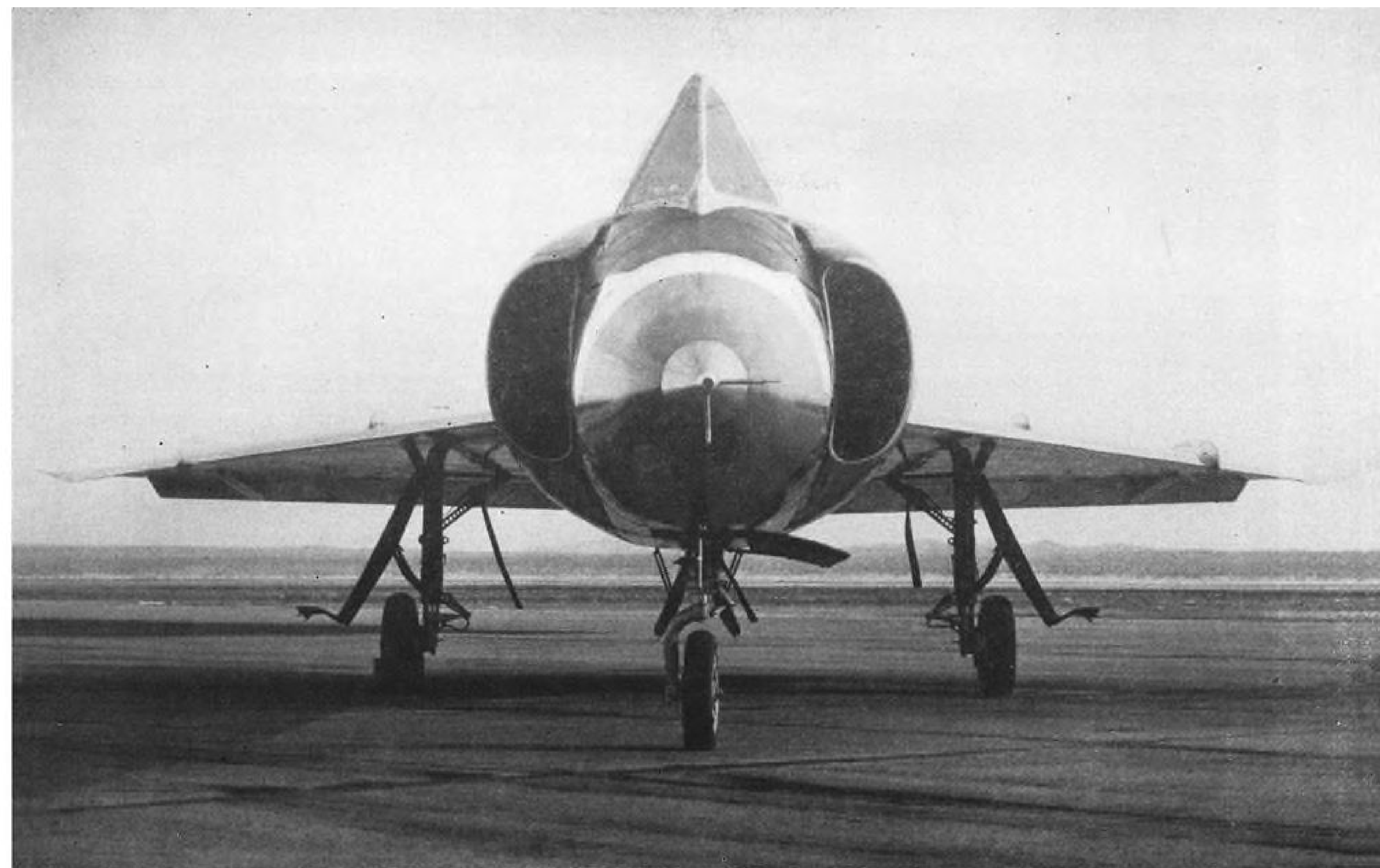
This isolator is the answer to your toughest vibration-protection problems. Let us show you what it will do for you — at the New York I. R. E. Show; or write for Bulletin describing this new mount.

THE BARRY CORP.

715 PLEASANT STREET

WATERTOWN 72, MASS.

AVIATION WEEK, March 7, 1955



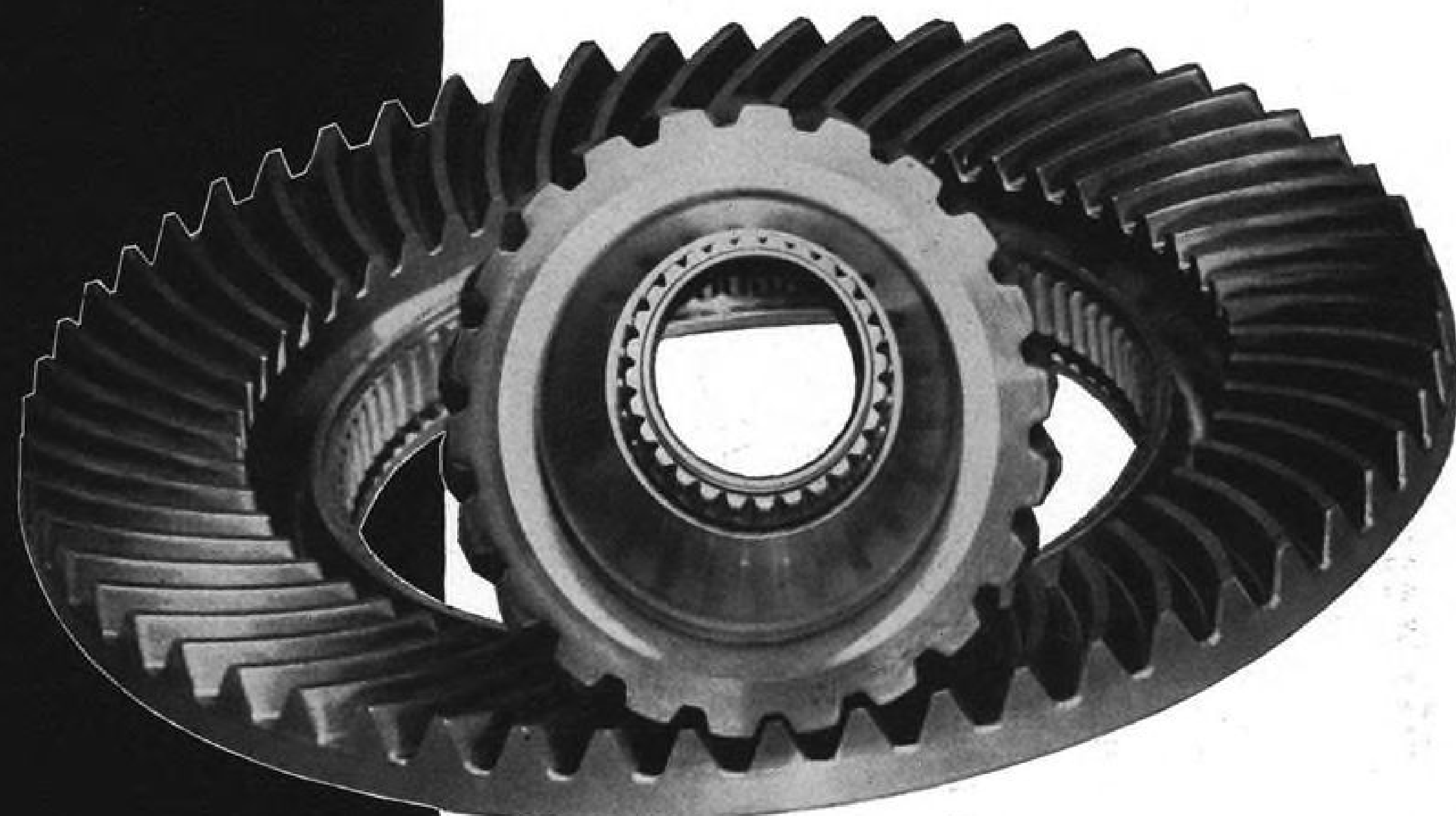
CONVAIR YF-102A delta-wing interceptor presents a grim aspect. Visible are some changes made over earlier F-102 to aid level-flight supersonic performance. They include camber on leading edges of wings, upswept wingtips and revised intakes for the P&W J57.

New Angles on Highspeed USAF, Navy Jet Fighters

CHANCE VOUGHT F7U-3 CUTLASS shoots flames from the afterburners of its twin Westinghouse J46 turbojets as the Navy fighter prepares for a night takeoff at NAS Moffett, Calif. Plane is operated by Composite Squadron VC-3, which trains F7U-3 pilots.



**and
then
we
built**



*the input drive gears for the main transmission
of the S-58 Sikorsky Helicopter.*

The concave spiral bevel gear is 18.930 inches in diameter—of thin-walled section, carburized and hardened with our distortion-free metallurgical techniques and held to the closest of aircraft tolerances *without* tooth grinding. This was one of those "it can't be done" operations.



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WHO'S WHERE

In the Front Office

Sydney L. Albert has been elected president of Bellanca Aircraft Corp., New Castle, Del. He succeeds John C. Redmond, who has become board chairman.

William M. Ehart has resigned as director of public relations and publicity for National Airlines to take over Collins Laboratories at Miami, in which he has acquired controlling interest.

Robert H. Wood, former editor of AVIATION WEEK, will join McDonnell Aircraft Corp., St. Louis, this month as assistant to the president for public relations.

John F. Davidson, former vice president-operations of California Eastern Airlines and onetime operations director for Air Transport Assn., is new assistant to the president of Pacific Airmotive Corp., Burbank, Calif. Moved up by the company: L. B. Littrell, vice president-aircraft service; William Maxfield, manager of the Aircraft Division.

F. H. Bechill has been appointed vice president and works manager of Kaiser Metal Products' newly merged Aircraft and Commercial Divisions, Bristol, Pa. Other changes: R. L. Collett, vice president-sales and engineering; J. L. Hallett, vice president-production, and W. K. Palmer, assistant treasurer.

T. A. Campobasso is new vice president-operations and maintenance for Alaska Airlines.

James W. Austin, vice president-traffic and sales for Capital Airlines, has been elected to the carrier's board of directors.

L. R. Ripley, president of Heli-Coil Corp., has become a director of Doman Helicopters, Inc., Danbury, Conn.

Capt. E. A. G. Whittle, Britain's Royal Navy, and J. H. Pitchford, managing director of Ricardo & Co., Engineers, Ltd., have been appointed to the board of Power Jets, Ltd.

Changes

Dr. Laurence E. Fogarty has moved up in Link Aviation, Inc., Binghamton, N. Y., to chief engineer. Also promoted: John M. Hunt, research and development director; Robert F. Hall, manager of manufacturing engineering; Vincent S. Kraeger, administrative engineering manager; Milton S. Wade, standardization manager; Melvain Oliphant, T-37A simulator and E-600 project manager, and James F. Newlon, Binghamton plant manager.

John J. Hennessy is new controller of R. M. Hollingshead Corp., Camden, N. J.

Col. Walter Hurd, formerly with Philippine Air Lines, has become quality coordinator at National Motor Bearing Co., Redwood City, Calif.

Honors and Elections

Mundy I. Peale, president of Republic Aviation Corp., has received Italy's highest civilian award of merit for his work in establishing a cooperative F-84 spare parts manufacturing program between his firm and the Finmeccanica Co., Naples.

INDUSTRY OBSERVER

► Both Douglas and Grumman are encountering stability and control problems with their latest Navy supersonic fighters—the modified-delta Douglas F4D Skyray and the lightweight Grumman F9F-9 Tiger. Data now available from USAF and North American investigation of the F-100 Super Sabre crashes (AVIATION WEEK Feb. 14, p. 13) may indicate a solution to these Navy problems.

► Lockheed's F-104, which resembles the Douglas X-3, has a wingspread of only 22 ft. Each panel measures about 9 ft. semispan, and fuselage diameter is approximately 4 ft. Leading edge is sufficiently sharp to warrant covering by felt strip while plane is on the ground. Plane probably has not yet been allowed to exceed 65,000 fpm. rate of descent.

► Industry interest in new North American Aviation-developed chemical milling process (see p. 40) is evidenced by list of firms that have signed with Turco Products, Inc., Los Angeles, NAA licensee, to use the production technique. New sub-licensees include: Boeing-Seattle and Boeing-Wichita, Lockheed-Burbank, Grumman, McDonnell, Northrop, Beech, Aeronca and Rohr.

► Britain has rejected an American proposal to build the Army's Nike anti-aircraft missile under license on the grounds that it is operationally limited, too complicated for field use and too expensive. Nike's slant range of about 15 mi. appears too short for any effective defense of British cities against transonic bombers launching air-to-ground missiles. Guidance equipment for Nike launching site costs about \$840,000, according to British sources, who also say Nike's guidance system cannot solve the problem of attacking two or more bombers that are flying fairly close formation.

► Allison J71 turbojet has joined the ranks of 10,000-lb.-thrust engines, having passed a 150-hr. qualification test at that rating. This engine is installed in the Douglas B-66 and the Martin P6M.

► Watch for another attempt to smash the transcontinental speed record of 4 hr., 6 min., 16 sec. set by Col. Willard W. Millikan in an F-86F on Jan. 2, 1954. New record attempt will utilize aerial refueling.

► General Aniline & Film Corp. has solved the browning problem in "Gafite," its new plastic for airplane glazing. Firm is building a plant for production of "Gafite," which has high heat resistance, and may become standard for the "Century" series of fighters. Main drawback: It will cost 10 times as much as Plexiglas.

► Ministry of Supply says all future British aircraft will be designed for plastic drop tanks and those in service will be converted if possible. An example is the English Electric Canberra for which plastic tanks are being developed. Metal tanks still are being purchased for older model aircraft. Plastic tanks probably will not be developed for these older planes since they soon will be out of service.

► Piasecki Helicopter Corp. is conducting experiments on boundary layer control applied to blades of the H-21 Work Horse.

► Watch for British Ministry of Supply to "eat crow" on its earlier rejection of the Folland Gnat lightweight transonic interceptor and place production orders for the Royal Air Force. RAF pilots who have flown the Midge, prototype for the Gnat, have been impressed with its flying qualities while British taxpayers will be impressed with its cost—about one-third that of the Hunter and Swift. Fast production time of this simple aircraft may bail out MoS from the heavy barrage of current criticism that is being leveled at the long delays in getting modern fighters from the drawing board into combat squadrons.

► Latest modification on the Vickers Supermarine Swift Mk. IV was not an all-flying tail but included larger elevator surfaces. Swift now has a variable incidence tail.

ATA Candidates

Candidates to succeed Earl D. Johnson as president of the Air Transport Assn. now are being screened by ATA's board of director's selective committee.

Under consideration for the \$42,500-a-year post are:

- **Republican Rep. Carl Hinshaw**, knowledgeable Capitol Hill leader in civil aviation affairs, and 1953 recipient of the Wright Brothers Memorial Award for his consistent service to civil aviation.
- **Philip Young**, chairman of the Civil Service Commission, former dean of Columbia University's Graduate School of Business and director of the Bank of Manhattan. Young also served with the Democratic administration.
- **Maj. Gen. Claire Lee Chennault**, wartime commander of the 14th Air Force in China, and chairman of the board of Civil Air Transport, commercial airline operating in the Far East and based on Formosa.
- **Stuart G. Tipton**, who has served as general counsel of ATA for 11 years and is an effective spokesman for the scheduled carriers on Capitol Hill.

Aircraft Leasing

Air Coordinating Committee will undertake an immediate review of Navy's plan for leasing cargo planes commercially to increase emergency airlift capacity during peacetime (AVIATION WEEK Feb. 28, p. 13). A meeting of ACC's full membership is planned Mar. 10, but Air Force has already indicated a complete lack of interest in the Navy proposal. Intending to proceed alone if necessary, Navy is actively seeking congressional support for an authorized program, despite the need of Budget Bureau approval.

'Foot and Mouth Club'

Trevor Gardner was sworn in as Assistant Secretary of the Air Force for Research and Development following Senate confirmation of his nomination without opposition. At the ceremony, USAF Secretary Harold Talbott commented that Gardner "has sometimes enjoyed that club that I'm in with Mr. Wilson (Defense Secretary) called the 'foot and mouth club,' but not often."

New Chairmen

Newcomers have taken over the chairmanships of the Senate appropriations subcommittees handling funds for civil and military aviation.

- **Sen. Dennis Chavez** heads the subcommittee on Defense Department. Although a member of the Appropriations Committee for several years, Chavez has not participated actively in defense matters.
- **Sen. Spessard Holland**, appointed to the committee for the first time this year, is chairman of the subcommittee on Commerce Department, handling funds for Civil Aeronautics Administration and Civil Aeronautics Board.

Nonskeds Bid

Aircoach Transport Assn. belatedly put in a bid for permanent certification to congressional committees considering legislation giving permanency to the local service lines (see p. 67).

Rizley Takes Over

White House produced a phalanx of the Administration palace guard as a demonstration of support for new Civil Aeronautics Board Chairman Ross Rizley when he was sworn in last week.

Such Administration leaders as Commerce Secretary Sinclair Weeks, Postmaster General Arthur Summerfield and GOP chairman Leonard Hall stood with White House aides Sherman Adams, Gen. Wilton B. Persons and Charles Willis to watch Rizley take the oath.

Rizley turned to Capitol Hill for an administrative assistant, choosing Robert L. Kunzig, former chief counsel of the House Un-American Activities Committee.

With Rizley in office, CAB is at full strength for the first time since the first of the year and will be able to get to work on several important cases now hanging fire. Possibility of 2-2 splits in voting which has plagued Board action for the past two months now is removed.

Full utilization of the CAB executive director is a must, chairman Ross Rizley told AVIATION WEEK. "I intend to use and rely on him," he said. The executive director's post, which has varied markedly in stature since its creation five years ago, is held by Raymond Sawyer, who joined the board in 1953.

Rizley said Sawyer's post was essential to handle the maze of administrative detail. "I knew we were busy at the Agriculture Department and it appears that CAB must be the second busiest place in town," Rizley said.

Air Show Plans

Enthusiastic Philadelphians predict a record crowd of 400,000 will see the 1955 National Aircraft Show at their International Airport. Last year's Dayton attendance: 200,844.

Quaker City exhibit, scheduled Sept. 3-5, will be the first on the East Coast since World War II. Defense Department has authorized participation by armed forces and the program will be drawn up before summer.

Louis Inwood, Philadelphia aviation boss, says his airport will provide more ramp space for outside exhibits than ever before available. Arrangements will be made with hangar tenants to vacate space for indoor displays. In addition to the city's large number of adequate hotels, the airport expects a new 75-unit motel, next to the \$1-million terminal, will be in operation by Labor Day.

Atlas Missile Progress

First official confirmation of USAF's intercontinental ballistic missile project—Convair's Atlas—followed a closed briefing of Senate Armed Services Committee by Gen. Nathan Twining, Air Force Chief of Staff.

Sen. Leverett Saltonstall commented to AVIATION WEEK that "very good progress is being made on that and other missiles."

Renegotiation Support

There is a strong move on Capitol Hill to revive the renegotiation law that expired Dec. 31, setting up an independent renegotiation board. Several members have introduced bills to accomplish this. An effort will be made to re-enact the law as an amendment to pending tax legislation.

—Washington staff

Boeing Wins \$700-Million Tanker Award

- **Contract for 300 jet-powered KC-135s climaxes hot aircraft industry competition for USAF prize.**
- **Lockheed will get AF order to pursue its proposal for 'advanced' design with engines in rear fuselage.**

By Claude Witze

Boeing Airplane Co. has won the industry's most hotly contested prize—an Air Force award that increases its KC-135 jet tanker orders to \$700 million.

This means about 300 aircraft, observers said.

An initial order for \$240 million was made last summer. USAF Secretary Harold E. Talbott emphasized that the orders would be placed "over an extended period."

The aircraft will be built at Boeing's plant in Renton, Wash.

► **Lockheed Design**—Secretary Talbott said Lockheed Aircraft Corp. also will get a contract for design and development of an "advanced jet tanker," described by USAF as an aircraft "of great interest." This was understood to be a tanker similar in size to the KC-135, but the engines are positioned in the rear of the fuselage.

The tanker design is roughly similar to Lockheed's L-193 jet transport.

The Secretary said USAF probably will want to buy one or more prototypes from Lockheed as soon as the Phase I engineering progress warrants.

Talbott declared that the decision to give the entire contract to Boeing, standardizing on the KC-135, was dictated by economy reasons and the need for speedy delivery of the planes. Industry circles estimated that establishment of a second source of jet tankers would cost more than \$100 million.

► **Pentagon Meetings**—Talbott said Boeing had agreed to provide a maximum of subcontracting to component and parts manufacturers throughout the United States.

Disclosure of the decision was made after long delays, and followed a Pentagon meeting of Roger Lewis, Assistant USAF Secretary for Material; Maj. Gen. David H. Baker, AMC Director of Procurement and Production, and William M. Allen, president of Boeing. On the previous day, Lewis also conferred with Maj. Gen. C. S. Irvine,

AMC deputy commander for production.

Previous week Secretary Talbott had been on the West Coast and conferred with Lockheed, Douglas Aircraft Co. and Boeing officials.

► **No Dispersal Factor**—Concentration of the final manufacture in the single Boeing plant at Renton was not considered contrary to the Defense Department policy of dispersing industry as a measure of protection against atomic attack. It was pointed out that any plant in the United States could be a target and Renton's location in the Northwest is not considered more vulnerable in modern warfare.

There were reports that Talbott and the Boeing management face some disagreement over the company's desire to mix commercial versions with the KC-135 on the assembly line. This controversy is being watched closely by the entire industry.

Both Talbott and Gen. Curtis LeMay, chief of the Strategic Air Command, are insisting that the entire production at Renton be delivered to USAF until the military contract is under the wings.

The Convair entry in the jet tanker competition was a delta-wing aircraft with conventional empennage.

Lockheed's design, in which the Air Force is interested, actually won the design competition on the basis of technical evaluation, but lost out to Boeing because the latter is closer to production.

Lockheed was understood to be considering a continued study of the commercial jet market possibilities, along with a concentrated effort to produce a medium-range turboprop aircraft of the type desired by American Airlines and Eastern Air Lines to replace present twin-engine transports.

There was no doubt selection of the Boeing tanker gave the company an unprecedented lead in the coming struggle for domination of the commercial jet transport market.

W. A. Patterson, president of United

filled. Boeing, on the other hand, cites wide airline interest in the commercial version and points out that it was Boeing money—\$15 million—that paid for the original design. USAF points out that they have a heavy tooling investment. First USAF order for \$240 million was made last August only three weeks before the deadline in Air Research and Development Command's jet tanker design competition.

► **Future Plans**—Other manufacturers, it was reported, were confident Boeing would persist in its right to divert some output to airline purposes. "They've already started to fight for it," one source said, "and when they start to fight, they're a pretty tough bunch."

Following Talbott's announcement that the Boeing contracts would be extended, William E. Beall, senior vice president of the company, said: "We want to sell jet transports commercially, but a final decision must await formalization of our contracts with USAF."

"For some time, we have hoped to be in a position to offer commercial jet transport airplanes for sale as soon as our obligation to the Air Force for production of KC-135 airplanes could be established, permitting us to firm deliveries on commercial aircraft."

Douglas defeated in the tanker design competition, is expected to go ahead with its plans for the DC-8 jet transport. This is similar to the design offered for the tanker, a sweptwing aircraft with four jet engines in pods under the wings.

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Air Lines, said he believes 50 or 60 commercial planes will take care of the needs of all domestic airlines. He predicted that all will be made by one company, choice of which rested on the military decision.

Like the Air Force, Patterson feels that dividing the orders among manufacturers would make unit costs prohibitive.

► **Engine Orders**—In addition to the profound effect on the outlook for commercial jet transports, the USAF decision will bring substantial new orders to the Pratt & Whitney Division of United Aircraft Corp., which will manufacture the powerplants. Early versions of the tanker will be powered by four P&W J57 engines, probably

to be followed in later models by the P&W J75, 15,000-lb.-thrust engine still under development.

The KC-135 is a military version of the company-developed 707, but with a considerably lengthened fuselage. Cruising speed is reported to be more than 550 mph. It will be used for refueling jet bombers, such as the B-47 and B-52, at altitudes up to 40,000 ft. Gross weight is about 290,000 lb., compared to 190,000 lb. for the 707 prototype.

Of major importance to Boeing is the fact that the extended KC-135 orders will insure continued production at the Renton plant, where the KC-97-300-mph. propeller-driven tanker—is being phased out. Nearly 800 KC-97's have been built.

ACC Will Arbitrate Navaid Battle

Committee steps into fight after ANDB touches off new flareup by favoring Tacan for the Common System.

The bitter fight over civil VOR/DME vs. military Tacan as the Common System shortrange navigation aid last week was dumped in the lap of the Air Coordinating Committee.

ACC promptly scheduled a meeting of its executive council late last week to recommend a plan of action.

Decision by the Air Navigation Development Board to proceed with the development of Tacan, aimed at its adoption as the Common System (AVIATION WEEK Feb. 14, p. 16), brought into the open a heated inter-governmental battle with industry undertones.

Here are the developments:

• **State Department** has requested ACC to clarify U.S. policy on the matter. State is concerned over the fact that they have promoted the use of VOR/DME in foreign countries through the International Civil Aviation Organization as part of U.S. policy.

• **Radio Technical Commission** for Aeronautics, also uncertain about the ramifications of the ANDB decision, asked ACC to determine if it represents overall federal policy.

• **Undersecretary of Commerce** Louis Rothschild, testifying before Senate Commerce Committee in connection with his nomination, said that he planned to look into the controversy. Rothschild said he expected to be named ACC chairman.

• **Both Senate and House** Commerce Committees plan to hold executive sessions on the controversy.

Observers pointed out that the ANDB's pro-Tacan ruling represented the views of only Commerce and the military services.

► **Protests**—Other agencies with an interest in Common System navigation,

such as State Department, Federal Communications Commission and Civil Aeronautics Board, did not participate in the ANDB decision.

Private plane organizations made strong protests, and set about to organize an effort to overturn the ruling.

Henry W. Boggess, chairman of the board of the National Business Aircraft Assn., wrote U. S. airline presidents:

"If ANDB's recommendation is implemented, it seems apparent that all civil users of the airspace will face serious safety problems and economic loss.

"The pressing problem of high-density traffic control is already complicated by transition from low frequency to VHF navigation aids, and will be further complicated by the additional transition to the proposed new Tacan system. It seems untenable that our existing system can be replaced by an unproven and experimental system . . ."

► **'Going to Cost'**—Max Karant, assistant general manager of Aircraft Owners and Pilots Assn., wrote Brig. Gen. M. W. Arnold, who served as chairman of ANDB's Vortac committee:

"The decision . . . appears to rest on whether or not the sheer weight and power of the military will decide this matter, without regard for the facts or cost. It is AOPA's earnest hope that, somewhere in the higher government levels that will have to make the final decision, a fair and impartial evaluation will be made. At the same time we recognize the gravity of this decision. Whichever way it goes, it is going to cost the American people vast sums of money.

"This fact alone, AOPA feels, warrants the closest possible scrutiny of this entire controversy by the highest gov-

ernment authorities. It is AOPA's opinion that this costly controversy never would have come about had not some branches of the armed forces improperly and perhaps illegally committed tremendous sums of money for a system of radio navigation that was—and still is—highly speculative."

Hiller Is Developing VTO, Convertiplane

Hiller Helicopters is developing a vertical-takeoff aircraft and a new convertiplane, plus drawing up a rotary-wing transport study, the company's annual report for 1954 reveals.

Both the VTO and transport project are being developed for the Office of Naval Research.

The convertiplane apparently is an independent project.

Until last year, Hiller's production centered on small copters. But 1954 was a year of "rapid growth and diversification of corporate activities" in which the company started more than 10 major projects or products for the armed forces.

New contracts received during 1954 totaled \$14.2 million and increased the company's backlog \$12.5 million at the year's end, compared with \$3,750,000 in 1953.

In its financial statement, Hiller reported a net operating loss of \$97,709 for last year, dropping from a net profit of \$247,637 in 1953. Sales and other income totaled \$6,380,677, compared with \$10,414,641.

Senate to Probe Missile Program, Airlift Cuts

Investigations of Administration plans to cut back "mobile" Army and Marine Corps units and supporting airlift and the guided missile program will be made by two Senate committees—Armed Services and Appropriations.

There were these developments:

• **Gen. Matthew Ridgway**, Army Chief of Staff, expressed dissatisfaction with the airlift contemplated in the Administration's present program at an executive briefing session of the Armed Services Committee, it was learned.

Sen. John Stennis, a member of the committee, said he had recommended an investigation of the airlift and anticipated that it would be undertaken.

• **Sen. Stuart Symington**, former Secretary of the Air Force and now a member of the Armed Services Committee, called for a "true Manhattan-type" program in the guided missile field. After closed-door briefings by all the defense secretaries and chiefs of staff, Symington repeated his complaint that "there is

not enough concentration on guided missiles" in the Administration's defense program.

• **Appropriations Committee** has a comprehensive report by Defense Department on steps that have been taken to eliminate duplication as a basis for its review of the guided missile program. The committee directed the Secretary of Defense to make an investigation and submit the report last year, after finding "what appears to be a disorganized situation relating to the guided missile program."

Sen. Dennis Chavez, chairman of the Armed Services Appropriations Subcommittee, reported staff personnel are making groundwork investigations preparatory to the opening of hearings on the 1956 fiscal budget in mid-April.

► **Doubts Capability**—Congressional support for increases in ground forces and airlift is strong and appears to be increasing.

Sen. Stennis presented this view:

"The plan is to reduce the 'mobile' forces of the Army and Marine Corps—not desk personnel or cooks. I am concerned and I think a congressional airing and discussion of this would be healthy.

"Since the Administration's decision on reductions was made there have been developments in Western Europe and the Orient affecting our defense program. I am concerned as to whether we could, should we be called upon, fill two commitments at the same time—in Europe and the Far East—if the reductions are made."

► **'Ridgway's Duty'**—Stennis suggested that congressional sentiment against the cuts, reflecting public support for this position, would be conducive to a change of plans by the Administration.

Sen. Leverett Saltonstall, ranking Republican on the Armed Services Committee and an Administration spokesman, observed that "it is Gen. Ridgway's duty to ask for everything he thinks he should have, but it is for the Administration and Congress to weigh his proposals for airlift in the light of the Navy program and overall logistics."

Substantial support for an increased effort in the guided missile field has not yet developed.

Saltonstall said that "all the money that can be intelligently spent for guided missile research and development is being spent."

Stennis considered the progress in guided missiles "very fine." He concurred, however, that there should be a committee review of the program.

Yaw, Pitchup Troubles Delay Douglas B-66

USAF disclosed last week that initial production of the Douglas B-66 light jet bomber will be held back because of

aerodynamic difficulties as reported in AVIATION WEEK (Feb. 7, p. 11).

Air Force said the problems, which involve yaw and pitchup characteristics similar to those encountered in the North American F-100, were uncovered by the manufacturer during the flight test program. Douglas already has found the corrections, USAF said, and engineering changes will be incorporated and flight tested before full production is resumed.

It was made clear that the completion date for present orders has not been changed. Production rate will be increased later in the program to make up for time lost in the early stages, once the new test program is completed this summer.

Both bomber and reconnaissance versions of the B-66 are being built at the Douglas plant in Long Beach, Calif. A later version will be built at the company's plant in Tulsa, Okla.

The plane, powered by two Allison J71-A-9 engines, is an Air Force version of the Navy's A3D.

Formosan Airpower Showdown Imminent

Airpower moved to the front in the Formosan situation last week.

Time for a showdown with the Red Chinese was not fixed on the calendar, but the Communists had moved as close to the Nationalist stronghold as they can come without a fight.

► **Airpower Key**—The fight will be in the air. Yu Ta-wei, Nationalist Defense Minister, was quoted as saying the fate of Quemoy and Matsu as well as Formosa itself "depends entirely on which side holds air control of the Formosa Strait."

There was evidence that U.S. Air Force and Navy officers agreed. In addition to the USAF wing of about 60 F-86 Sabre jet fighters on Formosa, carrier-based fighters of the 7th Fleet were ready for action. There are between 300 and 400 aircraft involved.

In addition, the U.S. is giving another 200 Sabrejets to the Nationalists, but it may take a few months to get them in operation.

► **Outnumbered by Reds**—On the Chinese mainland, Red forces were reported working hard to build landing strips and facilities for jet bases. Nationalist intelligence said the Communists have at least 2,000 planes that can be moved to the front.

Most of the Communist planes are MiG 15s, bolstered by propeller-driven fighters and Tu-2 twin-engine bombers. As in Korea, it was not expected that the MiGs would stand up in air combat against the Sabres, but the Nationalist and U. S. forces will be outnumbered.

Reports that the 7th Fleet cannot

help much because of shallow water and vulnerability to air attack were discounted by Navy spokesmen. They said carrier planes with the fleet would hold their own in battle with the Reds, mainly because U.S. pilots are more skilled than Chinese.

► **Keep Them Guessing**—Pending a move by the Communists, there was no proof that the U.S. would fight for the two small islands of Matsu and Quemoy.

Policy said that U. S. is keeping the Communists guessing; best guess was that the next move in the direction of Formosa, now that the Tachens and Nanki have been abandoned by the Nationalists, would bring the Reds into conflict.

Other items from the front:

• Taipei, Formosan capital, was readied for air raids. Nationalist intelligence says it may be two months before they start.

• Formosan morale was reported low. Visits of Secretary of State John Foster Dulles and Adm. Robert B. Carney, Chief of Naval Operations, had a two-fold purpose: to bolster discouraged Nationalists in addition to diplomatic and military missions.

• Downfall of Quemoy and Matsu were seen as goals of Communist campaign in order to open up mainland ports to tankers. Shipment of fuel by sea is essential to success of Red air warfare over the Formosan Strait. It can be harassed or stopped by guns on the two islands.

• In a situation similar to that in Korea, where U.S. airpower was curtailed in activity north of the 38th Parallel, nothing could be done about the Communist buildup across the Formosan Strait. Red work on more and better airstrips proceeded with no harassment from USAF or Nationalist planes, because U.S. policy requires no raids on the mainland until the Communists make a threat.

• Reports from Korea said the Reds are moving troops from there to China, at the same time bringing in fresh soldiers and bolstering their air forces. The State Department was concerned about violations of the Korean truce.

Correction

There were two errors in a statistical tabulation of aviation stock splits in the Feb. 14 issue of AVIATION WEEK (p. 101). Bell Aircraft Corp. should have read: In addition to the two-for-one stock split effected in February 1952, there was a subsequent two-for-one stock split in November 1954. Northrop Aircraft, Inc., should have read: Stock dividends of 20c each were paid in October 1952 and April 1954. In addition, a two-for-one stock split was effected in November 1954. AVIATION WEEK regrets the errors.



HAWKER HUNTER: 'In certain directions,' its performance could be improved.



SUPERMARINE SWIFT, Mark IV version shown here, has proved a disappointment.

U. K. Fighter Program Fouled Up, so . . .

Britain Builds 'Atomic Deterrent'

Great Britain has decided to concentrate a major part of its defense effort in the development of nuclear weapons (including the H-bomb), in three V-bombers to deliver them, and in air-to-air and surface-to-air guided missiles.

These objectives were outlined in two White Papers presented by the government in answer to criticism of Britain's lag in aircraft development.

The White Papers, however, did not spell doom for naval or land forces but said nuclear developments profoundly affect these services' weapons, organizations, tactics and training.

► **Mistakes, Failures**—The Ministry of Supply statement, outlining the history of aeronautical developments in the United Kingdom, admitted it had not planned to re-equip the Royal Air Force until 1957 and that there had been mistakes and failures. But the paper denied

that Britain's air arm is made up of obsolete aircraft dating from the last war, as charged by critics. It said Britain's night fighter force gives it "a better defense than anyone else in the world."

The paper practically wrote off the Supermarine Swift as an operational fighter. But it said troubles with the Hawker Hunter have been largely overcome, although "there are still certain directions in which the Hunter's performance could be improved."

Development and production of the V-bombers (Vickers Valiant, Avro Vulcan and Handley Page Victor) is progressing, with first squadrons scheduled to be introduced this year, the Ministry of Supply reported.

The paper officially revealed for the first time that the Valiant, now being delivered to RAF, was developed as an

interim bomber to cover the period until the Vulcan and Victor were available.

The Valiant was developed to meet as nearly as possible the full medium bomber requirement, but of less advanced design than the Victor and Vulcan, "so that the development problems should be fewer."

► **H-Bomb Capability**—The defense statement said Great Britain "has the capability to produce" H-bombs and that the government has decided to proceed with their development and production as a deterrent to Communist aggression.

"The main contribution to the deterrent is made by the Royal Air Force whose primary task now is to build up the V-bomber force, with its nuclear potential, to the highest possible state of efficiency and preparedness.

"The first squadrons of V-bombers (Valiants) will be introduced during this year."

► **Hunter, Swift**—Aerodynamic performance of the Swift was described as "disappointing." With production of the Swift building up rapidly, despite its troubles, the paper said tests are being made on the Mark 4 version to determine whether sufficient improvement has been made to warrant putting them into service with RAF.

"It will be possible to replace the Mark 4 Swifts with Hunters if necessary."

The government said both the Swift and Hunter were ordered into production from the drawing board as the result of the Korean war.

"In light of the new threat of a third world war," the paper said, "plans for re-equipping the services about the year 1957 had to be reviewed. . . .

"Owing to the emergency, production orders for the Hunter and the Swift were placed much earlier in the development phase than would normally be the case. . . ."

► **Mass Development**—"The decisions of 1950-51 to order many hundreds of these aircraft meant that while development was still in a very early stage,

Expenditures

(McGraw-Hill World News)

LONDON—Minister of Supply Selwyn Lloyd last week told the House of Commons, Britain spent \$1,050 million in three years in airframes, engines and spares. The annual fiscal expenditures: 1951-52, \$235 million; 1952-53, \$362 million, and 1953-54, \$450 million.

Total research, development and production costs of the Supermarine Swift to date: \$56 million.

tooling up and other preparations were rapidly pushed ahead for production of sweptwing aircraft with a large number of new features, such as axial flow engines, power controls, heavier armament and other more complicated equipment. All these had to be introduced and developed together. . . .

"A single intractable aerodynamic problem from time to time monopolized the flying time of all the available aircraft or grounded them so that all other development flying, including the flight testing of guns, radar and other equipment, had to be put back. For instance, for a long time difficulty was experienced in making the Hunter air-brake slow the aircraft effectively without upsetting the pilot's aim.

"Meanwhile, production built rapidly, and although this enabled early production to be diverted to assist in development flying, it also meant that increasing numbers of aircraft were coming off the production line while some major features of the design were still unsatisfactory."

When it was decided to switch from the Rolls-Royce Nene to the more powerful R-R Avon in the Swift, the resulting changes from the original aircraft design so complicated the process of development that it became a basic cause of many of the difficulties which later were encountered, the paper added.

► **Advanced Projects**—Britain now has adopted a slow production program similar to the USAF Cook-Craigie plan to cut the development cycle (AVIATION WEEK Sept. 20, 1954, p. 13).

Substantial deliveries of Gloster Javelin all-weather delta fighters is forecast for the next financial year and the development of the English Electric P. 1 day/night interceptor will be pressed.

"We are looking ahead to still more advanced projects."

► **Airpower Troubles**—Citing other troubles in Britain's airpower buildup, the paper said the Westland Wyvern, world's first service-type turboprop-powered plane, "has not proved successful for its designed purposes as a carrier-borne aircraft." Major problem: The engine and propeller control system.

The Fairey Gannet sub hunter developed trouble with its engine under certain conditions, but this has been overcome and the planes will be delivered to the navy this year in substantial numbers.

Much of Britain's trouble resulted from its hesitancy to investigate supersonic flight (AVIATION WEEK Jan. 31, p. 28).

"The decision was also taken in 1946 that, in the light of the limited knowledge then available, the risks of attempting supersonic flight in manned aircraft were unacceptably great and that our research into the problems in-



DETERRENT to aggression: V-bombers like this production Vickers Valiant.

British Press Critical

While the Ministry of Defense and Ministry of Supply White Papers were frank in admitting errors of judgment in development of aircraft, British newspapers were highly critical.

The Manchester Guardian called the statement on aircraft production "less than candid" and the Daily Telegraph said the assertion that RAF was not flying obsolete aircraft was "astonishing" and added that "no figures of available aircraft are given to justify" the statement that Britain has the best aerial defense in the world against night attack.

The Financial Times, after repeating

some of the White Paper's claims, demanded to know: "What about the next generation of aircraft?" It went on: "So far, two things in particular seem to have been wrong. Too much has been going on at once, and too many people have been concerned with it."

The London Times was somewhat more charitable: "The forecast of future policy is naturally the more important part of (the aircraft White Paper) . . . because the past history which it outlines with considerable frankness is already fairly well known. Some instructive additions are given to the history. . . ."

involved should be conducted in the first place by means of air-launched models," the paper explained.

"It is easy to be wise after the event, but it is clear now that this decision seriously delayed the progress of aeronautical research in the U. K."

► **Flexibility, Readiness**—While RAF is given the task of acting as a deterrent to aggression with its proposed H-bomb V-bomber combination, the defense White Paper did not write of Britain's army and navy.

► **Army.** "The main effect of nuclear weapons on the land battle is to greatly increase the need for flexibility so as to be able to move from dispersion to concentration as quickly, and with as little confusion, as possible. Greater elasticity of outlook by commands at all levels will be required; the organization of fighting units and their equipment also need modification.

"Experimental organizations and a revised scale of weapons and equipment, including transport, are being worked out. These will be tried out in maneuvers this year. . . ."

► **Navy.** ". . . We need ships and naval aircraft equipped with the latest weapons, well trained and ready to fight from the outset of war. Special attention is therefore being given to immediate readiness. . . ."

► **Guided Missiles**—Main effort in development of guided weapons is devoted to providing defense against bombers flying at high speeds and at great altitudes. Against this threat, anti-

aircraft guns will be of little value.

"The future air defense system of the United Kingdom will have as its main components the manned fighter and the ground-to-air guided weapon. . . ."

"The effectiveness of our manned fighters will be increased by fitting air-to-air guided weapons capable of engaging enemy aircraft at longer ranges and with a much greater certainty of success than is possible with aircraft armed only with cannon.

"Development of these air-to-air guided weapons, incorporating a variety of techniques, has reached an advanced stage.

"The surface-to-air guided weapons which are under development for use from the land and from ships are of greater complexity than air-to-air missiles, and the time required to develop an effective operational weapon system is necessarily longer."

The paper said Britain is working "in close collaboration with the United States" in the guided weapon field.

"It may be asked why we are not as advanced as our American allies (in the guided missile field). The simple answer is that we did not start until three years after them. . . ."

Minister of Supply Selwyn Lloyd told a group of newsmen that the air-to-air missile being ordered now will not be very good from a defense point of view, that it is to be used primarily as an interim weapon more valuable in training than in actual combat.



PADDLE BLADES absorb 10,000 hp. of Wright T49 turboprops in Boeing XB-47D flying test bed. Prop diameter is about 15 ft.

Turboprop-Jet XB-47D Prepares for First Flight



GROUND CLEARANCE was installation problem; nacelles replaced twin-jet pods, were mounted flush with wing undersurface.



TAXI TESTS at Boeing Field, Seattle, Wash., precede first flight. Test plane is modification of standard B-47B.



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Whittaker valves are made of aluminum alloys, iron alloys, and stainless steels... depending on temperature requirements. Typical valve leakage is approximately .25 lb. per minute of free air at 100 psi!

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ADF-12 The most popular automatic direction finder of all time! Total weight less than 18 pounds. Modulation and power provisions for VHF transmitter an added feature.



ADF-14 The lightest ADF ever to be CAA Type Certificated. Rugged, yet compact enough for dual installation in the smart new light twins.



ADFR-14 Features Remote Control Head for console or panel mounting. CAA Certificated for airline use. Meets military requirements.

ADF-15 Advanced design utilizing a new mechanical filter that affords the finest selectivity characteristics ever achieved in ADF's.

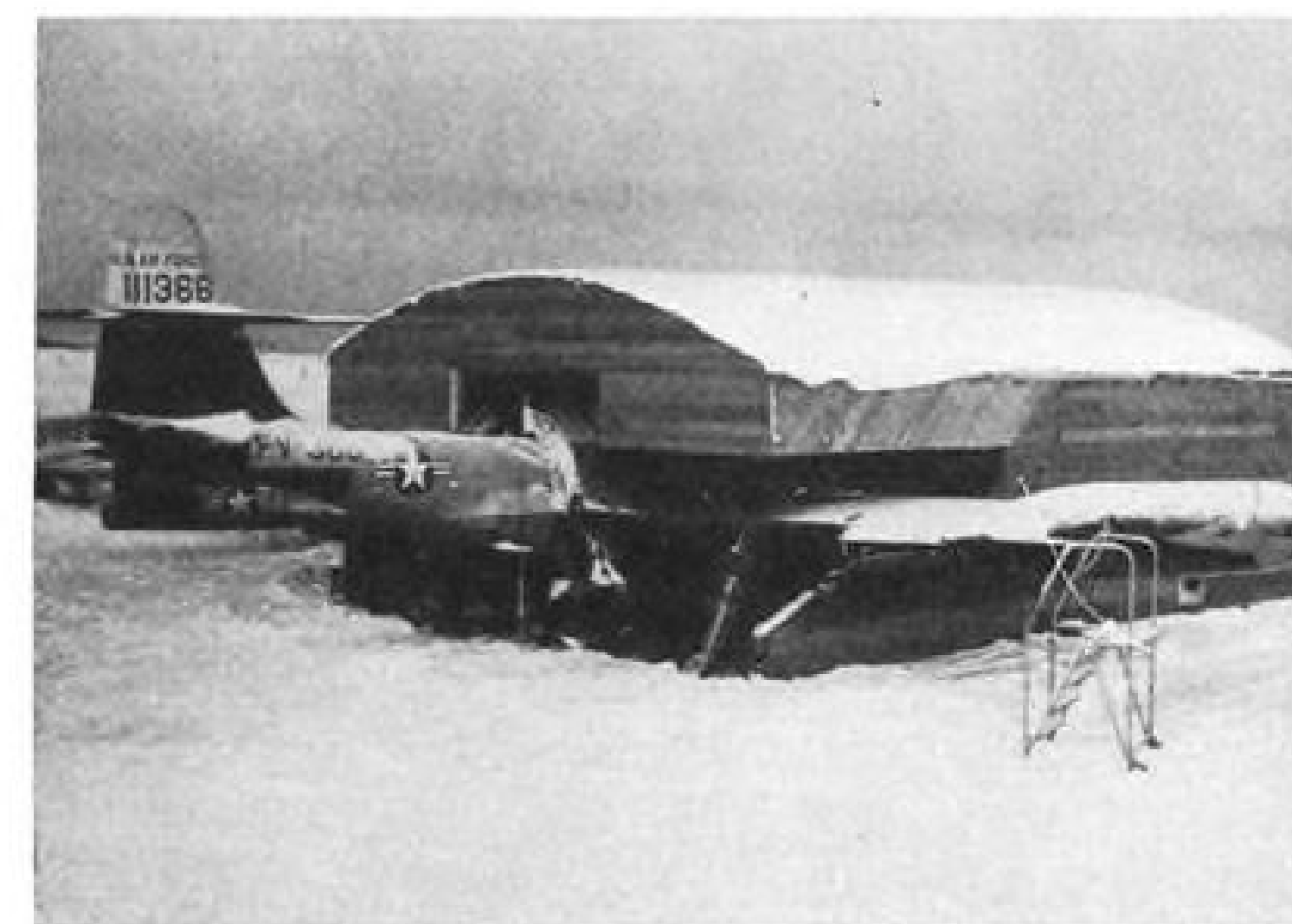


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TARPAULINS ARE REMOVED from Northrop F-89D Scorpion fighter in Alaska by maintenance men prior to cleaning off snow and ice.



PORTABLE DOCK protects ground crews from sub-zero climate.



HEATER in foreground warms crew as they work on turbojet.

Air Force Know-How Licks Cold in Alaska

By Claude Witze

Elmendorf AFB, Alaska—Aircraft maintenance crews of the 10th and 11th Air Divisions at this installation and Ladd AFB, 260 mi. nearer the Arctic Circle, have found that cold weather makes the job tougher, but know-how will lick any problem.

It's not true that polar bears are a menace, crouching under the tail pipes of the Northrop F-89D Scorpion to keep warm. It is true that water in the fuel is a major nuisance and a dangerous one, that special equipment has to be invented and built and that manpower is not efficient in temperatures that slide down to -40F. and -50F.

► **Frequent Scrambles**—The work rule is "Plan on being on the job three times as long, needing twice the equipment and once started, don't quit."

Scorpions based at Elmendorf and



PRE-FLIGHT and post-flight gear with hydraulic fluid, oxygen and nitrogen by F-89D.

AVIATION WEEK, March 7, 1955

21



DETACHABLE WORK STAND atop Coleman tractor is handy for cleaning off stabilizers.



TOW BAR is used to move F-89D tail-first. Nose-first towing is difficult in snow.

Ladd are America's first line of defense at this corner of the continent. Scrambles are frequent and the twin-jet interceptors take off fully loaded with 104 rockets, ready to knock down an enemy bomber if one appears. The network of ground radar that directs them to the target is growing fast.

Northrop Aircraft, Inc., builder of the F-89 all-weather interceptor, keeps 23 specialists and technical representatives in the Alaska theater to help service six squadrons, five of which fly the F-89D, one the F-89C. In addition, the company has a proficiency training team of four men on the job to help air crews learn their job in frigid temperatures.

► **Short Tours**—Upon special request of Maj. Gen. George R. Acheson, commander of the Alaska Air Command, Northrop has provided a special six-man team of maintenance experts to give their special attention to trouble spots

as they appear.

It is no secret that this step was taken because of USAF's personnel problem. With two-year tours of duty it has been impossible fully to overcome the low experience level of the ground crews. A man must go through at least one winter in Alaska to be acclimated to his job and the working conditions.

In addition to Northrop, Hughes Research and Development Laboratories have two technical representatives with each squadron to keep the complicated fire control and other electronic components in working order. Allison Division of General Motors, manufacturers of the Scorpion's J35-A-35 engines, has two representatives in Alaska, one for each air division.

► **Fuel Problem**—Personnel problem is complicated by all of the things an airman must learn about living and working in the arctic. Frostbite, snowblind-

ness and carbon monoxide are constant threats. Careless placing of a hand on frozen metal can peel the skin—and some flesh—from the fingers.

This winter has been unseasonably mild with wide ranges of temperature. Major complication from this is water in the fuel.

Contamination of jet fuel results from condensation following change in temperature. In normally consistent and cold weather, USAF crews are advised to cold-soak fuel before it is pumped into the aircraft. Cold soaking is done by storing the fuel in an outside tank for 72 hr. after removing all water. Cold fuel pumped into a cold airplane will minimize condensation.

► **Cold-Soaking**—Water-free fuel is essential in cold weather jet operations because it can cause the low pressure filter or valves to ice up and result in flameout. There have been instances where water froze in a fuel tank, completely shutting off the engine.

Northrop has conducted a test with four planes, which were completely dried out and cold-soaked along with the fuel. The trouble was overcome. The company also has perfected an improved shutoff valve to help fight icing conditions that is awaiting approval of Wright Air Development Center.

Here at Elmendorf AFB, men of the 66th Fighter-Interceptor Squadron have developed gadgets of their own to facilitate the cold-weather maintenance job.

► **Special Equipment**—A special tow bar setup, for example, was needed because it is nearly impossible to pull an F-89 out of a snowbank by pulling on the nosewheel. A V-shaped towing device that can be hooked to the main wheels was built to permit towing from the rear of the plane.

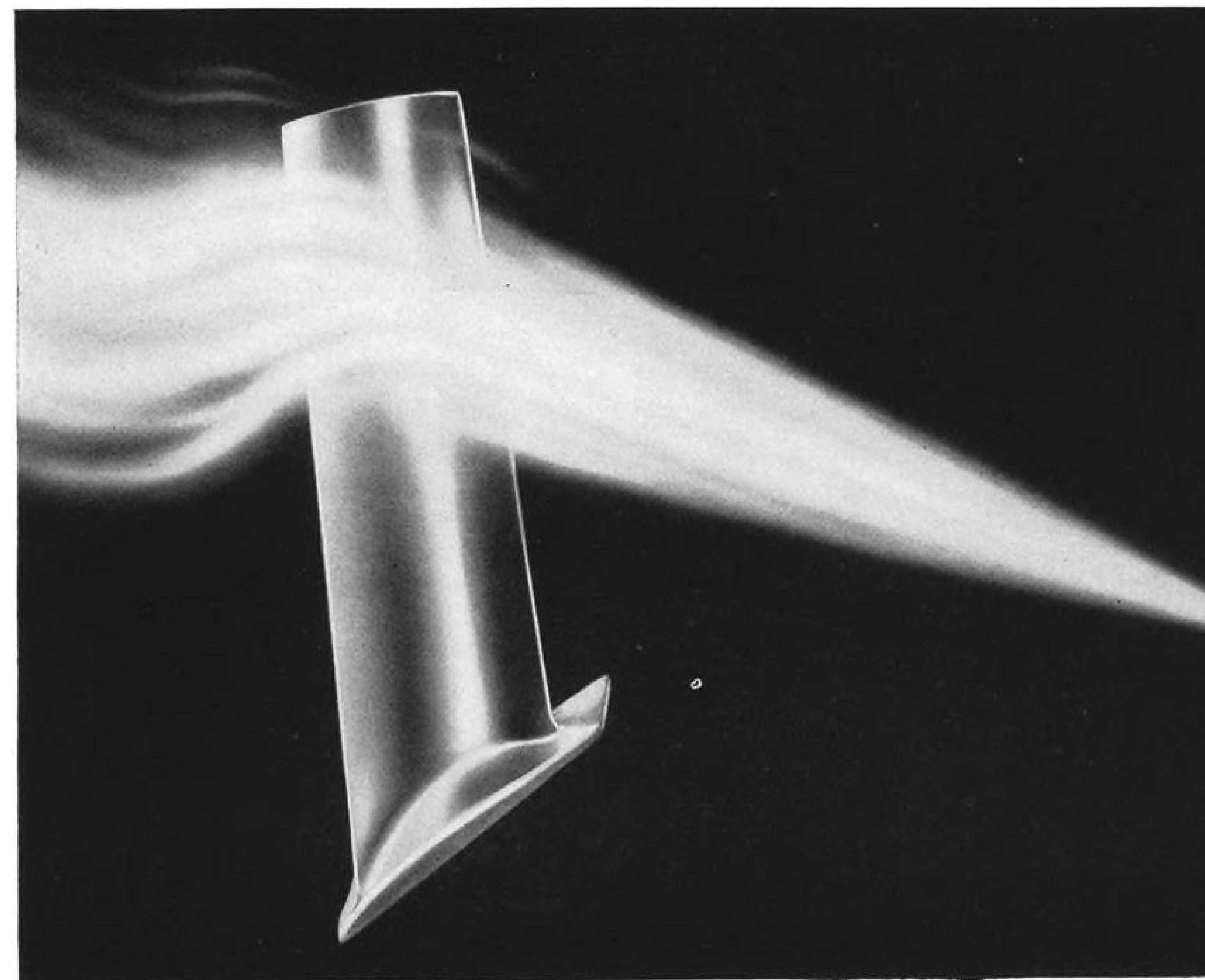
Another handy addition is a platform built over the cab of a truck. It is used to get a crewman in position to sweep snow off elevator surfaces.

Biggest contribution of the 66th to the arctic equipment picture is a portable maintenance dock that provides outdoor shelter for crews working on the Scorpion. The structure is 40 ft. long and has a canvas wall at the rear, through which the tail can protrude. The wings fit in slots at the side.

► **Efficiency Aid**—Engine, radar and armament maintenance can be performed inside the dock, sheltered from the wind. Most important feature, however, is the open front door. This permits harmonizing and boresighting of the aircraft's radar and fire control system while the maintenance crew is protected.

About a dozen of the docks have been built here and at Ladd AFB. It is estimated that they improve crew efficiency about 75%.

Other cold weather complications for



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YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

maintenance crews in arctic areas:

- Failure of rubber components that get brittle in low temperatures.
- Leaks caused at the union of different metals which do not have the same coefficient of expansion.
- Tire valve cores are difficult to seat properly; heat must be applied to make them work.
- Slush thrown up into wheel wells and around landing gears calls for constant cleaning. It must not be allowed to freeze on the plane.
- Hydraulic hose lines stiffen when the thermometer gets down to 10 below. End fittings work loose and must be repositioned.
- Constant watch must be kept for cracked windshields, resulting from sharp temperature changes when the defrosting system has been turned on.
- It is estimated that 40% of a man's working time is lost by his efforts to keep warm.

The Northrop F-89D has been on duty in Alaska since last May and is going through its first winter. Both USAF and the company's technical representatives expect new and more difficult problems before the snow melts.

NAL Asks Fast Action For Route to Texas

Bid for immediate action on a route requested between Florida and Texas has been made by National Airlines in a letter to Civil Aeronautics Board chairman Chan Gurney.

NAL president G. T. Baker asked for an exemption to allow the carrier to start service immediately between Miami, Tampa, New Orleans and Houston. Baker said the move is necessary because Eastern Air Lines has refused to cooperate in a proposed interchange.

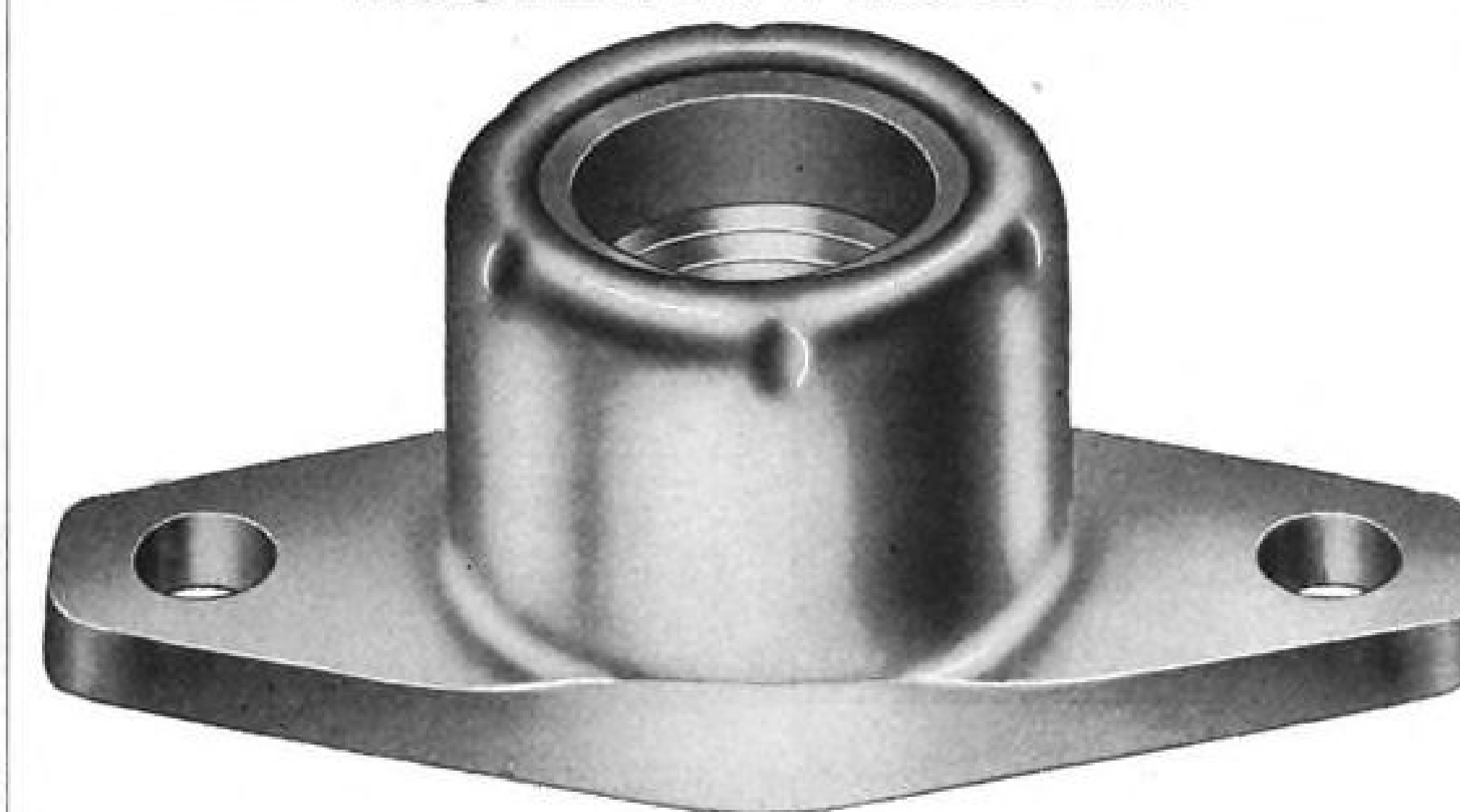
► **NAL Arguments**—National's route now extends to New Orleans, and it has an interchange agreement with Delta-C&S and American Airlines for a Miami-Los Angeles service.

Baker cites a long series of incidents dating back to 1949 to prove his contention that Eastern is being unreasonable in negotiating the interchange.

"I respectfully submit," said Baker, "that the time has come when the Board must show Eastern that the Board, rather than Eastern, has the function of determining what services are required in the public interest."

"The most reasonable and practical method of resolving the impasse created by Eastern is to authorize National to operate not to exceed two daily round trips between Miami and Houston and New Orleans by means of exemption for a temporary period pending hearing and decision on National's application for the extension of Route 39 from New Orleans to Houston and San Antonio."

FASTENER PROBLEM



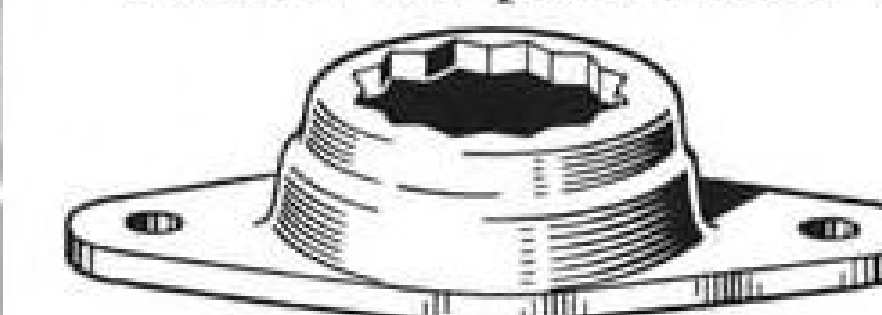
Cost-reducing, weight-saving single-unit assemblies for high tensile, fixed nut applications

High tensile anchor nuts have normally been two-piece assemblies: the nuts themselves, plus separate shells that fit around them. ESNA engineers realized that a one-piece fastener designed to do the same job would save weight... space... inventory complication... and quite probably cut the cost at the same time.

Their answer—the ESNA NA101 high tensile nut—offers equivalent high strength performance and also provides remarkable cost and weight savings over the old two-piece assemblies. Actual cost savings range from approximately 89% for the 1/4-inch, to about 65% for 1/2-inch nuts. Weight savings are substantial: 1/4-inch NA101 nuts weigh 19% less than 1/4-inch two-piece nuts, while the 1/2-inch NA101 actually weighs 23% less than its older counterpart!

The new one-piece NA101 high tensile anchor nut meets specification

NAS353 for self-locking nuts to be used on 160,000 to 180,000 psi high tensile bolts and is available in 1/4-, 3/8-, 1/2-, 3/4- and 1-inch sizes. Like all ESNA "fixed" type or anchor nuts it incorporates the red nylon locking collar guaranteeing the finest vibration-proof performance, extra reusability and bolt interchangeability.



The old way

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Safety Reports

- CAA speeds reports on reported air violations.
- But ALPA says system harasses airline pilots.

Time of processing reports of air safety violations by Civil Aeronautics Administration has been cut one-third under a new procedure now being tested, CAA administrator Fred Lee reported, but the system has drawn bitter criticism from Air Line Pilots Assn.

All enforcement action on safety breaches is now centralized in the Enforcement Division of the General Counsel's Office. Formerly field agents of the Office of Aviation Safety not only reported violations but also recommended punitive action.

► **'Harassment'**—ALPA president Clarence Sayen wrote Lee that "if the purpose is to promote a higher standard of safety, then the Legal Enforcement Division is shooting wide of the mark. Their harassment action is constituting a hazard . . ."

Gerald F. White, chief of the Enforcement Division, told AVIATION WEEK that the change is in procedure not in policy.

The new system, White said, works this way:

- **Field agent's report** is filed directly to Washington with a copy to the Regional Safety Office.
- **Regional Safety Office** is required to submit comments on the agent's report to Washington within 10 days.
- **Enforcement office** simultaneously requests comment on the agent's report from the Washington office of aviation safety.
- **Initial action** is determined in the case within a week after all comments are correlated by the enforcement group.

In addition to more rapid processing through this procedure, White said, there has also been the benefit of an improvement in the safety agent's report and evaluation of the violation. The agent is now relieved of the tough job of assessing a safety violation in terms of a suspension or fine as a civil penalty.

► **Split Jurisdiction**—"He can't be a traffic cop and a judge at the same time," White said. The enforcement chief admitted that some agents were resentful at first in the belief there was "a loss of authority," but he said they were by no means in the majority.

The Enforcement Division's follow-through on reports of safety violations under the new procedure was designed to wed authority with responsibility,

CAA said. White's office now has the last word; previously there was a split in jurisdiction with the Office of Aviation Safety. Same co-operation and co-ordination between technical and legal staffs is still maintained, White said.

Sayen claimed, however, that the new procedure has:

- Succeeded in shutting off incident reporting.
- Created basic distrust of CAA and its motives.
- Promoted a resistance to the acceptance of new devices and procedures which provide an additional opportunity for the enforcement division to harass pilots.
- Jeopardized the investment in existing programs such as radar which depend for their utility upon the confidence and acceptance of the user.

Lee said that he can only re-assure ALPA and others protesting the new system that this is a strictly internal management change and not a policy change.

The CAA administrator emphasized the program has his personal attention and it is essential that "we have a fair trial period."

The Administrator added: "The changed procedure hasn't resulted in any punitive actions nor will there be any. I will reassure those who have doubts that no radical changes will result from this new procedure."

Sayen's letter to Lee insisted that the procedure means prosecution of alleged "technical violations" which loom large in the mind of the non-pilot, non-technical attorneys in the enforcement office.

Ryan Profits in 1954 Set All-Time High

Ryan Aeronautical Co., San Diego, Calif., last week reported its 1954 profits were highest in the company's history despite the fact that sales for the year fell below peak figures set in 1945 and 1953.

Gross revenue for last year was \$45,155,287, down 10% from the 1953 total of \$50,167,693. Profits, however, went up 33%. Each share of stock earned \$5.15 compared with \$3.80 in 1953.

The total net profit was \$1,961,667, up from \$1,475,446.

► **Prime Contract Gain**—T. Claude Ryan, president, said that the company still gets most of its sales dollars from subcontracting work it does for other aircraft manufacturers. Items turned out under this program include parts for jet, piston and rocket engines and components for Boeing and North American aircraft.

At the same time, the report stated, Ryan is getting a larger number of



Boeing offers a real creative challenge to engineers

This Boeing engineer is determining antenna properties that will influence the design of supersonic airplanes which still are in their preliminary study stage. This illustrates the variety and challenge Boeing offers in many fields: civil, electrical, mechanical and aeronautical engineering, mathematics and applied physics.

Emphasis at Boeing is on engineering excellence. Boeing engineers develop airplanes and guided missiles for jobs never done before, at altitudes and speeds never reached before. They work to closest tolerances of weight and space, using new materials like titanium and magnesium alloys, acrylics and plastics. If this challenge interests you, there is a place for you on a Boeing design, research or production team.

Recent Boeing developments like the B-47 and B-52 jet bombers, the F-99 guided missile, and America's first jet tanker-transport are evidences of solid growth and engineering skill. New projects are already under way in widely diversified engineering fields: rocket, ram jet and nuclear propulsion, supersonic flight, guided missiles, research in new materials, and much more.

Boeing now employs nearly twice as many engineers as at the peak of World War II. And more engineers are needed. As a Boeing engineer, you will work with the most advanced equipment, like electronic computers, the world's most versatile privately owned wind tunnel, superb laboratories, and the huge new Flight Test Center.

You can be sure of individual recognition at Boeing as a member of a tightly knit "team." Promotions come from within the organization, after regular merit reviews. You will be encouraged to take graduate studies while working, and will be reimbursed for all tuition expenses.

- **JOHN C. SANDERS, Staff Engineer—Personnel**
- **Boeing Airplane Co., Dept. 16-C, Seattle 14, Wash.**
- Please send further information for my analysis.
- I am interested in the advantages of a career with Boeing.

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prime contracts with the military. Advanced planes "of unconventional concept" as well as the Ryan VTO project are mentioned.

Company's permanent interest in avionics is made clear by a statement that Ryan "is striving to maintain a key position" in the industry. Work is being done on guidance systems for planes and missiles, airborne navigation and, for the Navy, a helicopter hovering device. Ryan has been in the avionic field for eight years, since it developed a guidance system for the Firebird research missile.

► **\$40-Million Backlog**—In addition to rocket motors for the Firestone Corporation missile, Ryan is building ramjets for installation on helicopter blade tips and "major components of a large ramjet engine reported to be the powerplant for an advanced-type pilotless aircraft or missile.

Production of engine components, Ryan said, is of growing importance to the company. Last year the dollar value of parts for powerplants for the first time exceeded the value of airframe assemblies produced.

Ryan backlog stands at \$40 million, down \$7.5 million from a year ago. The company president blamed some of this on heavy deliveries, plus the government policy of providing minimum lead time in new contracts.

BuAer Acts to Plug M-Day Manpower Gap

If World War III broke out today, emergency aircraft production would create a manpower mobilization jigsaw puzzle for Navy's Bureau of Aeronautics. Missing pieces would range from engineers in BuAer's Research Division to field representatives in the aircraft industry.

To solve this puzzle, the Navy is forming Bureau of Aeronautics reserve training units. These groups would supply technical personnel to fit into gaps created if BuAer's manpower needs were tripled by war.

► **Keeping Up to Date**—BuAer is trying to pick men with backgrounds that will fit immediately into the shape and size of the jobs. Generally, BARTU members have wartime experience in BuAer or civilian skills in such fields as aeronautical engineering, guided missiles, aircraft production and maintenance. In addition, there are administrators, personnel experts, management engineers and attorneys.

In BARTUs, BuAer is able to maintain close contact with its reserve technical force, train and keep it up to date on changes taking place in each specific job.

With this program, the bureau believes break-in or on-the-job-training

time will be reduced to a minimum. Almost immediately after mobilization, the reserves will be able to take over billets in aircraft plants, in Bureau of Aeronautics General Representative offices and on drawing boards in BuAer headquarters.

► **Where They Are**—BARTU groups already have been formed in the bureau's eastern district at New York and Philadelphia, in the West at Los Angeles, Point Mugu and Oakland, Calif., and in the central district at Cincinnati.

Others are being considered at St. Louis, Chicago, Detroit, Cleveland and Buffalo. With these five units formed, all requirements in the central district will be filled.

More are needed in both the eastern and western districts.

Cal-Central Employee Delays Sale of Assets

Los Angeles—U. S. Judge Peirson M. Hall halted sale of the assets of bankrupt California Central Airlines and Airline Transport Carrier, Inc., for \$800,000 to two other carriers, pending a hearing early this week.

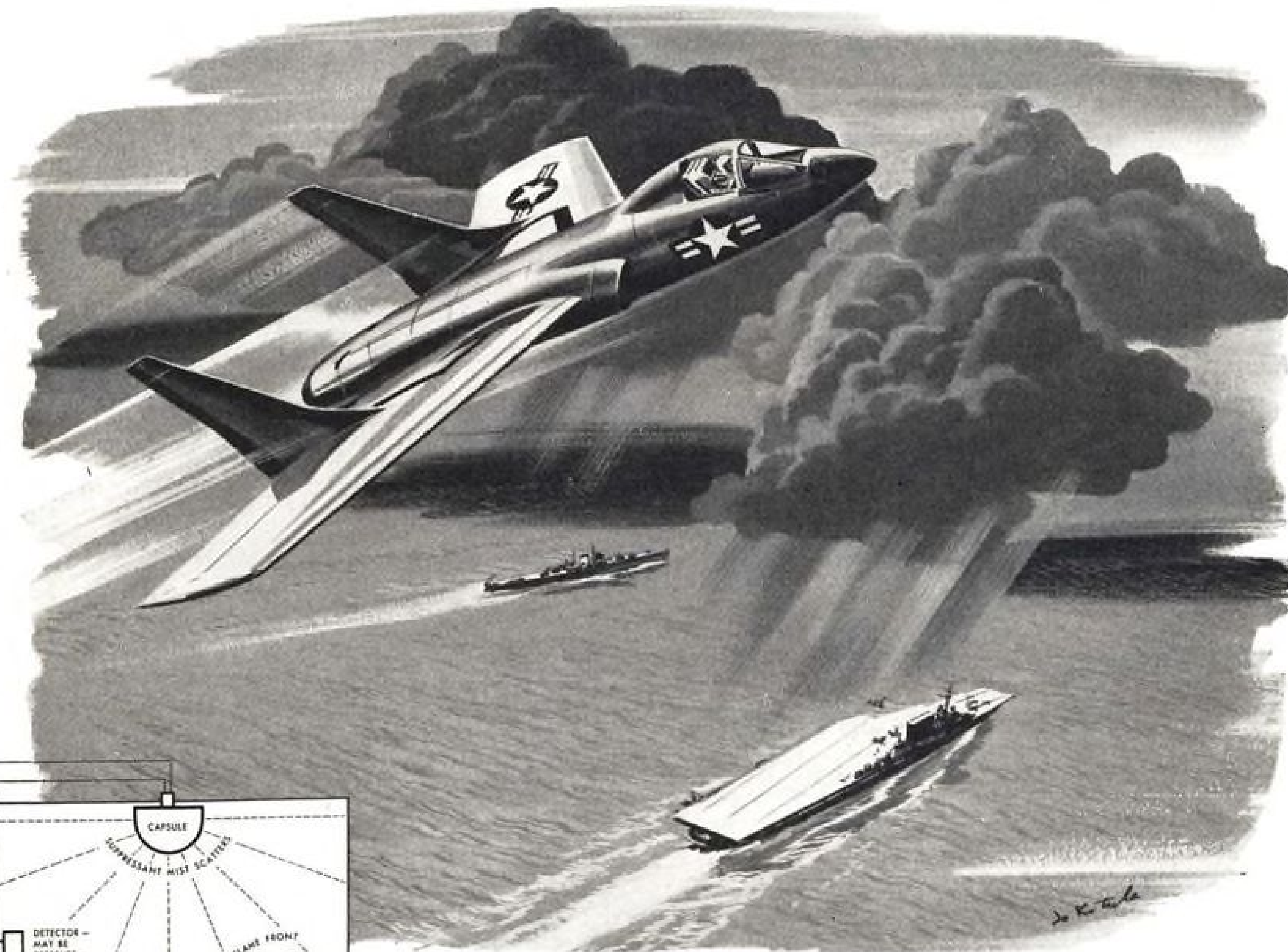
An employee of the bankrupt firms, Harry Conover, petitioned Judge Hall to stop execution of the purchase of four Martin 2-0-2s and two DC-3s by



Sign of ARDC

A missile rolling back the darkness of the unknown, symbolizing the mission of USAF's Air Research & Development Command, is the prominent feature of ARDC's new official emblem. Color scheme is a red-and-white missile piercing the dark blue background, with light blue showing through the tear. On the dark blue are five white stars. A motto on the emblem is "Ad Astra Per Astra," or "To the Stars Through Striving." Idea for the design was submitted by Col. A. A. Armyhm, special assistant to Lt. Gen. Thomas S. Power, ARDC commander.

A "COVER" FOR THE CUTLASS...



First Combat Plane Protected By Simmonds Explosion and Fire Suppression Systems

Marking a major advance in the protection of military aircraft is Chance Vought's hard hitting, fast climbing F7U-3 Cutlass, now rolling off the production line equipped with Simmonds Explosion and Fire Suppression Systems.

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Just as the Cutlass provides an air cover for the fleet, so Simmonds Explosion and Fire Suppression Systems provide a cover of protection against one of the greatest hazards of aviation — explosions and fires

caused by ignition of fuel/air mixtures.

Lightweight, and fully automatic, Simmonds Systems are designed to sense incipient explosions and fires within a fraction of a millisecond, and to snuff out the danger while harmless.

Systems operate with either visual type or pressure sensitive detectors, and a variety of dispersal units or capsules (see diagram above). Suppressants used depend on installation requirements.

Simmonds engineers have an unequalled background in explosion and fire suppression techniques.

Write for new booklet on Simmonds Explosion and Fire Suppression Systems.

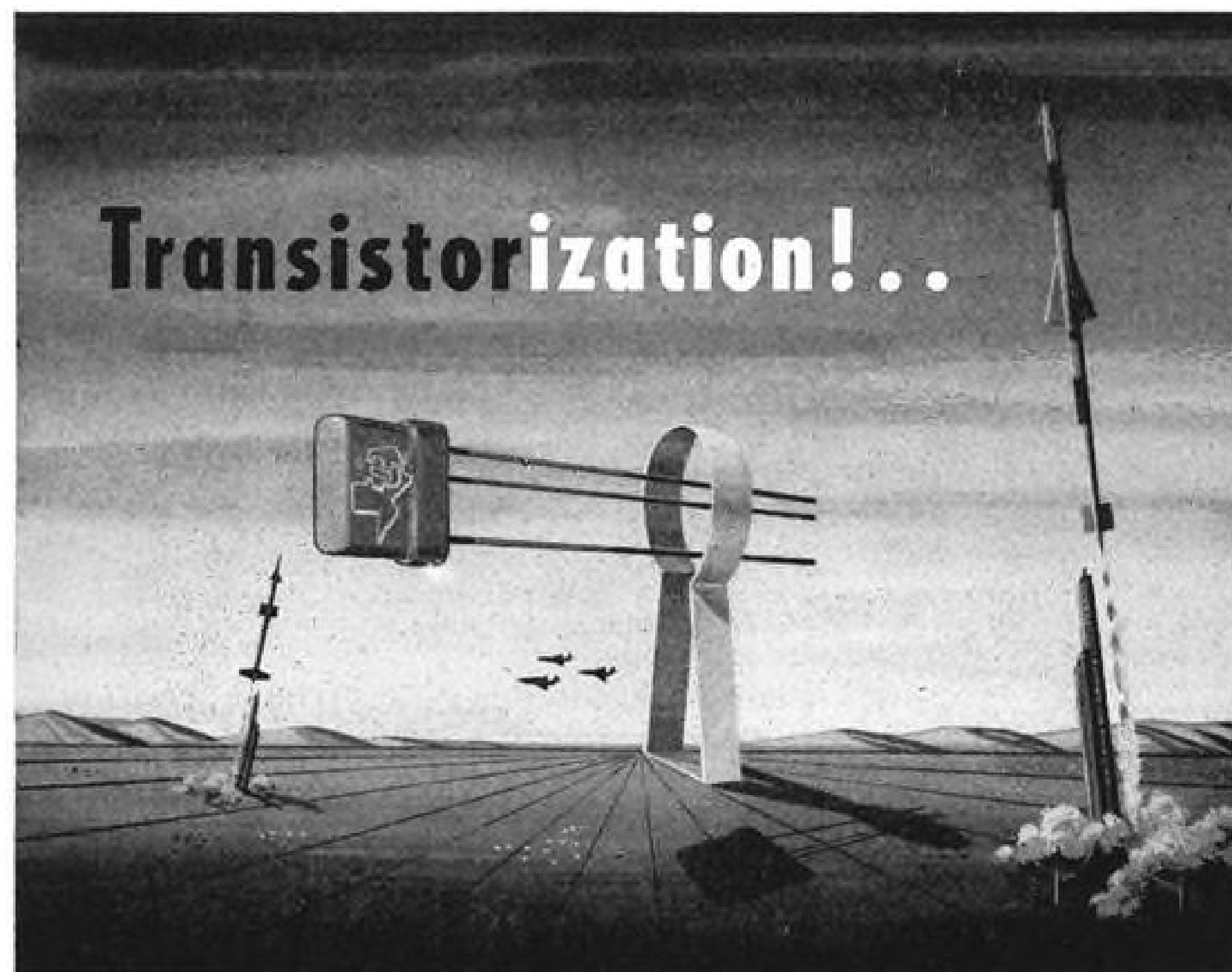
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TEXAS INSTRUMENTS
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Southwest Airways and Allegheny Airlines (AVIATION WEEK Feb. 21, p. 7).

The petition alleged, among other things, that the sale was illegal because the Civil Aeronautics Act of 1938 forbids the purchase of one airline by another without prior approval of Civil Aeronautics Board. It further contended that application has not been made to CAB for permission to acquire the assets of the bankrupt airlines.

Judge Hall began hearings on the petition for Feb. 28.

A bankruptcy referee ordered sale of the airlines' assets to Southwest and Allegheny at an auction Feb. 14.

Le Vier Says Planes May Need Heat Gages

Los Angeles—As we get into higher speeds, we soon may be flying by temperature gage. This was one of the probable conditions of supersonic flight outlined generally by A. W. Le Vier, Lockheed Aircraft Corp.'s chief engineering test pilot, before a packed meeting of the Los Angeles section of the Institute of the Aeronautical Sciences.

Many at the meeting believed that in many instances Le Vier was discussing the F-104, Lockheed's new high-flying supersonic fighter, although no specific aircraft was mentioned in his treatment of the subject: "My Reaction to Current Design Trends."

About 350 engineering representatives of this area's aviation activities were on hand, plus top personalities in flight testing. These included Capt. Virgil Gibbons, F-104 project officer at Edwards AFB; Scott Crossfield, National Advisory Committee for Aeronautics; North American Aviation's Joel Robert Baker and John Chase Bryan; Douglas Aircraft Co.'s Robert P. Brush; Northrop Aircraft's Lewis A. Nelson, and Lockheed's Herman (Fish) Salmon, Rudolph L. Thoren, and Avery Black.

► **Supersonic Fighters**—Other highlights Le Vier offered on supersonic fighters:

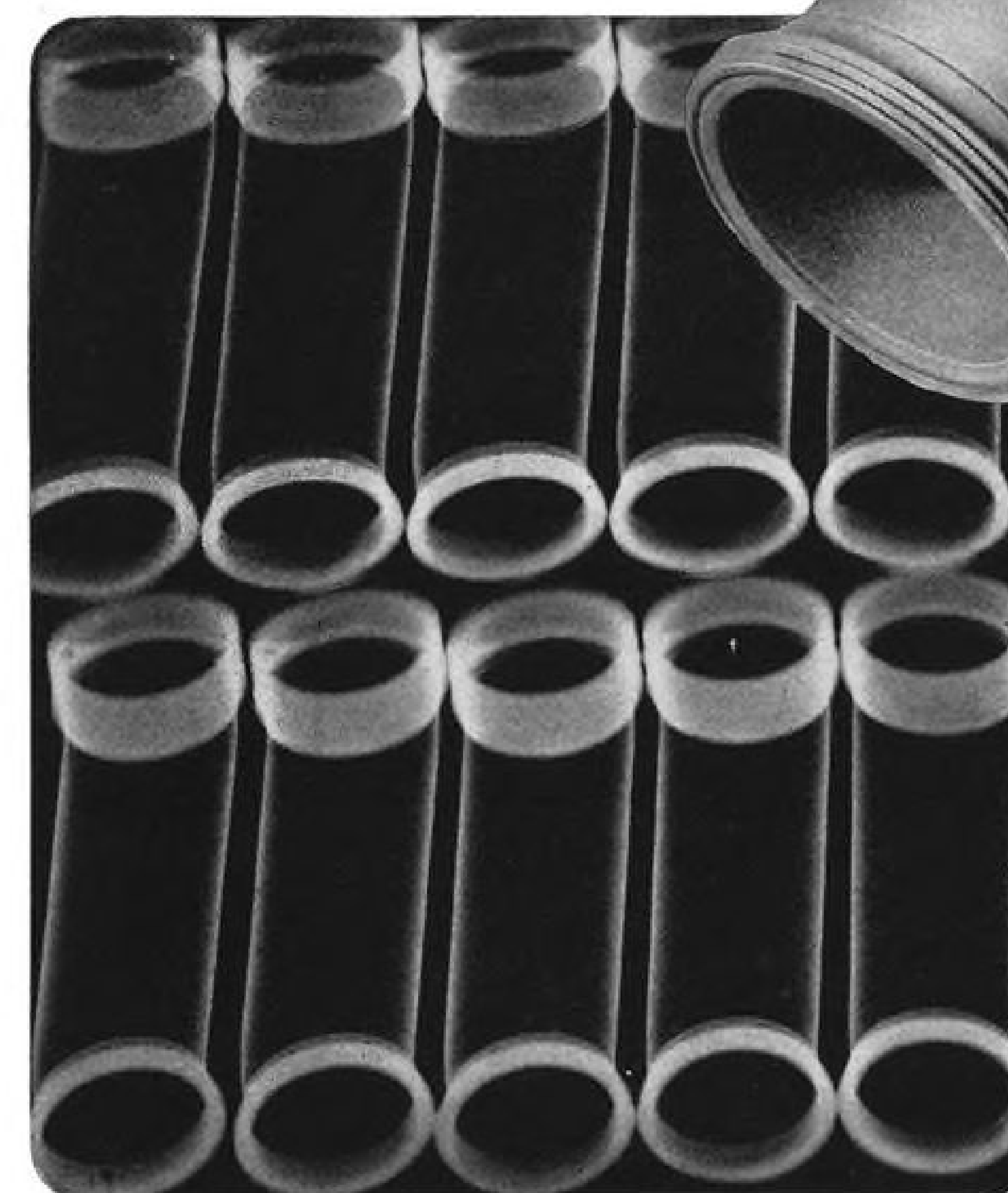
- Zoom potentials indicate that nearly 70,000-ft. altitude can be reached from a 30,000-ft.-altitude start in a supersonic, steep-angle pullup within a very short interval of time—a big advantage tactically. (Industry observers believe a 70,000-ft. figure would not be stretching too much the altitude capability of the F-104).

- "... But dives are more dangerous than ever," Le Vier emphasized. "You have to learn to use all this speed."

- "The elastic effect can make your 'stiff' airplane look (feel) like a 'dish-rag,'" Le Vier observed, commenting on the tricks of aeroelasticity.

- If the plane is designed to fly supersonically, the "sonic barrier" becomes

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just a name. "You can fly through it and not know it," Le Vier pointed this up by saying he once went through this speed regime with his arms clasped behind his head.

- How the airplane flies is the prime consideration—not its configuration. But the future supersonic fighter, he said, will have a low aspect ratio wing. The airfoil will be thin, straight and have a razor-like leading edge. (This generally expressed Lockheed's philosophy for supersonic flight.)

- How the combat plane is going to be used is one of the major problems." . . . One pass at the enemy plane and you don't see him for a couple of months," Le Vier said, referring to the startling rate of closure to be expected.

Stretching combat time two or three more minutes can mean the use of 10 to 20 times more fuel than it takes to cruise. It means that the pilot doesn't get home.

- Takeoff today "is no sweat," Le Vier said. But 50% of all jet accidents are caused by misuse of engine throttle power on approaches.

- Increment control—smallest amount of angular control pilot can produce on stick—is very important in the modern plane. This factor must be brought down to a few minutes of arc—not a few degrees, Le Vier said.

- Dynamic oscillation can be reduced to a minimum. Speaking about rate dampers, Le Vier said, "I like them." But it is hard to get more than a few persons interested in them, because they do not want to "gadget" the plane. He compared the rate damper (a 1- or 2-lb. device) with the jet engine fuel control and referred to the latter as the biggest gadget he ever saw.

- **Coordination, Safety**—"You engineers can build good planes—because every now and then one comes up." More seriously, he commented that the test pilot should work a little closer with all sections in the engineering group.

Le Vier also said the modern plane is not getting any safer, according to the record.

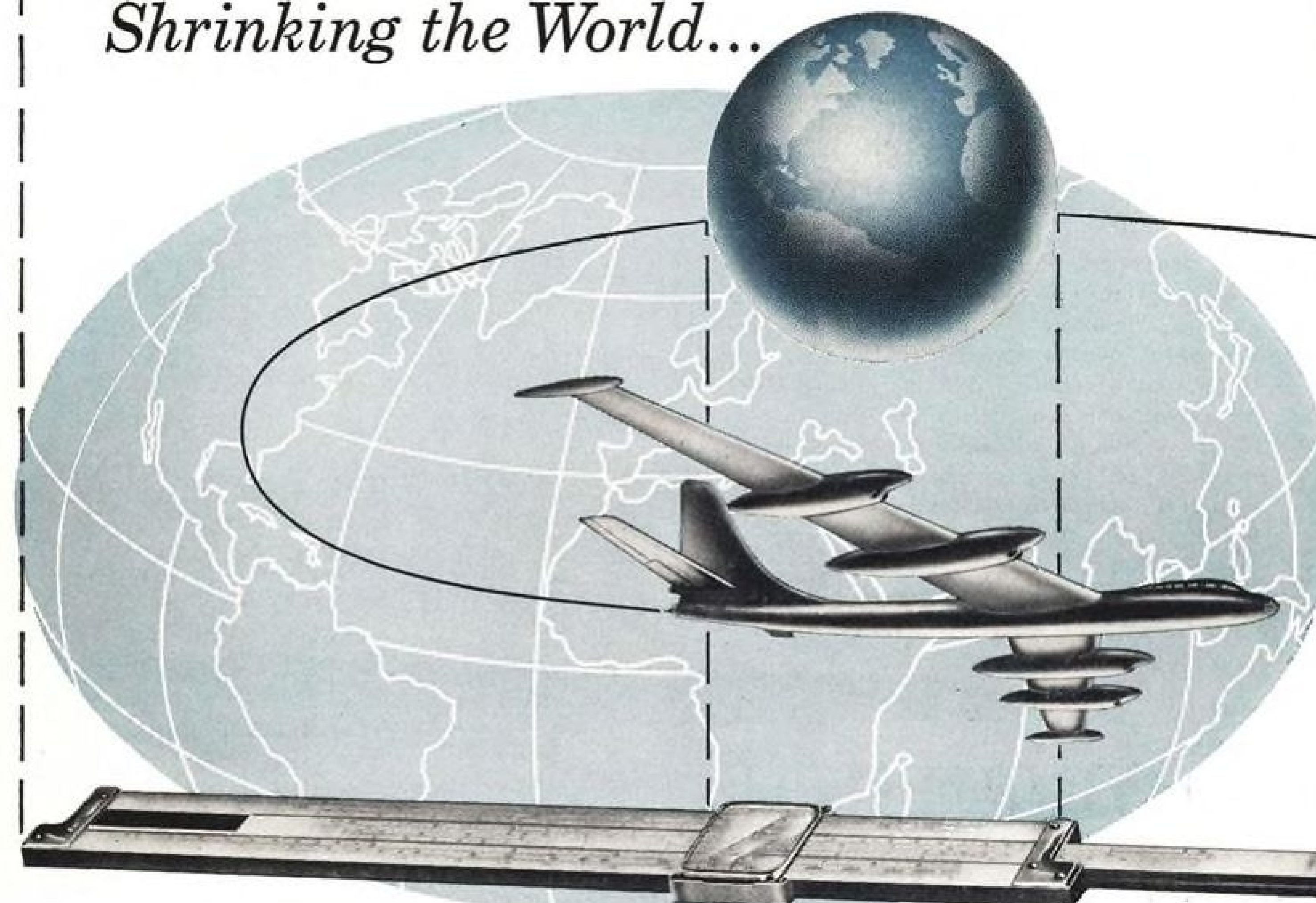
Flying at the "fantastic" speeds, the problem is what can be done to save a man if he "wants to get out." There are ways to improve this, he said, adding that "we owe it to the customers."

The military, it was brought out, is scraping the barrel to fill the cockpits, because flying is not as "glamorous" as it used to be.

CAP Selects ADF

Capital Airlines will use Marconi ADF equipment in its new Vickers Viscounts. Capital estimates that about 95% of the instrumentation, navigation and communication equipment on the turboprop airliners will be U. S. manufactured.

Shrinking the World...



through

Aeronautical Engineering

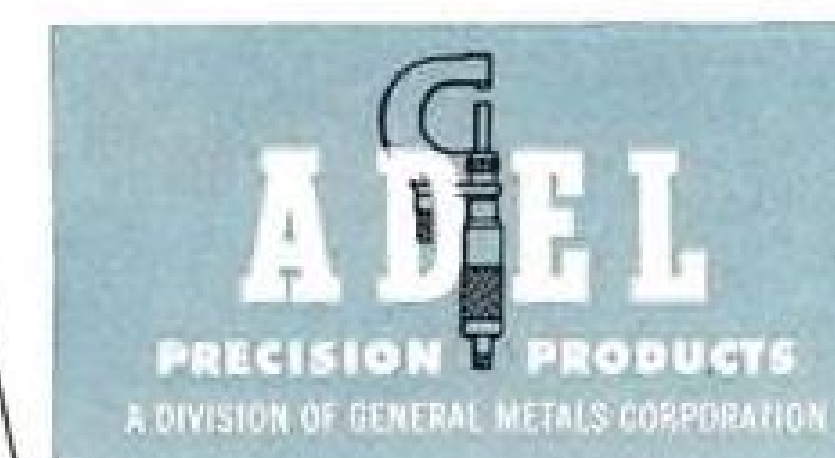
Just how far flight of the future will go beyond present limitations of altitude, speed and distance surpasses imagination. New records are being made with constant regularity, giving us a clue to the startling developments that lie ahead for all types of aircraft—military, commercial and civilian. Research, advanced engineering, design, development and sound production, which distinguish ADEL products, will provide major contributions for these new and greater achievements.

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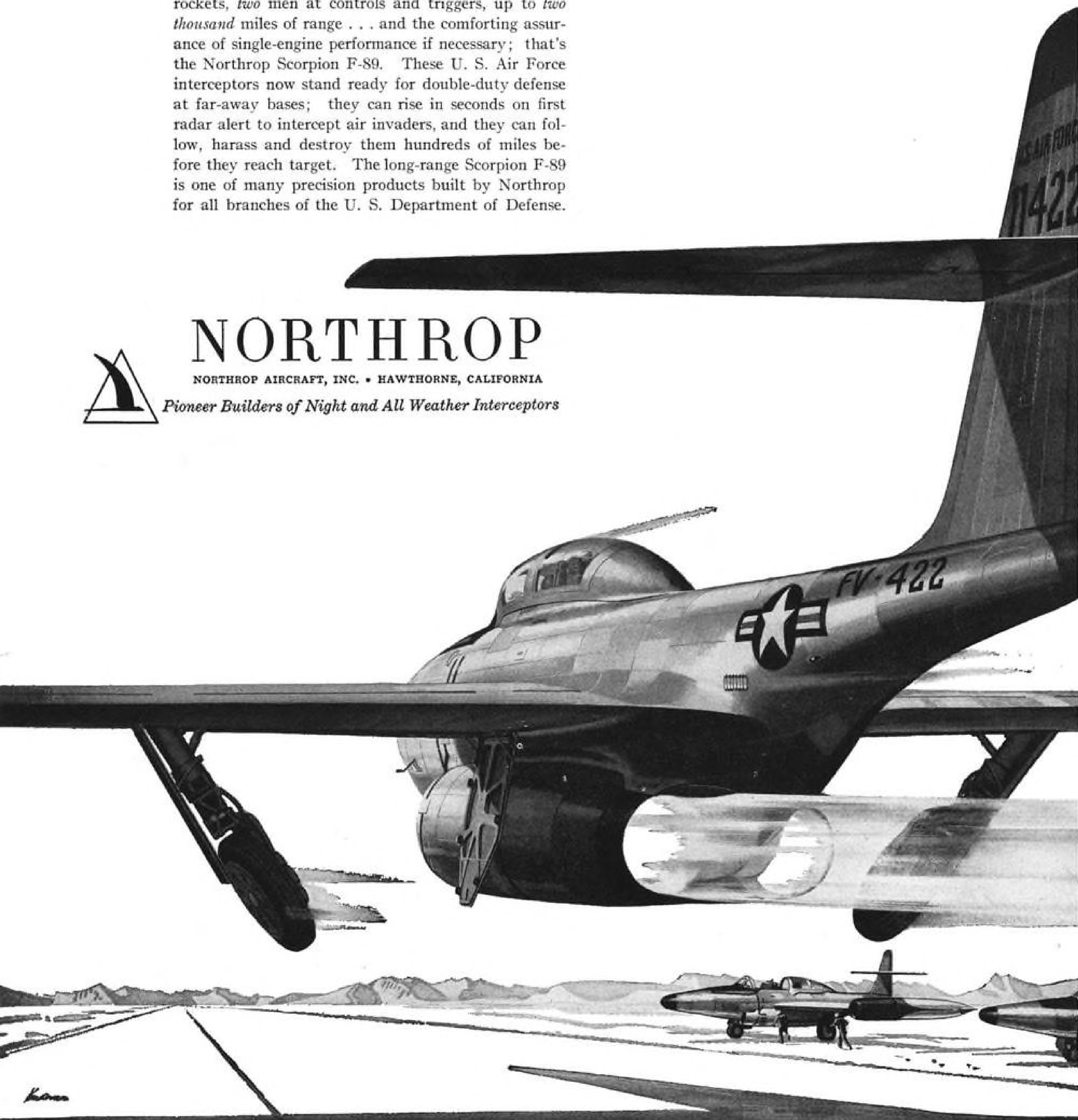
Two power-packed jet engines, two "decks" of 52 rockets, two men at controls and triggers, up to two thousand miles of range . . . and the comforting assurance of single-engine performance if necessary; that's the Northrop Scorpion F-89. These U. S. Air Force interceptors now stand ready for double-duty defense at far-away bases; they can rise in seconds on first radar alert to intercept air invaders, and they can follow, harass and destroy them hundreds of miles before they reach target. The long-range Scorpion F-89 is one of many precision products built by Northrop for all branches of the U. S. Department of Defense.



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CAB Makes New Cuts In Subsidy Estimates

Substantial cuts in airline subsidy are revealed in Civil Aeronautics Board's latest estimate of service mail pay and subsidy for U.S. air carriers.

The new CAB figures show considerable decreases from estimates made six months ago. In September, it was estimated that subsidy would be \$80,448,000 for fiscal 1954, \$79,426,000 for fiscal 1955 and \$79,100,000 for fiscal 1956. Revised estimates indicate expenditures of \$73,052,000 for 1954, \$66,151,000 for 1955 and \$61,698,000 for 1956.

These new totals show subsidy reductions of \$7,396,000 for the last fiscal year, \$13,275,000 for the current fiscal year and \$17,402,000 for fiscal 1956.

► **Reasons for Reduction**—The changes are based largely on events occurring since September. CAB says the basic factors in the reductions were:

- Increases in military mail being carried across the Pacific by certificated air carriers.

Although the mail rates have been reduced, the added volume has increased service mail payments and decreased need for subsidy payments.

- Settlement of the trans-Atlantic mail rate case, which cut subsidy for Pan American World Airways and probably took Trans-World Airlines off subsidy entirely.

The trans-Atlantic case isn't entirely final, since Pan American has opposed the Board's findings and is asking consideration. PAA also has applied for court review of CAB's final decision.

► **Changes Possible**—All subsidy estimates are uncertain to the extent that they are subject to revisions caused by subsequent changes in service mail rates. Figures for future periods are based on Post Office estimates of mail volume. Any shifts in mail traffic could have an effect on subsidy.

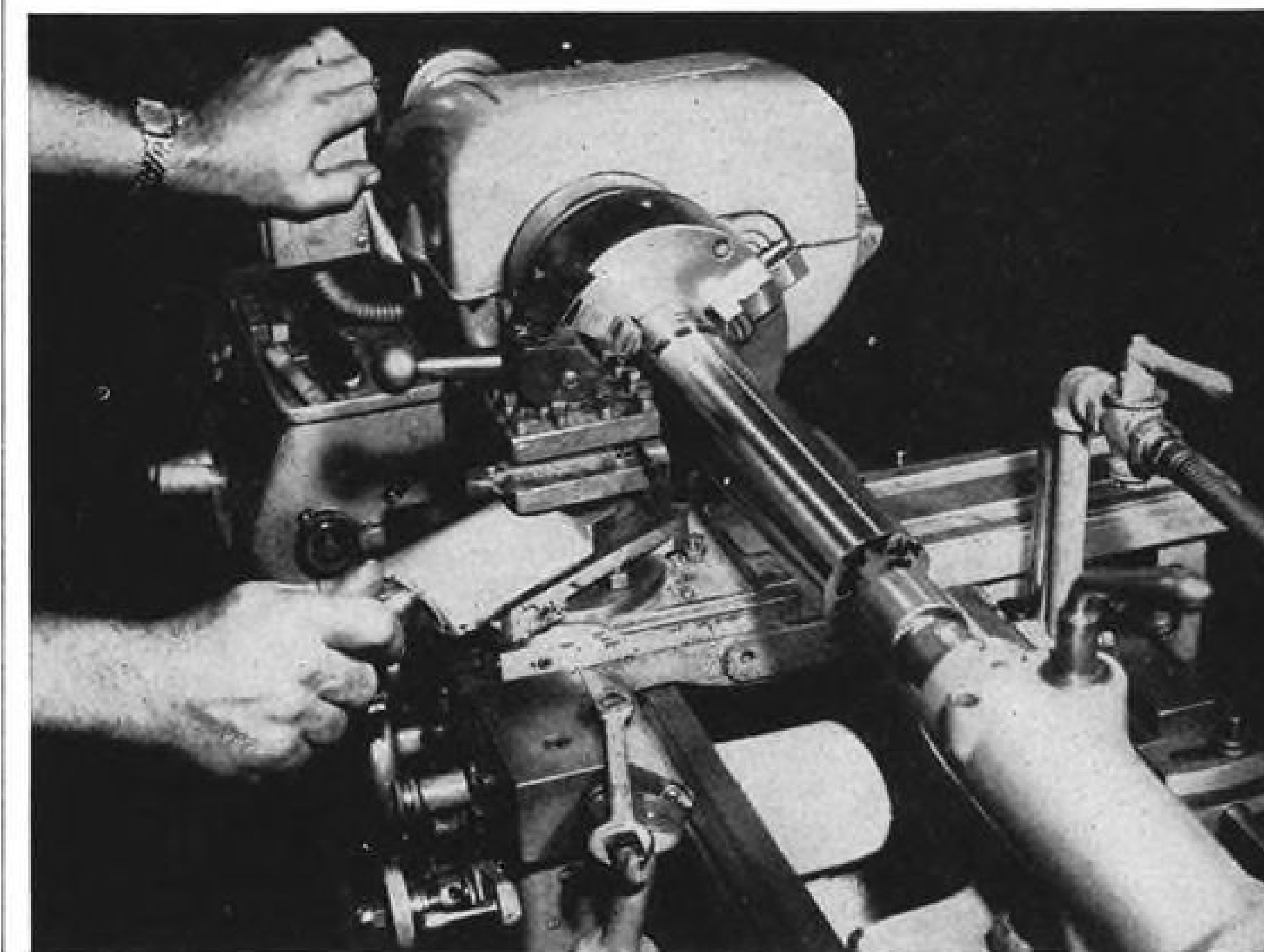
The CAB figures that by fiscal 1956 Pan American will be off subsidy entirely in Pacific operations, and Northwest will be down to \$1,483,000 from \$2,171,000 for the current fiscal year. Pan American's subsidy is estimated at \$3,286,000 this year.

The report points out that while mail volume has increased, total mail and subsidy pay has declined. A total estimate for 108,195,000 mail ton miles is \$129,177,000 in service mail pay and subsidy, while in 1956 \$127,891,000 is estimated as the total for 144,385,000 ton miles.

This substantial increase in mail volume while total pay has declined reflects a decrease in average yield per ton mile from \$1.19 in 1954 to \$0.89 in 1956.

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— U. S. Supreme Court

LETTERS

Miles E. 24/43

David Anderton ably summarized the British failure to follow up their supersonic model flights of 1946-8 (AVIATION WEEK Jan. 31, p. 28). However, his criticism did not mention one point which to my mind had the greatest bearing on the decision to close the program.

I recall that at a meeting of the RAeS in 1946, Sri. Ben Lockspeiser (then chief scientist of the Ministry of Supply) explained why he had canceled the Miles 1943 project. He would not order any piloted supersonic aircraft until more was known about behavior beyond the critical Mach number. This decision was clearly influenced by the unexplained breakup, a few weeks earlier, of the DH Swallow, which had cost de Havilland his life while attempting transonic speed.

As a result, the Miles company collapsed and was taken over by Handley-Page. More important, the RAE-Vickers models were working a dead end, since they could not lead to full-scale tests.

British designers traditionally rely on full-scale flight experience, and much near-sonic flying was done at RAE before 1945. Though Lockspeiser's refusal to pay for more highspeed flying was undoubtedly guided by humane motives, it proved a severe setback to British progress in this field.

J. M. STEPHENSON
Danbury, Conn.

(Editors note: Thanks to Mr. Stephenson for further insight into the untimely demise of the Miles project. David Anderton's article was based entirely on the RAE report, and could not include any of the nontechnical aspects of the cancellation of the Miles-Vickers-RAE project.)

VFR Traffic Law

If Mr. Kimball's supposition (AVIATION WEEK Feb. 7, p. 22) that "no one aboard the Convair was even aware of our presence" was correct he put his finger on the basis of the trouble concerning midair collisions.

If it was VFR weather and outside a control zone (1 mi. 700 ft.), the Convair had no business not maintaining 1,000 ft. or better IFR, or an adequate lookout if VFR; in this case they had at least 300 ft. separation, but most en route altitude minimums are well above 1,000 ft., netting even more separation.

If the incident occurred inside a control zone, Mr. Kimball was in violation unless he had 3 mi. and 500 ft. vertical separation from the clouds, which should be adequate, or clearance from the agency appropriate to the zone he was in, in which case separation was the responsibility of that agency.

If all pilots would get their CAR straight, obey them, and above all else, maintain an adequate lookout, 90% of the problem would be solved.

Abolition of the 700-ft level would be no cure at all for the tall tower problem. There are many towers waiting for the unwary 1,000 and 1,500 ft. or more above the general terrain. I'd as soon hit one at 200 as

1,500. I frequently make use of the 700-ft. level in visibilities right down to the 1-mi. limit in slow aircraft not instrument equipped. I make sure to have up to date maps of the best type (sectional and local) and am anxiously awaiting arrival of AOPA's new list of tall towers to supplement them. I do not hesitate to take a little longer route to avoid tower areas as most of them are darned hard to spot in CAVU weather.

If all pilots would notify the Coast and Geodetic Survey at once of new towers not on the charts it would help us all.

As a pilot and operator who has put considerable time and effort into boosting private flying, it horrifies me even to hear discussions of further restrictions. The present CAR are in general adequate and well thought out. The sections on VFR flight particularly well so.

R. G. HUNT
Dustaire, Inc.
Middlebury, Vt.

Engineer Shortage

The editorial, "Losing the Technical Race To Russian Manpower" (AVIATION WEEK Feb. 7, p. 106), requires an answer.

I am getting sick and tired of reading articles crying about the "shortage" of engineering manpower. That is a lot of damned nonsense. There is no shortage of manpower, but there is a shortage of men who know how to use manpower intelligently.

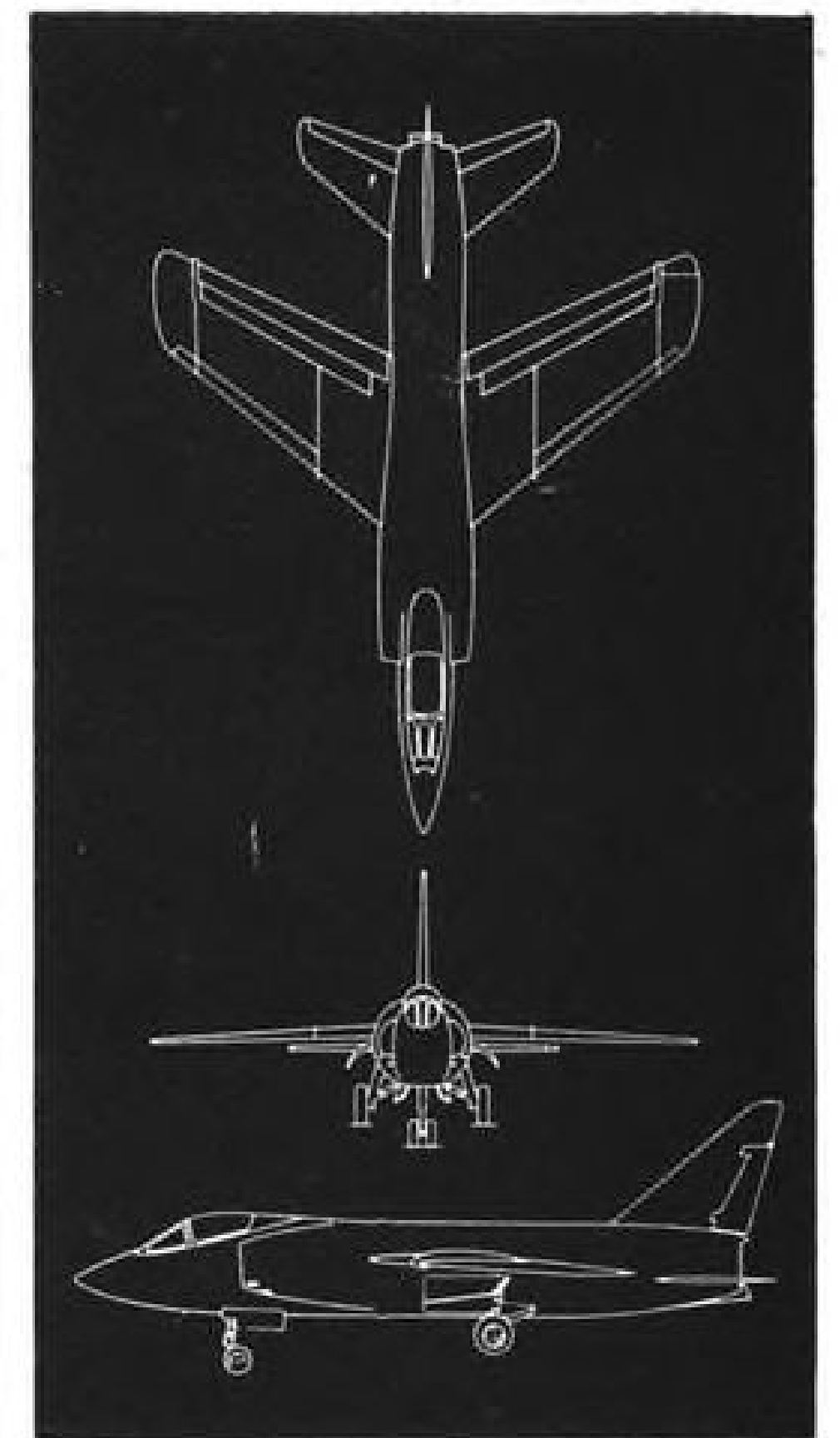
Let me go back to the 1920s. I went to the late Dr. Alexander Klemin then and asked his advice on how to get a job in an aircraft engineering department and also asked if my job, at that time, as a structural steel draftsman would be of help to me. His answer was that it would because "an airplane is nothing more than a flying bridge."

Dr. Klemin was not talking poetry—he was referring to the fact that an airplane was built up of a series of trusslike structures. When I finally did get a job in the industry in 1939, I found out that this comparison was true.

But I also found out that any structural steel engineer going into the aircraft industry would be horrified at the lack of efficiency to be found in the aircraft drafting rooms. Although they are designing planes of metal today, the system used is exactly the same as when planes were built of wood. There has been no advance in methods in 30 years.

Far from being a shortage of men, if the methods of structural steel design and detailing were applied to the aircraft industry, there isn't an aircraft engineering department that could not be radically reduced in size. I am today working on the detailing of one 20-story and two 14-story apartment house buildings. The work is being done by two beam detailers, one column detailer, one checker and two executives! Can you compare that with any aircraft engineering department? One of the Long Island outfits proudly (?) printed a photo of their engineering department and called it an "Acre of Engineers."

Now let me say that I worked in aircraft engineering departments from 1939 to 1947. Four of those years were with the Brewster Aeronautical Corp., and regardless of what



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LETTERS . . .

was said of Brewster, I consider it the best of any of the others I worked for. But even they could have learned a few lessons from structural steel methods.

The next outfit I worked for was so bad, in my eyes, that to avoid the W.M.C. 90-day waiting period, I deliberately got myself fired to get out of it. The next place was also small (Columbia), but at least the men worked together efficiently and got the work out.

From 1947 till now, I have been out of the aircraft industry, not because I wanted it, but because I could not get another aircraft job at that time. I did get a structural steel job then that has lasted nearly eight years without a break.

Let me point out another thing. For the last couple of years, I have been getting letters and even calendars from different subcontractors asking me to make use of their products wherever possible. These letters all bear the code "HIE," I think. Out of curiosity, I checked with one place and found that they had gotten my name from a McGraw-Hill mailing list.

But although I have been a reader of AVIATION WEEK and its predecessor magazines for more than 30 years, I have never once received a letter from any aircraft company asking if I would be interested in a job. What's the matter? Aren't the readers of AVIATION WEEK worth hiring, or don't aircraft personnel men know that there are some engineers who subscribe to AVIATION WEEK and read it?

Quite a while ago, you printed an article on the results of a survey somebody had made. At that time I was tempted to write and ask if that survey had made any attempt to query ex-aircraft men. But I knew from reading it that no such attempt had been made. If such an attempt had been made, you would have had some really interesting reading. But no such attempt will ever be made, because every one of these ex-aircraft men would tell why they were dissatisfied with the industry and it would not be nice reading. It is much better to cry "shortage" than face the facts.

As to the shortage, remember that today you have a civilian industry along with the "war" industry. I think if you totaled the engineers in both branches you would find out the shortage does not exist. If you took the engineers out of civilian industry and put them in war industries, as was done during World War II, your shortage would end, but so would all your luxurious living.

So it boils down to one thing—either the aircraft industry should stop crying "shortage" and get efficient, or else admit it is lack of competence and NOT shortage.

WILLIAM H. MOESEL
258 Franklin Ave.
Brooklyn 5, N. Y.

Ho! And Dr. Dryden now joins the chorus on the subject "Technically Trained Workers, Shortage of." As a graduate engineer with two years experience in the flight test section of an aircraft company located here in the Southwest and as a draftee with 14 months left in the army, I find such comments amusing after spending 10 months cleaning latrines, washing windows, and mopping floors.

Hope you will understand if I neglect to sign this—I still have some time to go.

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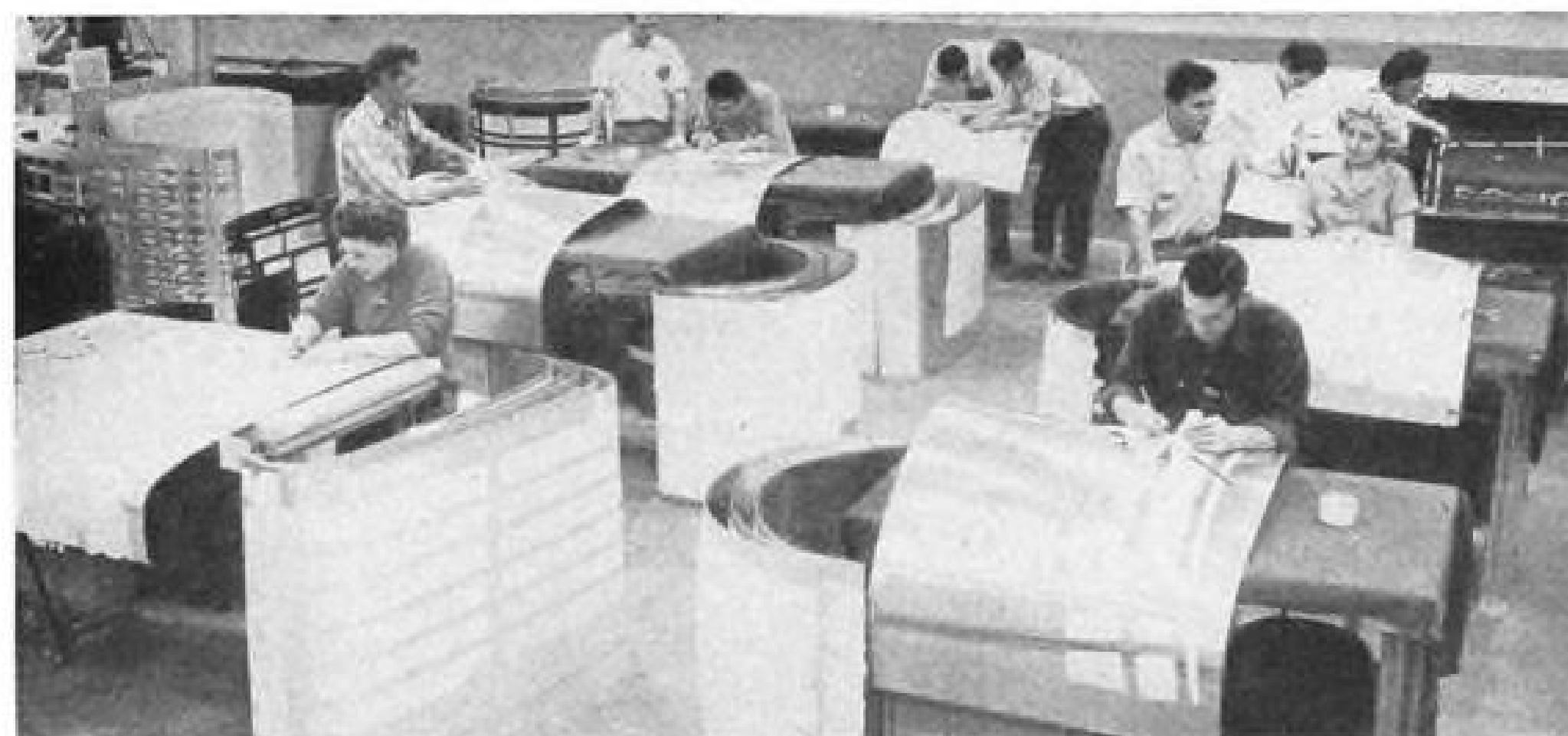
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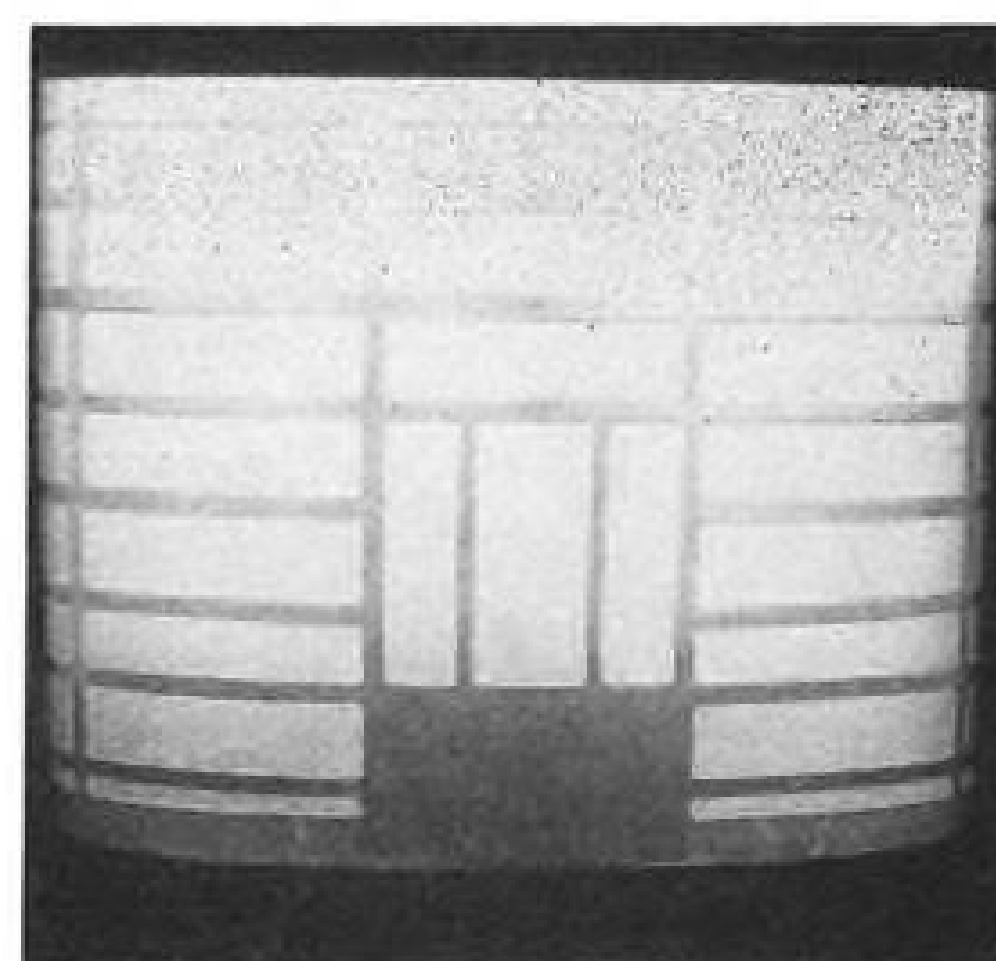


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PRODUCTION ENGINEERING



FORMED DUCT SKINS are masked prior to the chemical milling process. Masking paint is applied, then baked. Tape is then stripped off and skins are exposed to etching solution.



LIGHT AREAS show where etching bath has removed desired pattern of material.

Etch Replaces Machine in NAA Milling

By Irving Stone

Downey, Calif.—Chemical milling, a process for removing metal selectively by etching, looms large in future manufacturing schemes at North American Aviation.

Already established at the company's Downey plant as a sculpturing technique for production runs, the process has been applied, so far, to about 70 detail parts for a total of more than 2,000 units.

► **Big Benefits**—Designated Chem-Mill, the process shows many advantages over machine milling, in some instances does jobs the latter can't do. Although not intended to replace all machining operations, the process is destined to take on an increasing role in the fabrication of airframes, because an entirely new approach to design is possible, NAA engineers say.

They point out that engineers have been thinking generally in terms of designs within the limitations of machine milling. Now, broad design advantages are seen when structure specifically is designed to take the wide latitude of configurations chemical milling allows.

► **Available to Industry**—Chem-Mill was developed with company funds by the Aerophysics Dept.'s materials research and process group at NAA-Downey. Work started about 1½ years ago. Key figures in the chemical-milling development are Manuel C. Sanz, materials and process development group leader, and staff coordinator Russell Spencer.

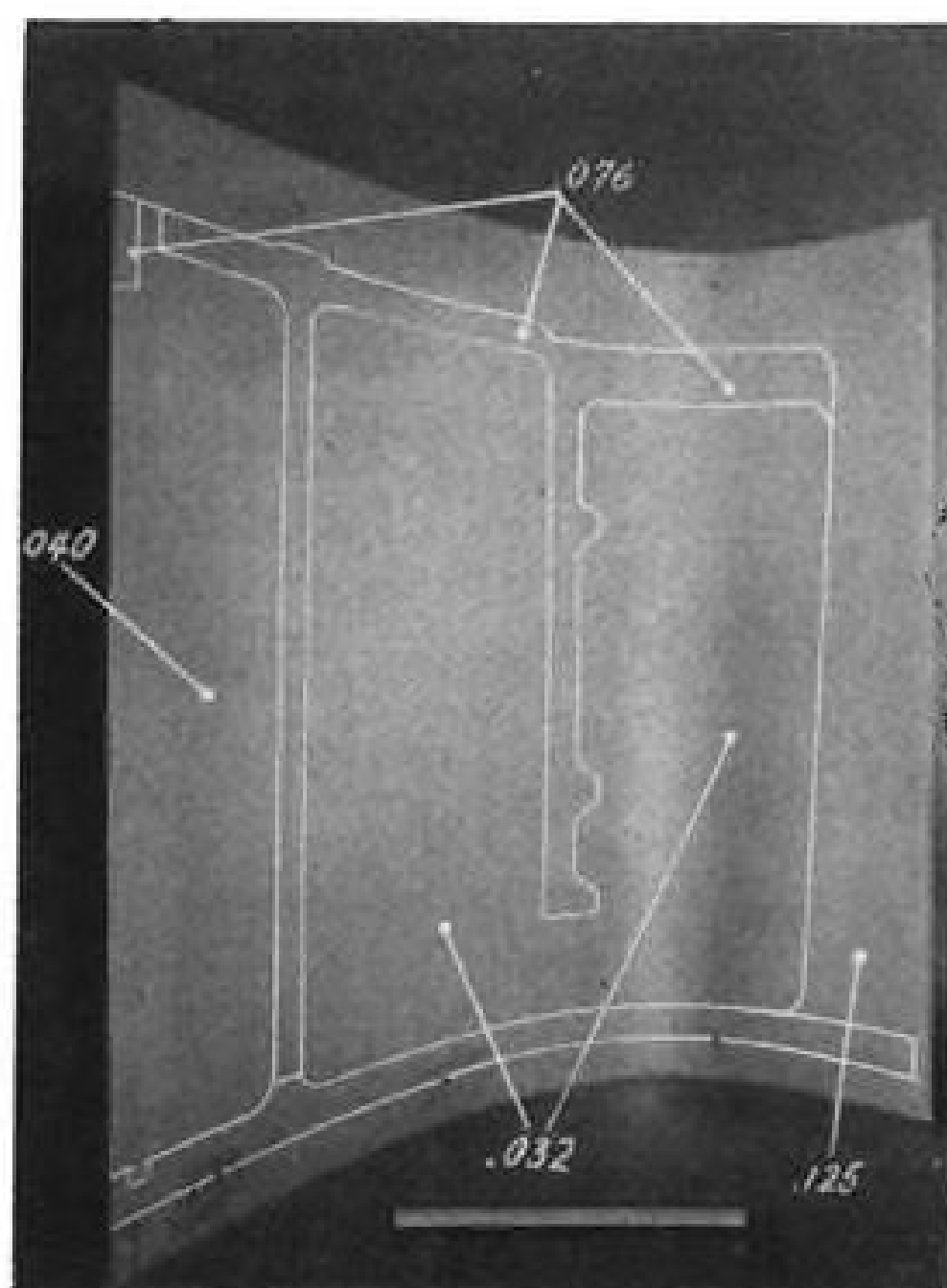
Turco Products, Inc., Los Angeles, through arrangement with NAA, is licensed to make the process available to industry.

► **Metals Involved**—The process can be applied to numerous alloys—aluminum, titanium, magnesium and zirconium,

and ferritic and austenitic steels. Concentration has been on these materials, but there's no reason why the process couldn't be applied to other metals as well, NAA engineers say.

Most prominent metal in the Chem-Mill production picture now is aluminum alloy. Next two to be channeled into the works are ferritic and austenitic steels. Titanium alloys, too, are entering the picture in increasing volume, mainly because of the difficulties encountered with conventional treatment.

In normal milling, titanium alloys are machined flat, then contoured hot. Milling alone is difficult, but contouring after milling increases the headaches because of embrittlement and resultant notch sensitivity. Chem-milling allows contouring (stretch forming) to be done first, followed by sculpturing (chemically) to desired configuration.



VARIATIONS in chemical milling are shown on this sample of stepped sheet.

► **Targets**—Aim of the process developers at NAA-Downey was to establish a production technique tolerable to normal shop procedures—one which would give reproducible results, batch-to-batch, with minimum supervisory control. Prime requirements were:

- **A chemical process**, as distinguished from an electro-chemical method. The latter would limit the size of the structure to be "milled" because of the extreme current required. Chem-milling is limited only by the size of the tank.
- **A process requiring addition of heat** to keep the bath active. This is an important control feature.

- **An etch rate of about 1 mil (.001 in.) per minute** over all exposed areas. This would afford a feasible production time—a rate too slow would be unacceptable, whereas a fast rate would result in poor tolerances.

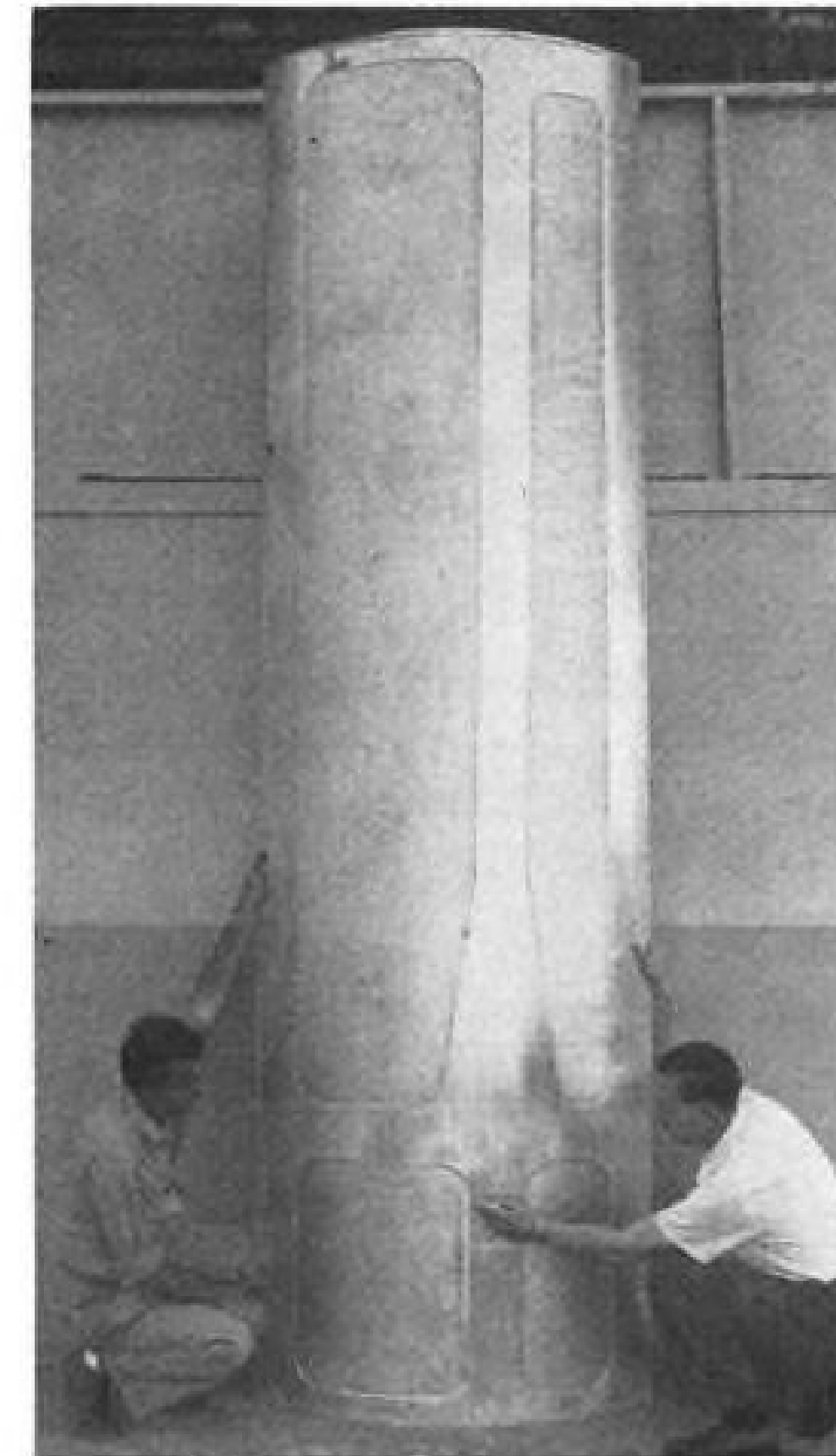
- **Automatic control.** This feature is still in the process of refinement—now being readied for production release is an automatic bath control for such factors as etch rate, concentration, temperature. Meanwhile, NAA has a depth limit monitor which controls depth of etch to within $\pm .005$ in., including sheet tolerance.

► **Specific Benefits**—NAA sees these advantages for chem-milling:

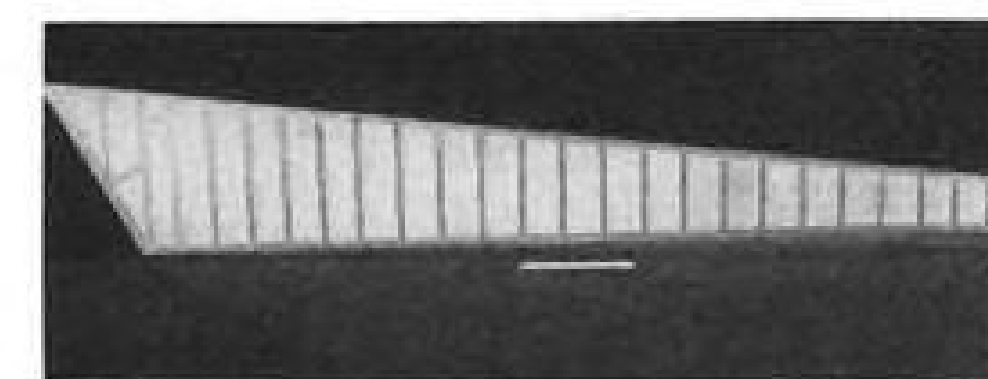
- **Etching after forming.** The process can be performed after forming operations, whereas machining is limited to slightly contoured parts, and forming after machining is difficult.

- **No machining restrictions.** Chem-milling is not limited by machining restrictions with respect to shape, direction of cut or limiting radius of cutters. Complex shapes, broad or narrow cuts, and comparatively sharp corners are possible in a single operation. Metal removal may be performed on either surface of a sheet at the same time.

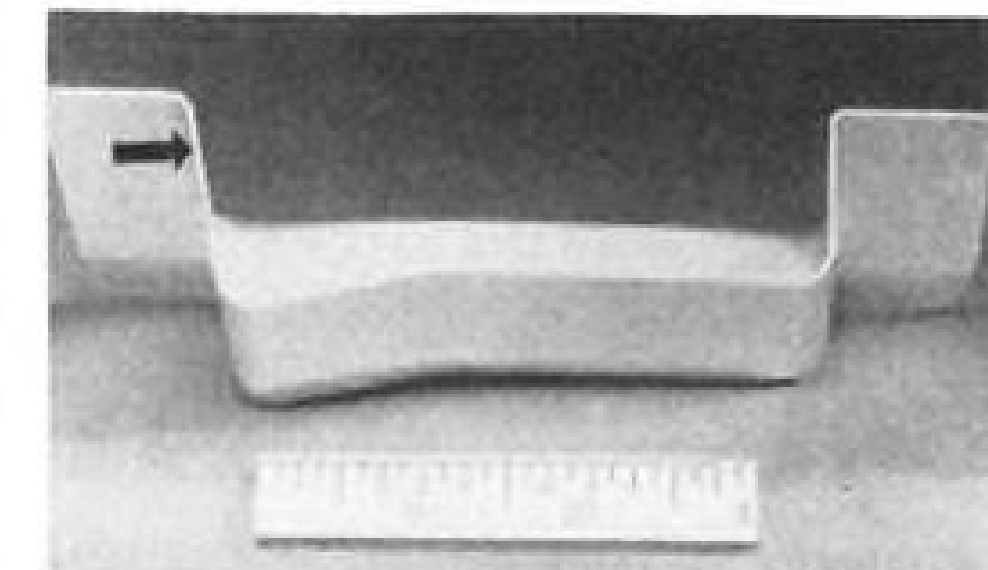
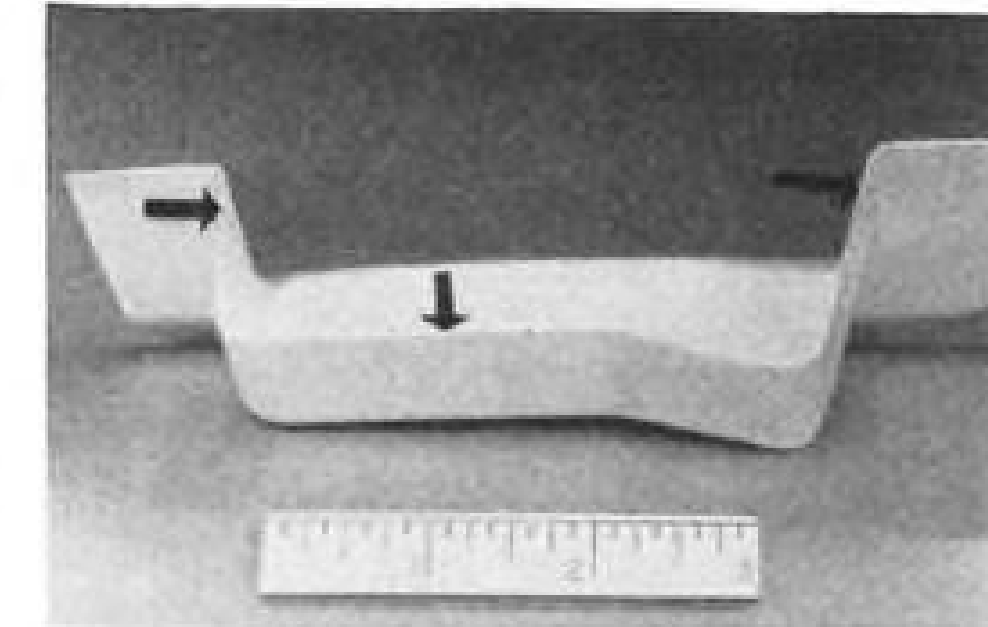
Typical Examples of Chem-Mill's Work on Plane Parts . . .



MODERATE-SIZE part after etching.



SKIN PANEL was etched (light areas) leaving cap material for riveting.



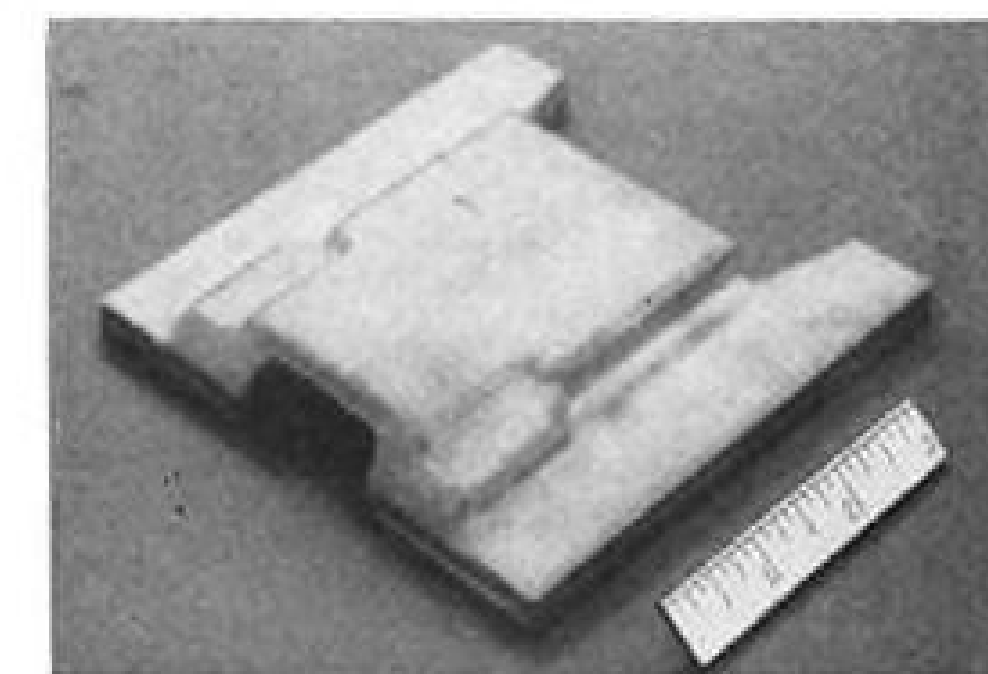
THICKNESS is reduced all-around (top) on heavy-gage formed part.



SMOOTH PORTION (front) of steel forging cap material shows fine Chem-Mill finish.



POCKETS are formed in leading edge.



SCALE REMOVED by Chem-Mill from titanium alloy forged component.

- **Lightweight construction.** Light makeup, with bands or stiffeners integral with the skin can be obtained. These may be curved or contoured to direct transfer of stresses as desired.

The process permits reduction in weight of parts such as extrusions, forgings or deep-drawn units, which otherwise are heavier because of limitations due to standard sizes and minimum thicknesses required for forming.

Sheet, extrusions, hat-sections and other stiffeners may be tapered by chem-milling to transfer design stresses proportionally, as required.

Also, various depths of cut may be made on large areas of one sheet by a method of progressive unmasking.

- **No highly skilled operators required.** The technique lends itself to automatic processing.

- **Multiplicity of production.** The number of parts which can be etched at the same time is limited only by the size of the tank. This feature offers a big manufacturing advantage.

- **No sanding or polishing required.** Finished chem-milled parts need no further work such as sanding or polishing to eliminate notch sensitivity in the ma-

chine-milled part, NAA engineers say. After machine-milling of thin skin sections, a hand-polishing operation with rotary or vibrating sanders is necessary to remove the scars, it is said.

- **Conventional equipment** is involved. Equipment required for chem-milling is the conventional cleaning and pickling type available in airframe plants.

► **How It's Done**—The process, generally, is a simple one. The steps:

- **Degreasing with solvent**, followed with hot alkaline bath (180F).

- **Rinsing, with cold water.**

- **Mild acid etch** to deoxidize the surface. This gives a water-breakfree surface.

- **Rinsing, with hot water (180F).**

- **Drying cycle**, using a 180-200F oven.

- **Masking.** Tape is applied, the configuration is cut out, masking paint is applied and baked, tape is stripped off. (Masking paint now employed is resistant to etchants used for all metals handled.)

- **Exposed (unpainted) surfaces** are chem-milled.

- **Final stripping** is done after chem-milling, and the part is bright-dipped for final cleaning.

► **Cost Data**—This procedure applies to pilot-line operation, and undoubtedly will be refined to cut costs as fuller production experience is gained.

Preparation for chem-milling costs about 40¢/sq. ft. Chem-milling itself costs about 40-50¢/lb. of metal removed. This is for aluminum alloy; cost with other metals would be higher. Step milling—successive cuts through progressive unmasking—also would boost costs a little.

One cost example cited by NAA engineers is that in a specific item under study an expenditure of 16,000 man-hours would be required for conventional construction, including fabrication of detail parts and joining by established procedure.

With new design for chem-milling, coupled with modifications in joining techniques, an equivalent structure would result for an expenditure of about 5,000 manhours.

Typical Applications

Typical parts which can be handled:

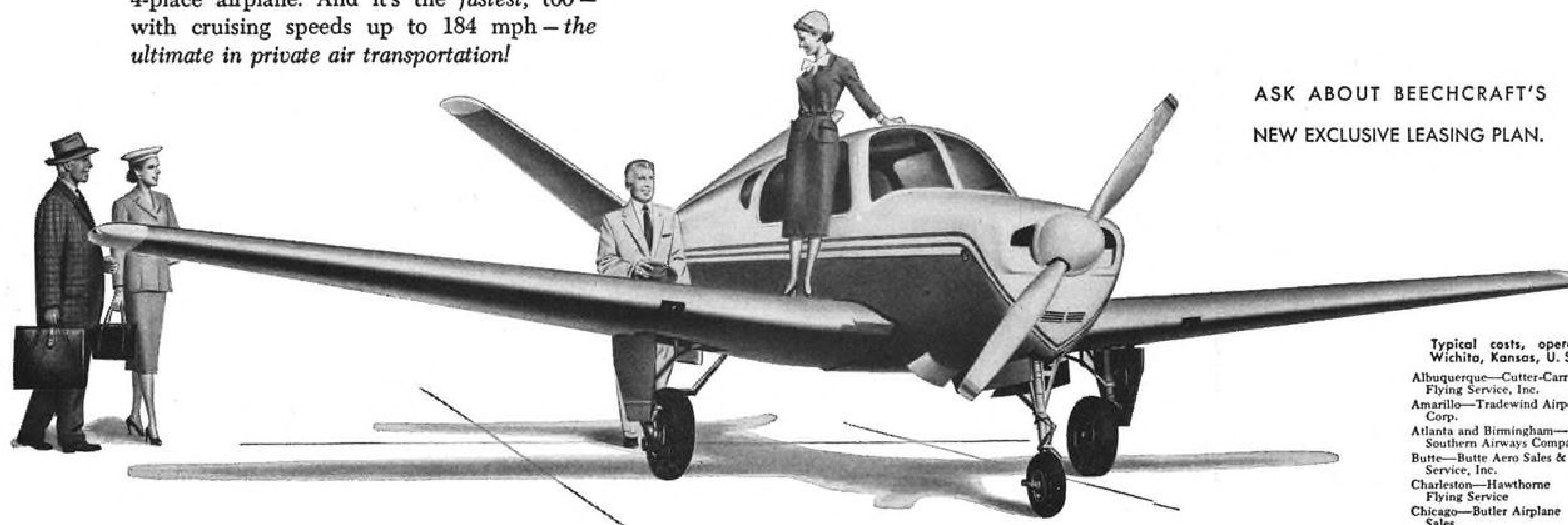
- **Waffle panel.** In this application, two sheets are used for a "sandwich"



SIX windows plus an exceptionally wide windshield provide unexcelled built-in visibility and extra travel enjoyment.



Licensed in the utility category, the Beechcraft Bonanza is the only 4-place airplane capable of passing CAA Utility Category Tests at full gross weights, making it the world's *strongest* 4-place airplane. And it's the *fastest*, too—with cruising speeds up to 184 mph—the *ultimate in private air transportation!*



Owners report that there are *101 Reasons* for the Beechcraft Bonanza Superiority. The four thousand time-tested and service-proved Beechcraft Bonanzas *now at work* for business and industry in all of the 48 states and some 50 foreign countries are proof of the Bonanza's design, structural, and high-performance operating efficiency. Here are a few of the NEW Bonanza features for 1955:

A NEW Additional Window on each side provides even greater visibility, greater safety, and greater comfort.

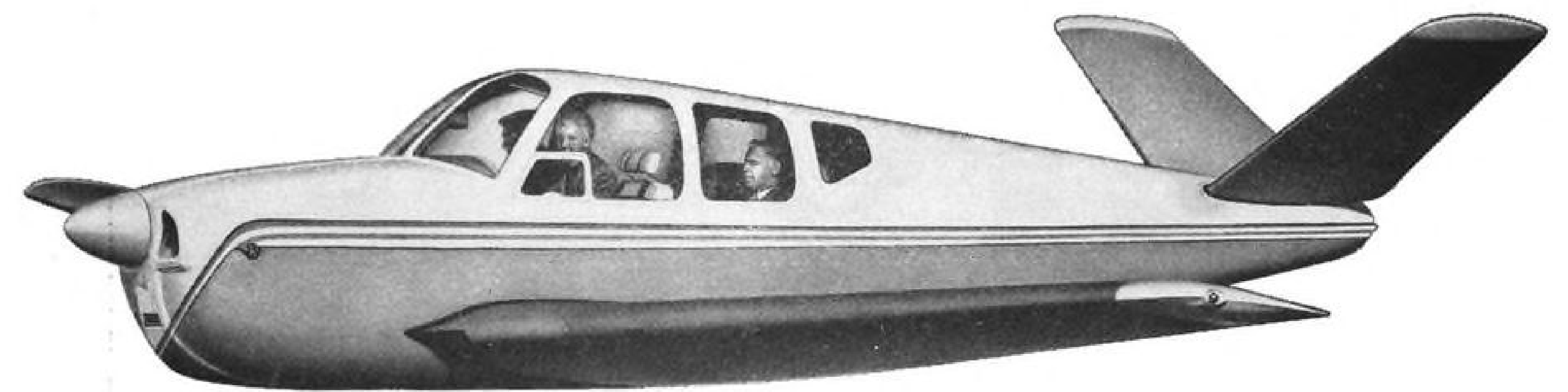
ADDITIONAL Fuel Wing-Tanks, exclusive in the F35 Bonanza, provide ten more gallons of fuel in each wing. When installed, they provide greater range without loss of baggage space.

ADDITIONAL Leg-Room for front-seat passengers now available through a special F35 installation.

COMPLETE Exterior Painting is an exclusive standard feature of the Bonanza. The new F35 designs are offered in a wide array of attractive, durable, and easy-to-see colors.

NEW Interior Styling for the 1955 F35 Bonanza provides the ultimate in design, quality of materials and workmanship. Beechcraft's exclusive safety harness furnished standard in harmonizing colors.

NEW Posture-Ease, Adjustable Seats for the Bonanza provide *the tops* in comfort for all passengers.



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"Easy to buy — easy to fly — easy to service — that's the reason I purchased my Bonanza," Beechcraft dealers are often told by men who make up the Air Fleet of American Business.

Dependence upon outmoded means of executive travel can be costly. Beechcrafts slash your travel time as much as 75 per cent. *You* make *your* own schedules — on *your* map and travel at *your* convenience. Oftentimes it's possible to land your company Beechcraft at the scene of activity, or within minutes of the important business or pleasure destination.

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Charleston—Hawthorne Flying Service
Chicago—Butler Airplane Sales

Dallas—J. R. Gray Co., Inc.
Davenport—Elliott Flying Service
Denver—Mountain States Aviation, Inc.
Houston—J. D. Reed Co., Inc.
Indianapolis—Rascoe Turner Aeronautical Corporation
Lansing—Francis Aviation
Lantana—Florida Airmotive, Inc.
Memphis—Memphis Aero Corp.

Milwaukee—Anderson Air Activities
Nashville—Capitol Air Sales, Inc.
New Orleans—Magee Aircraft Co., Inc.
New York City—Atlantic Aviation Corporation
Oakland—Pacific Aircraft Sales Company
Oklahoma City—Aircraftmen, Inc.
Omaha—C. J. Abbott & Co.

Philadelphia—Atlantic Aviation Service, Inc.
Portland—Flightcraft, Inc.
Rochester, Minn.—Gopher Aviation, Inc.
Rochester, N. Y.—Page Airways, Inc.
Salt Lake City—Kemp & Kelsey Airservice, Inc.
San Antonio—Alamo Aviation, Inc.
Shreveport—Curry Sanders Aircraft Company, Inc.

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Van Nuys—Norman Larson Company
Wichita—Aircraftco, Inc.
Wilmington—Atlantic Aviation Service, Inc.
Youngstown—Youngstown Airways, Inc.

makeup. Sheet is preformed to matching contour, then chem-milled and joined by resistance welding at the islands formed by the rib junctions. Resulting structure is about five times as stiff as an equivalent weight of solid sheet, it is reported.

• **Tube modifications.** When a tube not standard in size or gage is required, considerable delay may be involved in getting the proper unit from the tube fabricators. By selecting tube with the proper O.D., wall thickness may be reduced to that required by design by chem-milling internally. This can be done by pumping the etchant through the tube, using a sonic detector to determine gage. In this application, there's no masking or bath submergence involved.

With a unit having the proper I.D., the tube may be plugged and excess material removed from the outside surface by chem-milling.

Also, with proper masking, critical areas may be "beefed-up" for drilling, tapping welding or other work.

• **Wing rib.** In one application, a prerequisite is to have a shear member to seal off integral fuel tanks from adjoining structure. Low-stressed areas in the shear web are reduced to optimum thickness by chem-milling.

• **Stabilizer rib.** With chem-milling, doublers are made integral with the rib web and the resultant structure is lighter because low-stressed areas are of lesser gage. The integral doubler eliminates shear lag encountered in transferring loads from the attaching unit to the web.

Normally, machine-milling wouldn't be used to duplicate this part—generally, the weight penalty would be taken for attaching a riveted doubler, or increasing the gage overall.

• **Forged rib.** Main problem in units of this kind is the limitation of minimum web thickness. With chem-milling, the thickness may be reduced to that needed for the stresses involved.

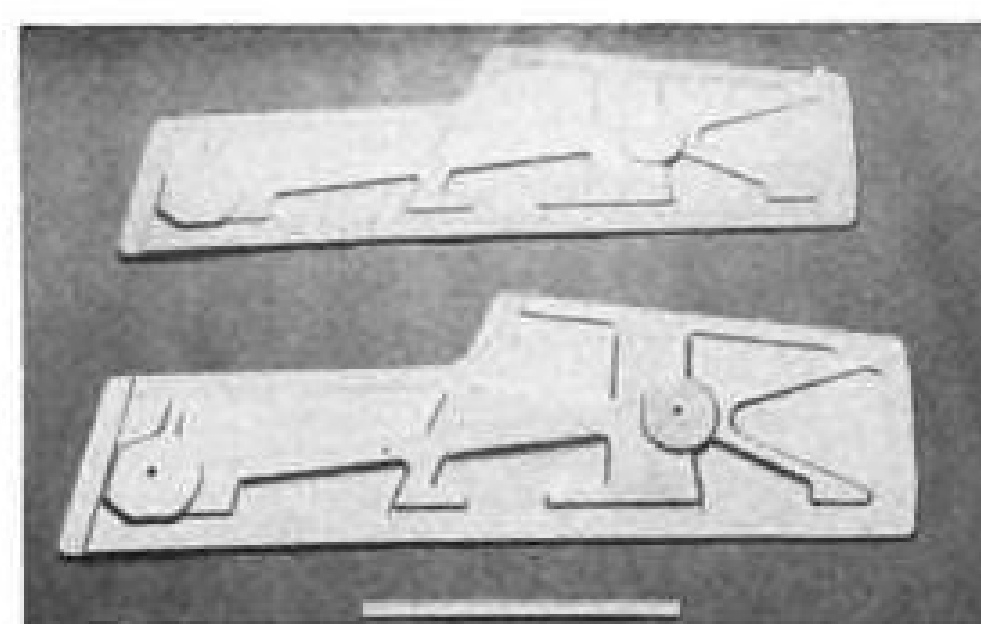
One method is to mask the critical areas and Chem-Mill the unmasked areas to the minimum gage determined by the design stress.

Another procedure is to forge the critical areas oversize, then reduce the entire forging without the necessity of masking.

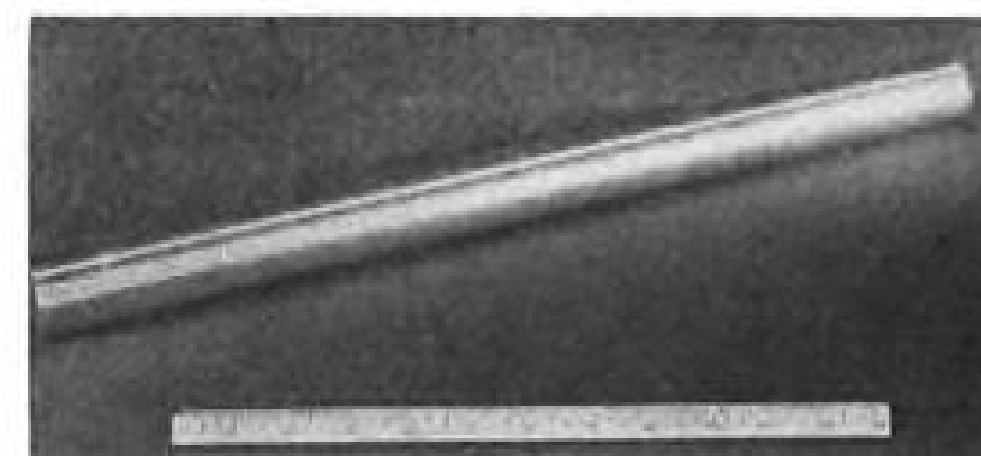
• **Rough forgings.** For a 4130 steel forging, removal of slag and scale from the surface after heat treatment normally is accomplished by a slow pickling process and does not result in the smooth surface generally required, NAA engineers say.

For this type of job with chem-milling, no masking generally is required and material is removed at the rate of .001 in./min.

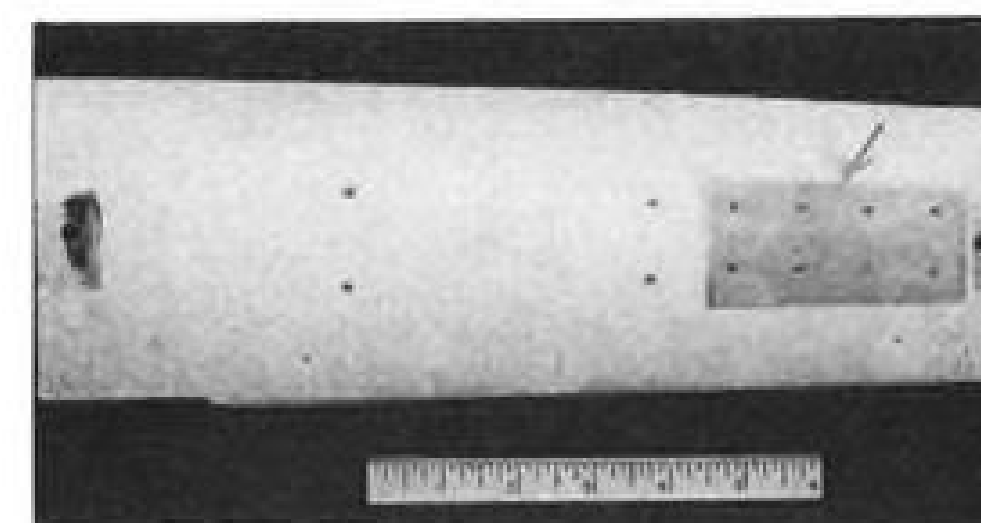
Titanium alloy forgings also can be



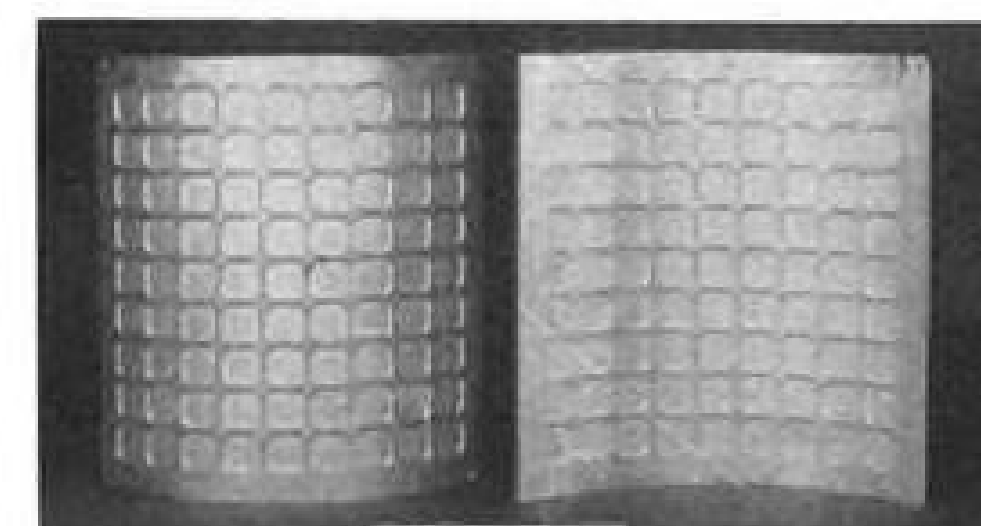
FORGED RIB before (top), after Chem-Mill etching process (bottom).



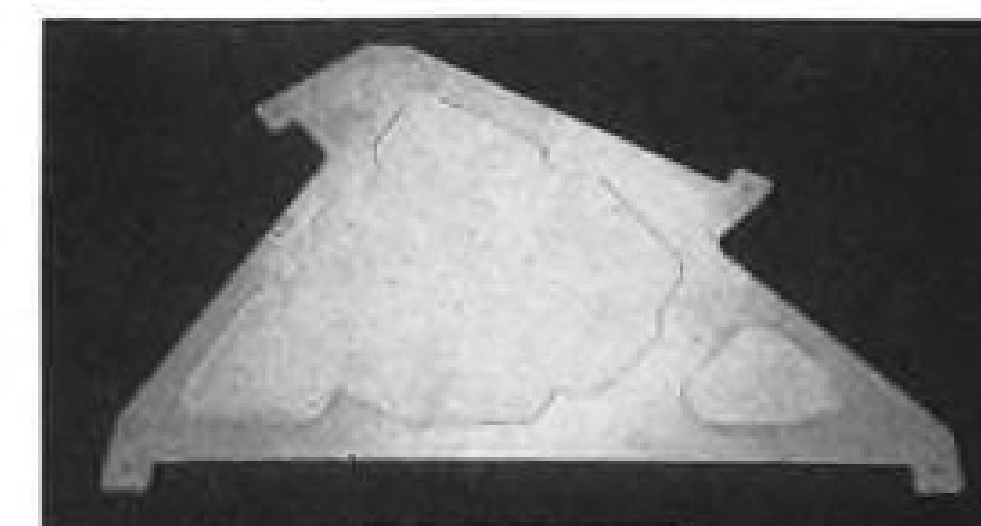
TUBING inside or outside diameters can be reduced by chemical milling.



STABILIZER integral doubler (right) has been produced by etching process.



WAFFLE PANELS are ready to be joined to give high-stiffness 'sandwich.'



STEPPED SKIN PANEL has areas etched to differing depths (steps).

taken down at a fast rate and with minimum hydrogen pickup, NAA engineers say. Removing scale from titanium alloy with chem-milling reduces notch sensitivity, hence increases fatigue life, they claim. In many cases, it eliminates the necessity of machining.

• **Deep-drawn sheet.** Deep-draw forming is accomplished more favorably with heavy-gage material, since local rupture at high stress areas is minimized. Excess material of these deep-drawn heavy-gage parts may be removed with chem-

milling for appreciable savings in weight.

• **Stepped sheet.** Intricate panels may be chem-milled to give substantial weight savings. Where several dimensions are involved, a temporary mask is used to prohibit action on intermediate areas until the exposed area has been milled to a value equal to the difference in depth between the maximum depth and the intermediate step.

In another stepped sheet, conventional procedure would give difficulty in maintaining tolerances on thin sections, and there would be a tendency for the part to break in after-forming. Also, in the heavy areas, local flats result and these are aerodynamically undesirable.

With chem-milling, the part first is preformed to smooth aerodynamic contour, then the metal is removed to desired dimensions. This part, measuring about $3\frac{1}{2} \times 4$ ft., reflects a weight saving of approximately 2 lb. over the conventional machine-milled counterpart.

In another skin panel, the material is removed from the non-critical areas by chem-milling, leaving cap material of sufficient gage to permit cut-counter-sinking of rivet holes for attachment of substructure. The conventional procedure introduces a weight penalty due to the heavier gage normally used, or local dimpling of thin-gage skin is done, with countersinking of mating part, resulting in inferior aerodynamic surface, it is said.

• **Duct skin.** In this application, chem-milling is used to save weight and eliminate skin dimpling, thus giving a smoother aerodynamic surface. Counter-sunk rivets are used in the heavy sections.

• **Leading edge skin.** This part is preformed in the soft condition, then heat-treated. Next step is to chem-mill for the weight-saving pockets. This gives a good aerodynamic surface and there is no localized dimpling.

USAF to Sell 750 Machine Tools

Air Force on Mar. 22 will publicly open bids received on 750 machine tools stored at its Departmental Industrial Equipment Reserve Storage Site No. 1, The Tumpane Co., Offutt AFB, Neb. Bid forms are being mailed out by the company and distributed at the site, where the equipment may be inspected Feb. 28 through Mar. 11.

Entrance can be obtained to the storage area by contacting James Hladek of Tumpane. Phone is Bellevue 2100, ext. 2237.

The tools include gear grinders, boring, drilling and milling machines, planers, gear shapers, lathes, welders and other items.



the man from Esso . . . the field service representative

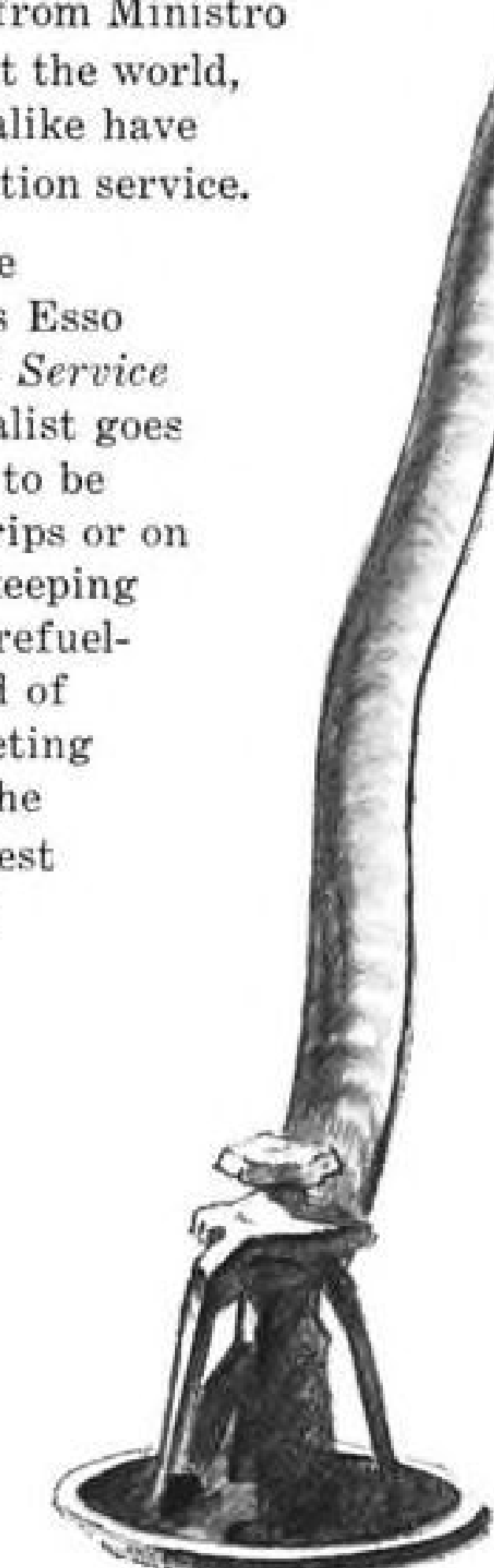
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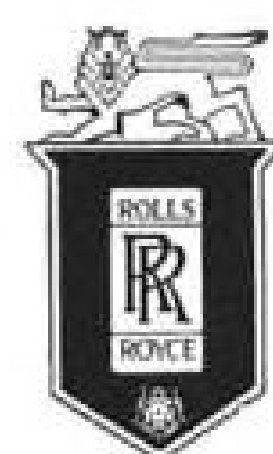
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IAS Summaries

The recent four-day meeting of the Institute of Aeronautical Sciences heard approximately 80 papers, ranging from Aircraft Design, Aeroelasticity, and Aerodynamics, through Structures, Stability and Control, and Meteorology.

AVIATION WEEK published in its issues of Feb. 14, 21 and 28 summaries of 35 of these papers. The series is continued here with publication of 10 more. Others will be published in subsequent issues.

Electronic Aids to the Aircraft Industry

(In Cooperation with the Institute of Radio Engineers and the Radio Technical Commission for Aeronautics)

► **Application of Electronic Simulation to the Development of Airplane Flight Control Systems.**—William R. Monroe, Chief, Flight Controls and Servo, Northrop Aircraft Co., Inc.

The paper discusses the application of simulation in the initial design stages which cover ideal linear systems and expected non-linearities.

The development progresses to use of the prototype system in breadboard form, together with simulation of the airframe, thus introducing real system non-linearities, noise, crosstalk, limiting, hysteresis, backlash, and live pilot inputs. A further phase employs the prototype system in the flight test airplane, including real conditions of installation and pilot inputs, but with the airframe performance simulated.

This results in "flying" the airplane on the ground. The final verification of the development is the "closed-loop" flight test of the complete airplane. Additional applications of the simulator as an aid to solving system problems as they arise in the field are discussed.

► **Analog Equipment for Processing Fluctuating Data.**—Francis B. Smith, Aero Research Scientist, Instrument Research Div., Langley Aero. Lab., NACA.

Experimental studies of buffeting, flutter, and atmospheric turbulence produce data not amenable to solution by the usual process of measuring or calculating precise values of static forces, pressures, moments, etc. Instead, where rapidly varying quantities are involved, it becomes desirable, or sometimes essential, to secure statistical analyses of the data in order to understand the phenomena being investigated.

The type of information often required from time-varying quantities are probability distributions, power spectral densities, and cross spectral densities. These analyses can be secured digitally but the large number of calculations required seriously limits the number of analyses that can practically be obtained.

NACA has developed electronic analog analyzers which make possible rapid and efficient processing of fluctuating data. Data from missiles, windtunnels, or airplanes are recorded on magnetic tape and played back into equipment which automatically plots the analysis required. This method

is not as exact as digital computation but the accuracy is usually well within the statistical reliability of the data sample being analyzed. The time required per analysis is a few minutes as compared to several hours required by other methods.

► **What Can Electronic Simulators Do for the Missile Designer.**—Floyd E. Nixon, Chief of Simulation, The Glenn L. Martin Co.

Electronic simulators and automatic computers are becoming of increasing importance to missile design. As the machines are very expensive and their utilization increases rather than decreases engineering staffs, the economic justification for these machines must be firmly established. It is not sufficient that they quickly perform routine calculations, but their most important application is in the stimulation of creative thinking in the synthesis of the missile system design.

A typical missile design problem is discussed. First, general types of control laws are investigated; then, more detailed problems are studied when the characteristics are better defined. Problems which occur as a result of flight test performance also can be evaluated on the simulators so that an improved design will result, in many cases in the very short time available between successive missile flight tests.

► **The Simulator Modification Problem.**—Richard C. Dehmel, Chief Engr., Electronics Div., Curtiss-Wright Corp.

The anticipated life history of future simulators is outlined. Author reviews their use as (1) research tools for system planners, (2) aids to new cockpit, instrument and control design, (3) media for initial

crew qualification and (4) means for recurrent proficiency training.

Simulator applications determine their fidelity criteria and equipment design. Changes in simulator application, and changes in the parent aircraft may generate requirements for simulator modification.

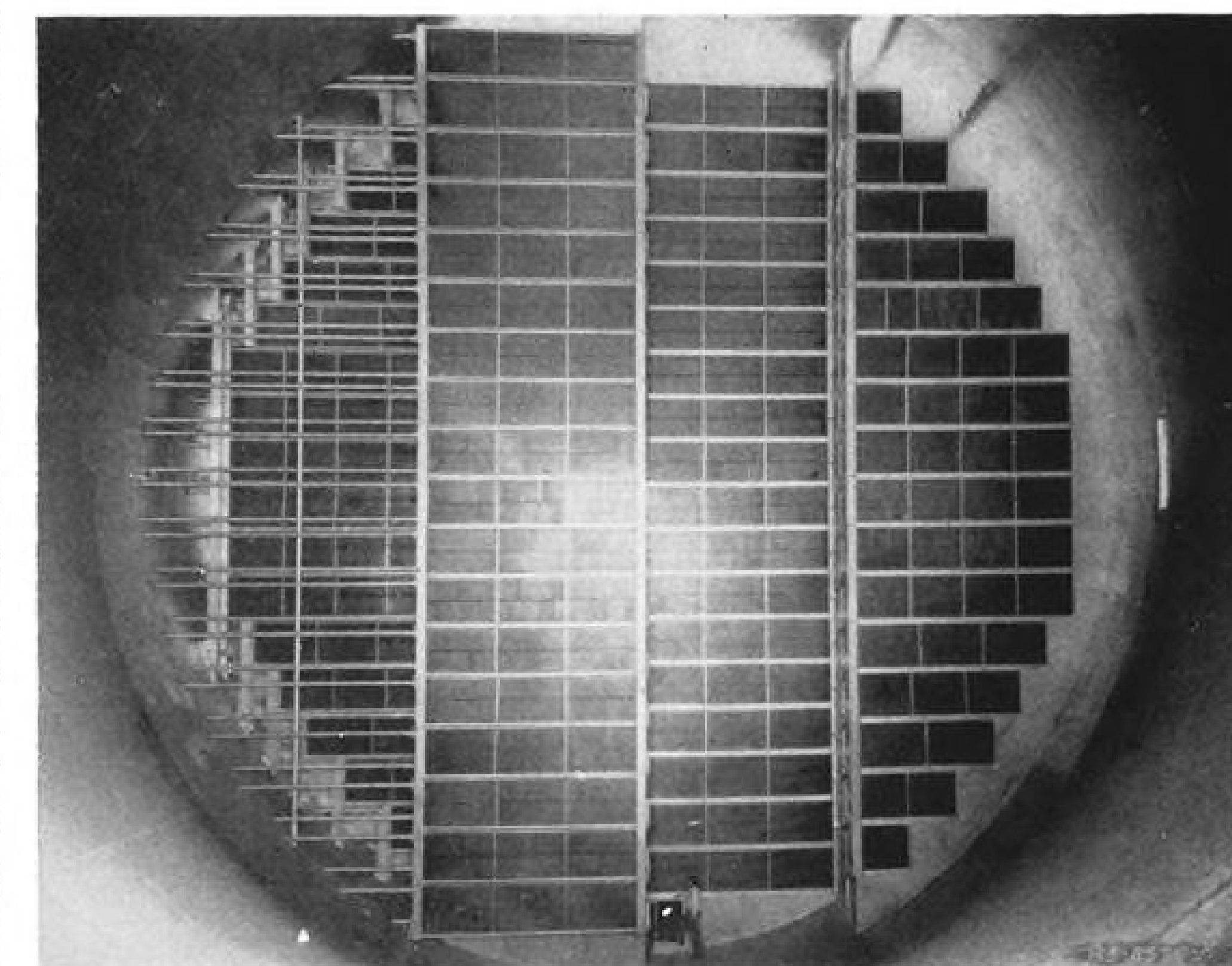
Typical aircraft design changes are examined in relation to the problems of simulator modification and their solution. Engineering and manufacturing cost breakdowns and time schedules are given for a new simulator and for modification programs. The effect of computer type equipment (e.g. digital or analog) on ease of conversion is discussed. Factors favoring field or factory conversion kits or replacement units are outlined. The role of standardization, citing examples, is illustrated as a means of time and cost reduction in conversions.

Aerial Surveying, Photographic and Electronic

(In Cooperation with the Institute of Radio Engineers and the Radio Technical Commission for Aeronautics)

► **The importance of Aircraft in Map-Making and Exploration.**—Virgil Kauffman, Pres., Aero Service Corp.

Few people, even those closely associated with aviation, appreciate the importance aircraft play in the preparation of maps of many types throughout the world. Aerial cameras with the precision of the finest instruments, together with new-type lenses and sensitive photographic materials installed in aircraft, are the foundation for



Colossal Cooler

This 80-ft.-diameter section is the after-cooler of the newest supersonic windtunnel now under construction at NACA's Ames Aeronautical Laboratory, Moffett Field,

Calif. Heat added to the circulating air in the tunnel by compression must be removed by these units, which will swallow 54,000 gallons of water per minute.

topographic maps with vertical accuracies as close as one-foot intervals.

During the past decade practically all cartographic work has been completed with airplane photography as a foundation. To accomplish this a number of companies throughout the world are flying with old World War II fighter and bomber ships constantly at altitudes as high as 35,000 feet.

Another aid to mankind in which aircraft participate as a primary instrument is in the worldwide search for minerals and oil by geophysical means. Special airborne instruments of various types and functions have been developed which are usually flown from very low altitudes. They indicate the probability of oil, but oftentimes point to deep underground deposits of minerals. The largest mineral deposits of great commercial value found both in the United States and Canada in the present century have been located from records obtained in aircraft flying at altitudes averaging 500 feet above the terrain.

Other instruments have been developed for airborne use—for detection of radioactive outcrops; the success in our country in finding many radioactive deposits may be attributed again to low-flying aircraft with special instruments aboard.

The paper discusses the growth of this amazing industry and the extent of the far-flung operations at the present time, together with the many inadequacies of the aircraft which are being used for these purposes.

► Problems of Aircraft Construction for Electronic Magnetometer Survey or Detec-

tion.—H. C. Wroton, Head, Magnetic Gr., Electronics Dept., Glenn L. Martin Co.

The airborne electronic magnetometer dramatically illustrates the need for a "systems engineering" approach in achieving a successful and satisfactorily operating installation through careful integration of conflicting design requirements.

This extremely sensitive device is designed to detect minute changes in the magnetic fields in which it operates—generally the field of the earth in a local area. Because of its great sensitivity, the magnetometer also detects the fields generated by magnetic parts and electrical conductors, including airframe structural parts. Methods for neutralizing the interference caused by the aircraft are difficult to apply and involve lengthy and costly tests, as well as continuing maintenance. Considerable airframe structural modification is frequently required.

Design information has recently been accumulated which, if applied in the early stages of aircraft design, can greatly reduce the time and cost required to obtain a good magnetometer installation. The scope and nature of the information presently available are presented in this paper.

► Effects of the Systems Approach on Reconnaissance Equipment Design. — Irving Doyle, Mgr., Systems Div., Fairchild Camera and Instrument Corp.

Equipment design under a systems concept requires extensive consideration of overall system and component performance, and must be based on a compromise of the best features of each subsystem. Converse to adding complexity, it is usually a

requirement to reduce complexity—so reducing weight and increasing reliability.

New approaches to component design are needed to offer increased system flexibility without increasing complexity. Through the careful application of these principles and emphasis on optimizing the system, significant advantages have been gained in photo reconnaissance systems in terms of increased capability and performance, reduced weight, space and power requirements, and improved reliability.

Instrument Systems And Simplification

► Instrument Simplification.—Lt. Comdr. George W. Hoover, ONR, Air Branch.

This paper discusses the importance of presentation in the development of instruments, outlines the weaknesses of all instrumentation, states the types of presentation required for aircraft instruments and emphasizes that proper teamwork is required to design properly.

A methodology for design and development of proper aircraft instrumentation is given. This will prove that there is a logical and adequate solution to the instrument problem; that instrument presentation should be based on scientific principles, and that instrument flying training can be reduced to an absolute minimum.

► A Compass-Controlled Directional Gyro System for Today's Fighter Aircraft.—H. E. Treckell, Mgr., Aircraft Instrument Engrg., and Harold S. Whitehead, Supvr., Aircraft Navigation Instrument Engrg., General Electric Co.

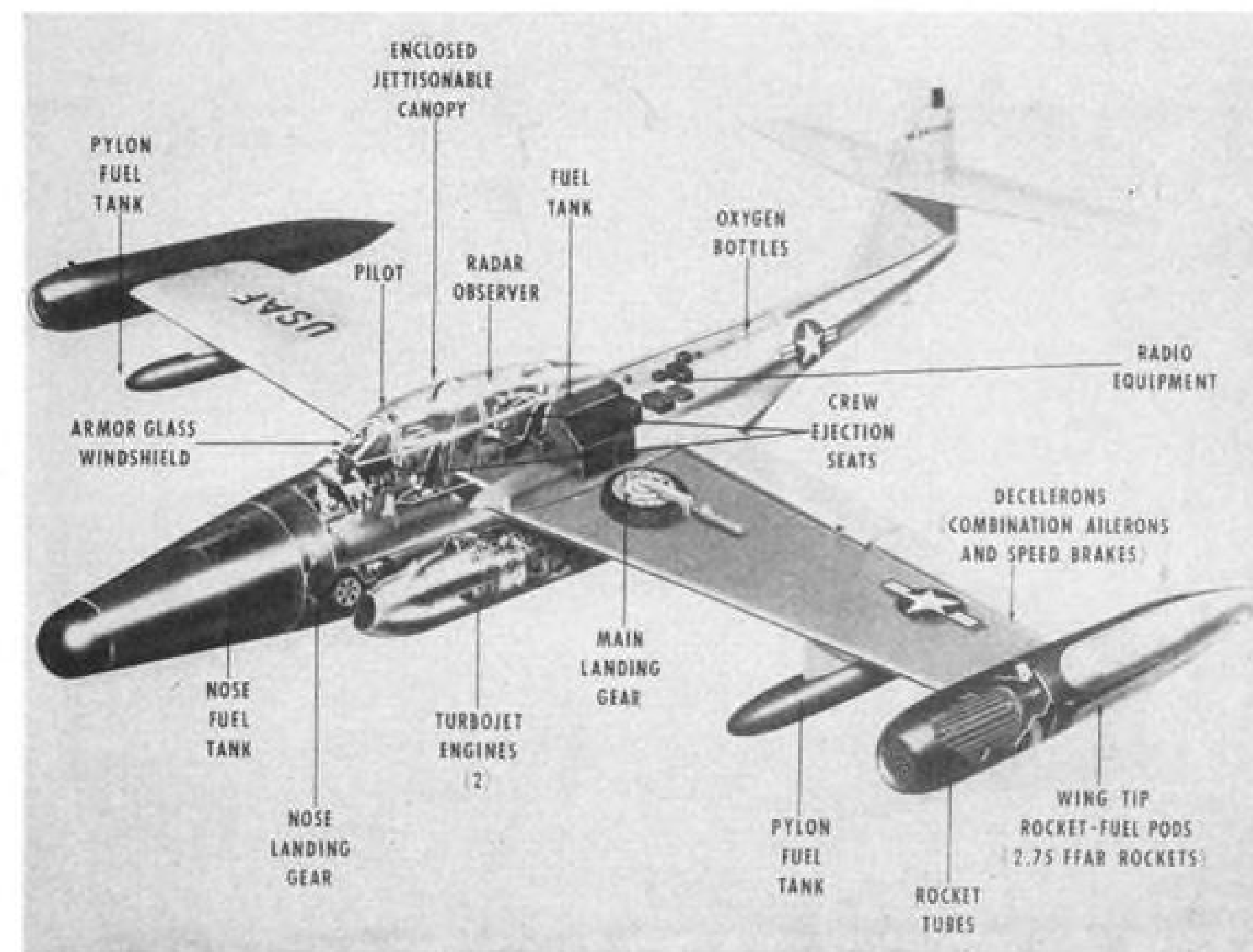
This paper presents a new compass-controlled directional gyro system meeting today's requirements for fighter aircraft.

The evolution of the compass system design is described from the design engineer's viewpoint as well as the operational requirements of the user. Discussed are representative design decisions and compromises of complexity, weight, size, reliability, and accuracy which must be made to obtain an optimum system which can be produced in quantity at a reasonable cost.

The added complexity of today's system to meet stringent specifications and operation requirements is noted.

► The Floating Integrating Gyro and Its Application to Geometrical Stabilization Problems on Moving Bases.—C. S. Draper, Head, Aero. Engrg. Dept., Dir. Instrumentation Lab.; W. Wrigley, Assoc. Prof., Aero. Engrg., Deputy Dir., Instrumentation Lab.; and L. R. Grohe, Proj. Engr. in Charge of Gyroscope Development, Instrumentation Lab., MIT.

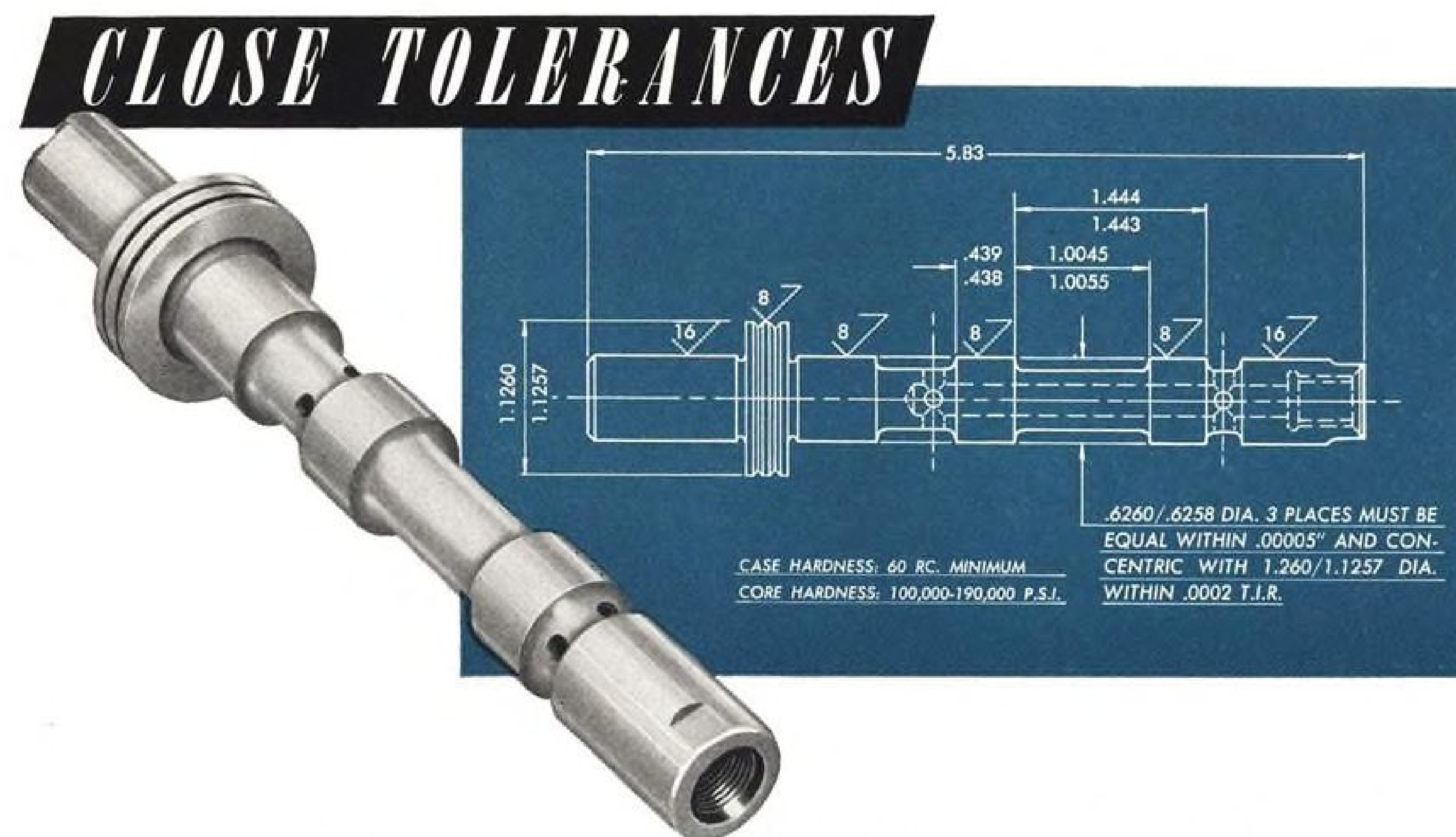
The basic problem of space integration from the fundamental laws of motion is discussed. This is followed by a generalized theory of gyro instrumentation with particular application to the single-degree-of-freedom integrating gyro. The integrating gyro. The integrating gyro is further discussed in its essential features and possible means of utilization with a servo drive as a method for instrumenting the space integrator. This is illustrated by data taken from laboratory tests of a gyro-monitored servo-driven turn table.



Inside the Northrop F-89D

Northrop F-89D Scorpion's hitherto unrevealed nose fuel tank, not carried by earlier versions of the longrange all-weather interceptor, is shown in this phantom view of the craft's interior. Internal details are also given of the plane's combination wingtip rocket-fuel pods. Powerplants are two Al-

lison J35-A-35 turbojets with afterburners. Electronic aiming and triggering equipment permits the crew to fire the plane's one hundred and four 2.75-in. folding-fin-rockets without seeing their target. F-89Ds are in service in Alaska (see story, p. 21) and with Air Defense Command.



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Compac Modules Head for Mass Output

By Philip Klass

Alexandria, Va.—Avionic equipment manufacturers soon will be able to buy Project Tinkertoy type modules in large scale quantities for the first time since their development.

By this Summer, a new million dollar ACF Industries facility here is scheduled to be turning out improved-type Tinkertoy modules at a rate of up to 400,000 units a month. By the end of the year, the facility is expected to be capable of producing at the rate of one million modules a month, ACF officials have told AVIATION WEEK.

(Modules produced by the original Navy-National Bureau of Standards automatic Tinkertoy factory, unveiled more than a year ago, have gone largely into sonobuoys as part of a field evaluation program.)

The new ACF "Compacs" (component packages) will consist of perhaps a dozen resistors, capacitors and other components, all suitably interconnected on a stacked ceramic module which equipment manufacturers need only mount and dip-solder to their printed circuit boards.

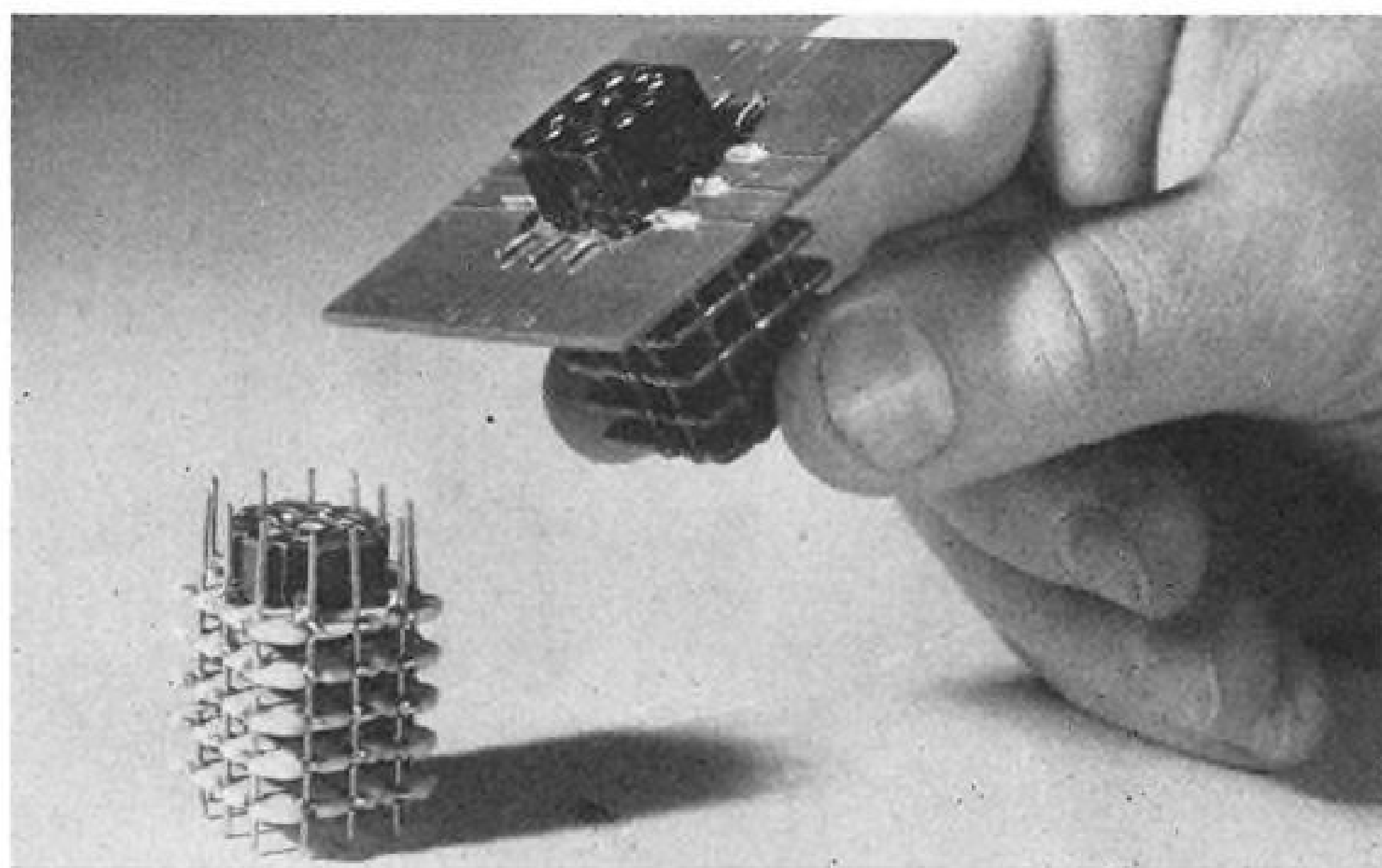
In quantities of 50-100 units, the new Compacs are expected to cost equipment makers no more than they now pay only for the unwired conventional components.

► **Industry Impact**—The new ACF facility could have a big impact on the electronic equipment and components industries.

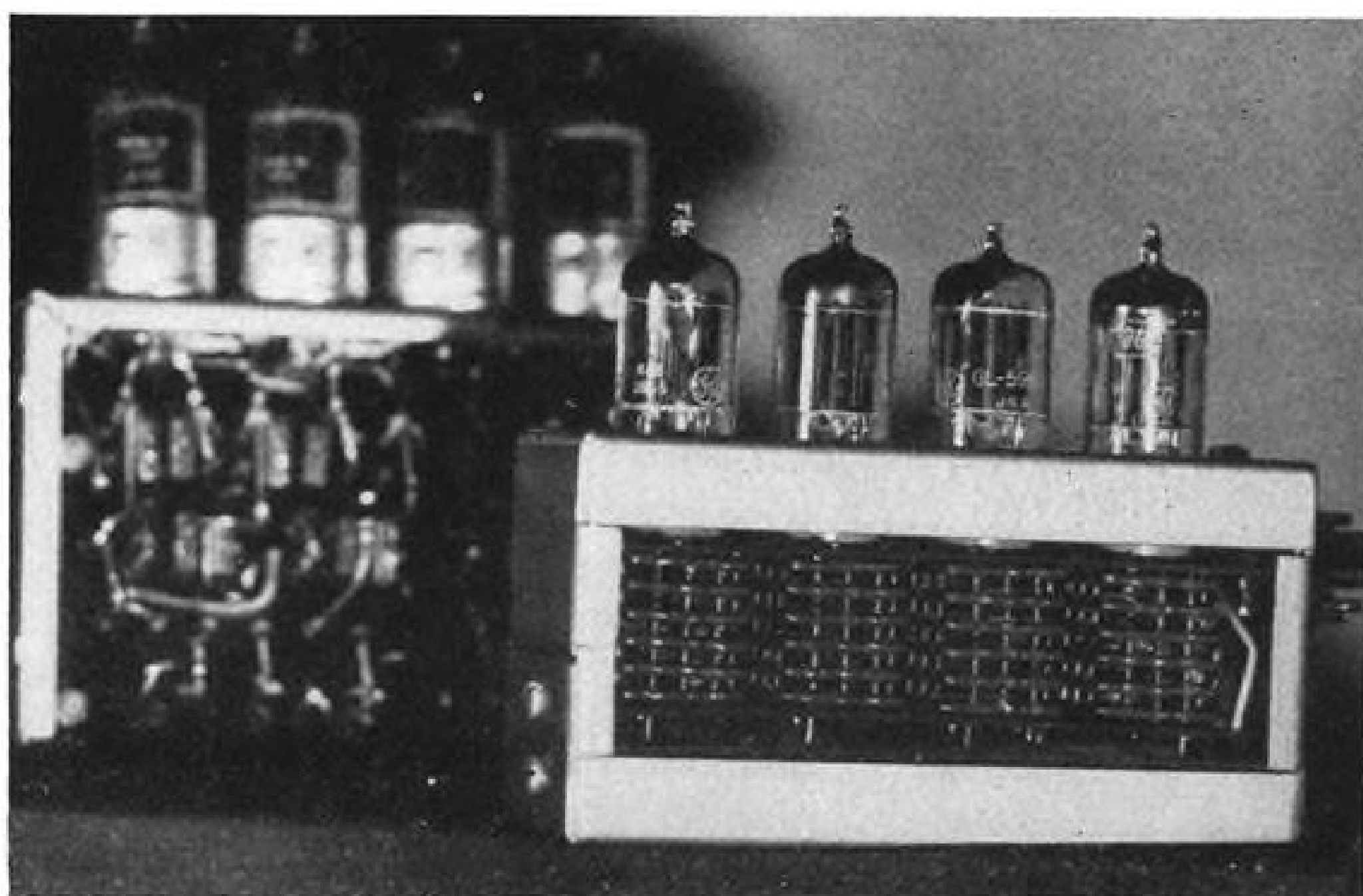
Although Project Tinkertoy created a big stir when it was announced, industry has not been quick to pick up the process. Primary reason is the high cost of setting up a Tinkertoy automatic factory and the fact that few equipment makers can absorb the full output of such a factory. (The modules can be built with hand fixtures, but few firms have seen sufficient advantages to this model-shop approach to justify conversion to the new technique.)

Now however, with a commercial source available, many equipment manufacturers can be expected to take a fresh look at the Tinkertoy module type of construction. This is particularly true of suppliers to Navy BuAer, which has announced a policy of encouraging its contractors to switch to this type construction wherever feasible (AVIATION WEEK Aug. 23, 1954, p. 23).

ACF's statement that it expects its



ACF's improved Tinkertoy module (right) employs new technique for attaching to printed circuit board. New module externally resembles original Navy-NBS module (left).



MODULE-IZED version of decade counter (front) is contrasted with conventional "rat's nest."

Compac to cost no more than the equivalent unwired components it replaces probably will cause some uneasiness in certain segments of the component industry.

► **Speculation Confirmed**—It has been slightly more than a year since ACF formed its electronics division at Alexandria under J. G. Reid, former head of electronics at NBS. ACF then hired the entire group of approximately 40 engineers and technicians from NBS that had worked on the Tinkertoy program, including Robert L. Henry, project engineer. Reid now is general

manager of the ACF electronics division; Henry is manager of its module manufacturing department.

At the time, AVIATION WEEK speculated that the company intended to set up a facility to produce Tinkertoy modules (Feb. 1, 1954, p. 11). However, company officials refused comment and until recently they have kept their activities pretty much under cover until AVIATION WEEK confirmed earlier speculation on Nov. 29, 1954 (page 68).

► **Busy as Beavers**—During the past year this staff, expanded several-fold, has been busy improving upon the

original NBS-Navy module, as well as designing and building new improved automatic machinery to produce Compacs.

The original module design had been essentially frozen when Korean hostilities broke out. New component materials and fabrication techniques which have been developed since that time are now being applied to the new Compacs.

To date, ACF has put some \$1½ million into its Alexandria operation, and the figure is expected to reach \$2 million by fall.

► **Compac Versatility**—New and improved types of resistors and high-temperature, high-Q capacitors developed by ACF enable the Compacs to "do practically anything that you can do with conventional components," Henry told AVIATION WEEK.

To show what can be done, ACF is experimenting with converting a variety of equipments to Compac-type construction. This includes such devices as a TV receiver, a 30-mc. intermediate-frequency amplifier with a 10-mc. bandwidth, a video mixer-amplifier, a decade counter, and a transformerless hi-fi amplifier, which ACF says has flat response from 7 cycles to 100 kc.

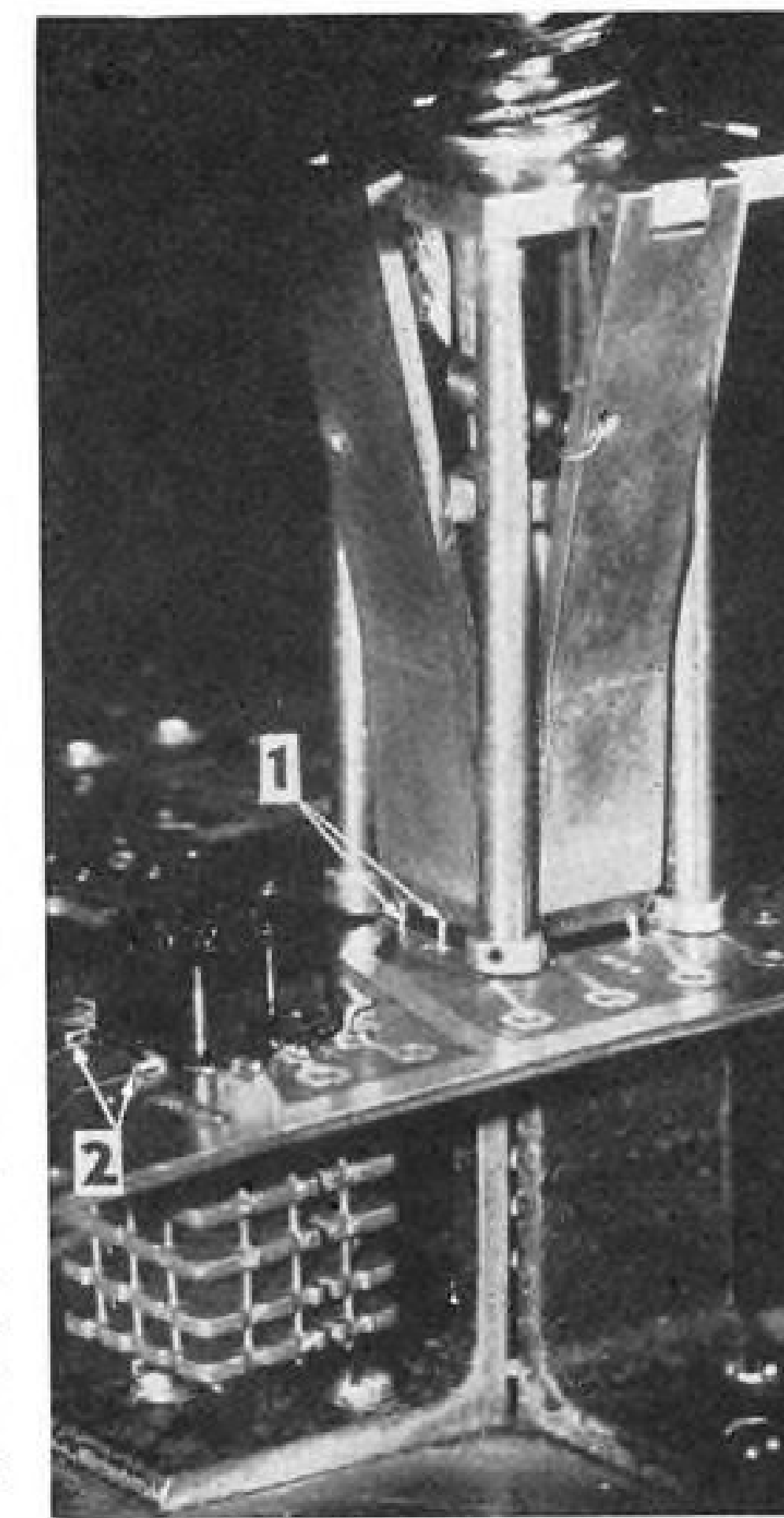
► **Wide Application**—ACF has made an analysis of 15 typical airborne avionics equipments to determine what percentage of each could be fabricated from Compac modules. The equipments ranged from devices with 11 to 472 electron tubes, with from 150 to 3,600 individual circuit elements. The analysis showed that in 14 of these equipments:

- 82% to 95% of the components were replaceable with Compac modules containing components produced in the Tinkertoy auto-factory, or others such as air-core inductors made elsewhere, which can be machine-mounted to the module plates.
- 2% to 9% of the components were massive types, such as electrolytic capacitors and selenium rectifiers, which were not suitable for module mounting.
- 1% to 9% of the components were panel-mounted and thus could not be included in the module.

In the case of the 15th equipment analyzed, possibly an airborne radar, only 68% of the components were suitable for module construction, 22% being massive-type components and the remainder being panel mounted.

► **Improved Modules**—In basic module construction, ACF has adhered closely to the original NBS-Navy design. Most noticeable external difference is that the module is coated (but not solidly encapsulated) with an epoxy resin to provide complete insulation of the ceramic wafers and external riser wires (which support the wafers and act as interconnections).

ACF has devised a new method of



ATTACHING module to printed circuit board is accomplished by tool which bends over riser wires to mate with printed circuitry. Unit is then dip soldered.

attaching the modules to printed circuit boards which appears to be well-suited to automatic machine assembly. Added advantage is that the module can be removed easily from the printed circuit board should replacement prove necessary.

In the new mounting procedure, the module tube socket and riser wires protrude through a square hole punched in the printed circuit board so that the top ceramic wafer rests securely against the underneath side of the board. A machine then bends over the 12 riser wires which clamps the module to the board (photo, above).

The riser wires mate with printed circuit connections which converge on the same hole. When all modules have been mounted, the entire unit then is dip soldered to secure the riser wires to the printed connections.

To prevent unwanted solder from adhering to the exposed wiring, it can be covered with a protective coating or the solder pot itself can be masked.

► **Better Resistors and Capacitors**—ACF has improved the characteristics of some of the original Tinkertoy components, developed some new ones to complement the older types.

• **Carbon composition resistors.** New ACF carbon formulation provides greater uniformity. Resistors are mounted on tape for ease of mechan-

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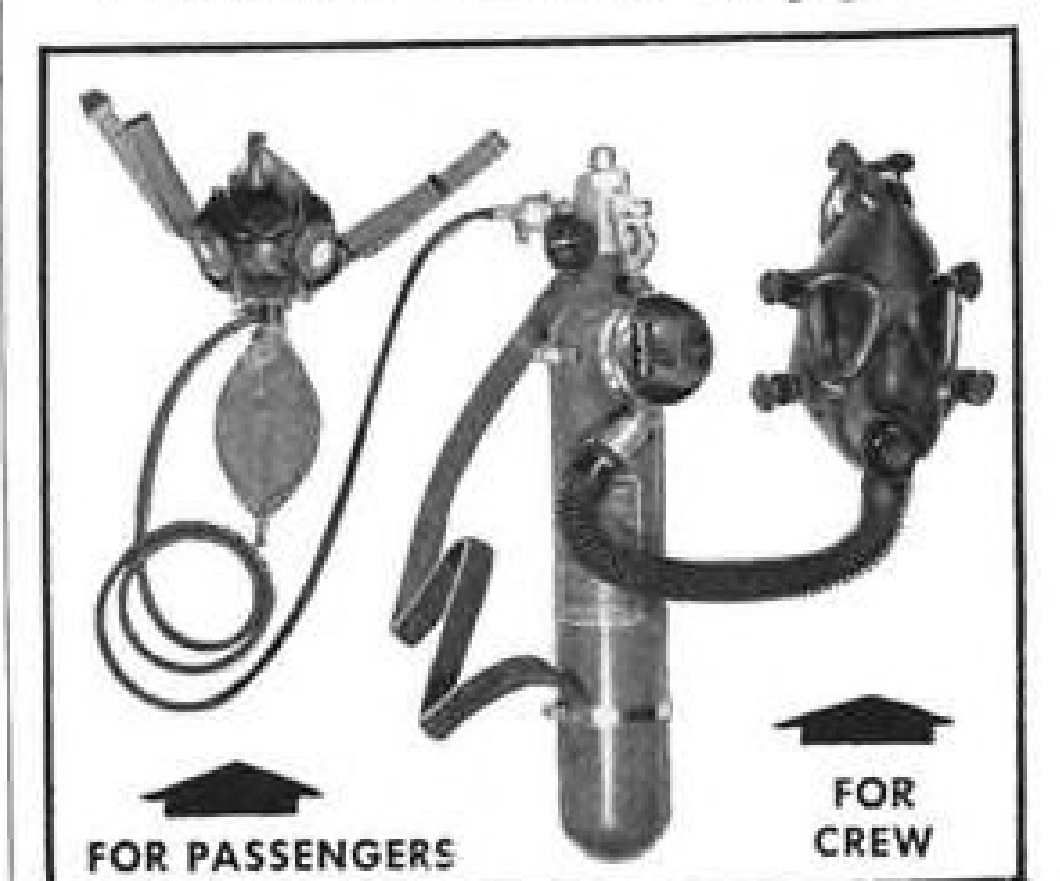
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ized handling. Units are available in 1-watt sizes (or 1- and 2-watt sizes by paralleling resistors), covering the range of 5 ohms to 10 megohms, to tolerances of 5%, 10% or 20%.

• **Precision resistors.** ACF is developing a cracked-carbon precision resistor, with accuracy of 1/2 to 1%, which it hopes to have in production in a year.

• **Printed ceramic capacitors.** This original Tinkertoy design, with an appreciable temperature coefficient which makes it useful in temperature-compensating circuits, is available in the range of 5 mmfd. to 0.01 mfd.

• **Mylar capacitors.** This new line of capacitors has a Q and temperature co-

efficient comparable to mica units up to temperatures of 85C, and makes a good replacement for paper capacitors up to 125C with little voltage derating, Henry says. Mylar capacitors will be available in the range of 2,500 mmfd. to 0.5 mfd., rated for 200-volt operation. In 400-v. rating, the top size presently is 0.1 mfd., slightly lower at 600 v.

• **Glass capacitors.** ACF is working with Corning Glass Co. in the development of glass capacitors with very high Q. Their temperature coefficient will be less than 150 parts/million/degree, and they can be used up to 150C, Henry says. The new glass unit will cover the range of 10 mmfd. to 0.01 mfd. in

New Tape Resistors

Two new pre-cured types of tape resistors, especially designed for experimental use with metal terminals to permit soldering onto printed circuits, are now available from Hansen Electronics Co.

The new TYPE RNP resistors, available in resistances of 100 ohms to 1 megohm, 5% or 10% tolerance, measure 1.3 in. long, 0.11 to 0.150 in. wide, including metal tips. Units reportedly meet temperature coefficient of MIL-R-11A, Characteristic F.

The smaller type RTW, designed for experimental use on Project Tinkertoy-type ceramic modules, measures 0.5 in. long, 0.110 to 0.150 in. wide, comes in resistances of 39 ohms to 4.7 megohms.

Manufacturer's address: 7117 Santa Monica Blvd., Los Angeles 46, Calif.

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300-v. ratings, with the top size of 0.0085 mfd. in 500-v. ratings, Henry reports.

Another new component is a square phenolic tube socket, which replaces the original circular one. The new socket was designed by Amphenol, under ACF sponsorship, for fully mechanized production. The socket has a small indexing notch to permit automatic alignment during module assembly.

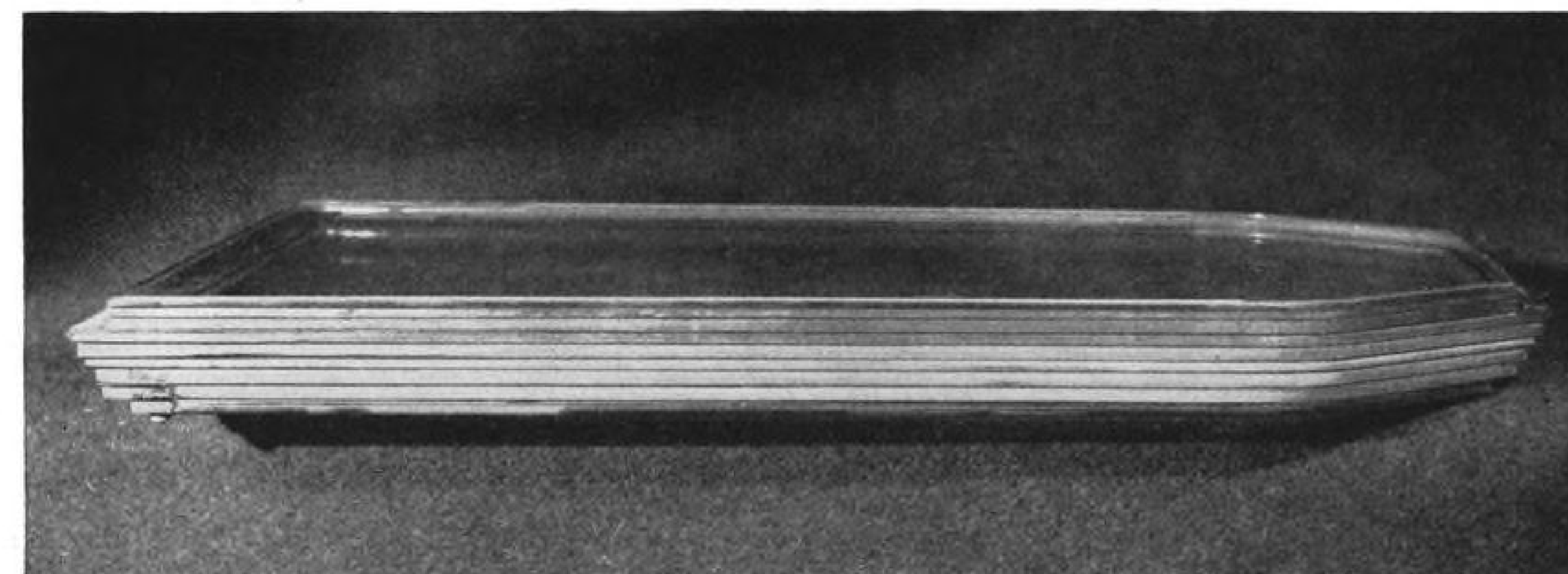
► **Secretive About Machines**—ACF officials are very secretive about details of the actual module factory and assembly line, declining to give AVIATION WEEK even a fleeting glimpse of the facility.

However, Reid says that the ACF line will be more fully automatic than the Navy-NBS Tinkertoy pilot plant unveiled more than a year ago, which was an eye-opener of automaticity.

The Navy-NBS plant had no provision for mechanized transportation of components from one machine to another; ACF may have mechanized this in its new facility.

Some of the machines will have "built-in feedback," Reid indicates. This suggests that some individual machines may be combined with automatic testers to enable them to take corrective action when something goes awry in the process. Reid adds that ACF currently has 32 projects underway to develop new processes and design new production mechanisms. Reid claims the ACF production line will be better balanced than the original NBS Navy plant, to prevent bottlenecks.

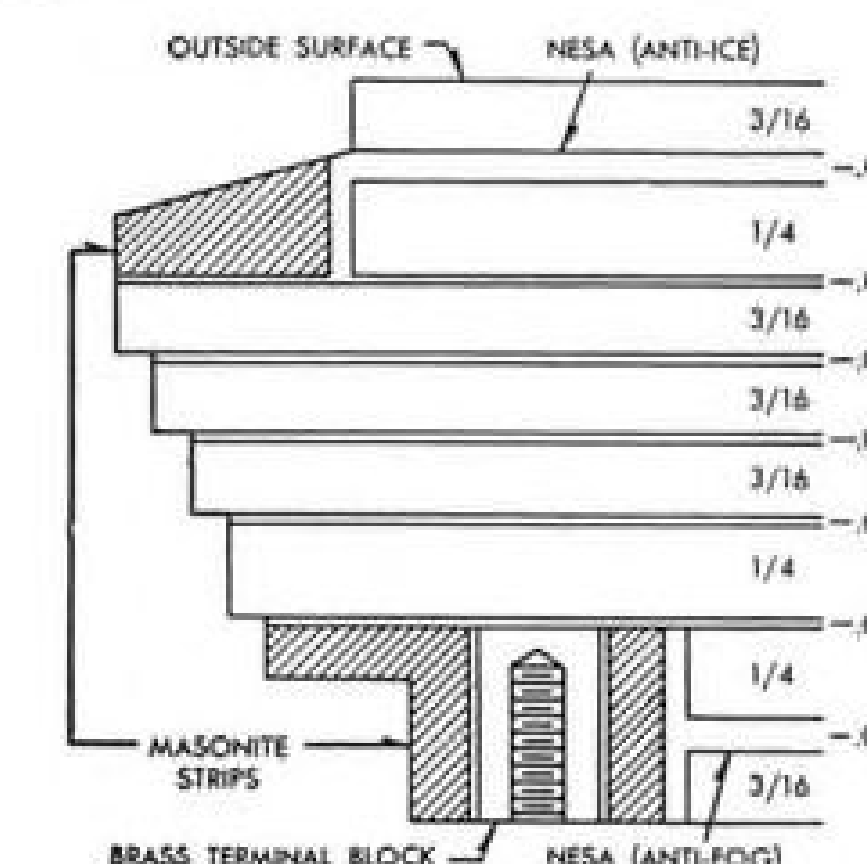
Also on the drawing board is a machine designed to automatically attach up to 15 Compac modules on a large printed circuit board (roughly the number needed for a TV receiver) at the



How electrically-heated Multiplate "NESA"® is used in the windshield of the Avro Aircraft CF-100



A report from THE PITTSBURGH AIRCRAFT GLAZING FILE



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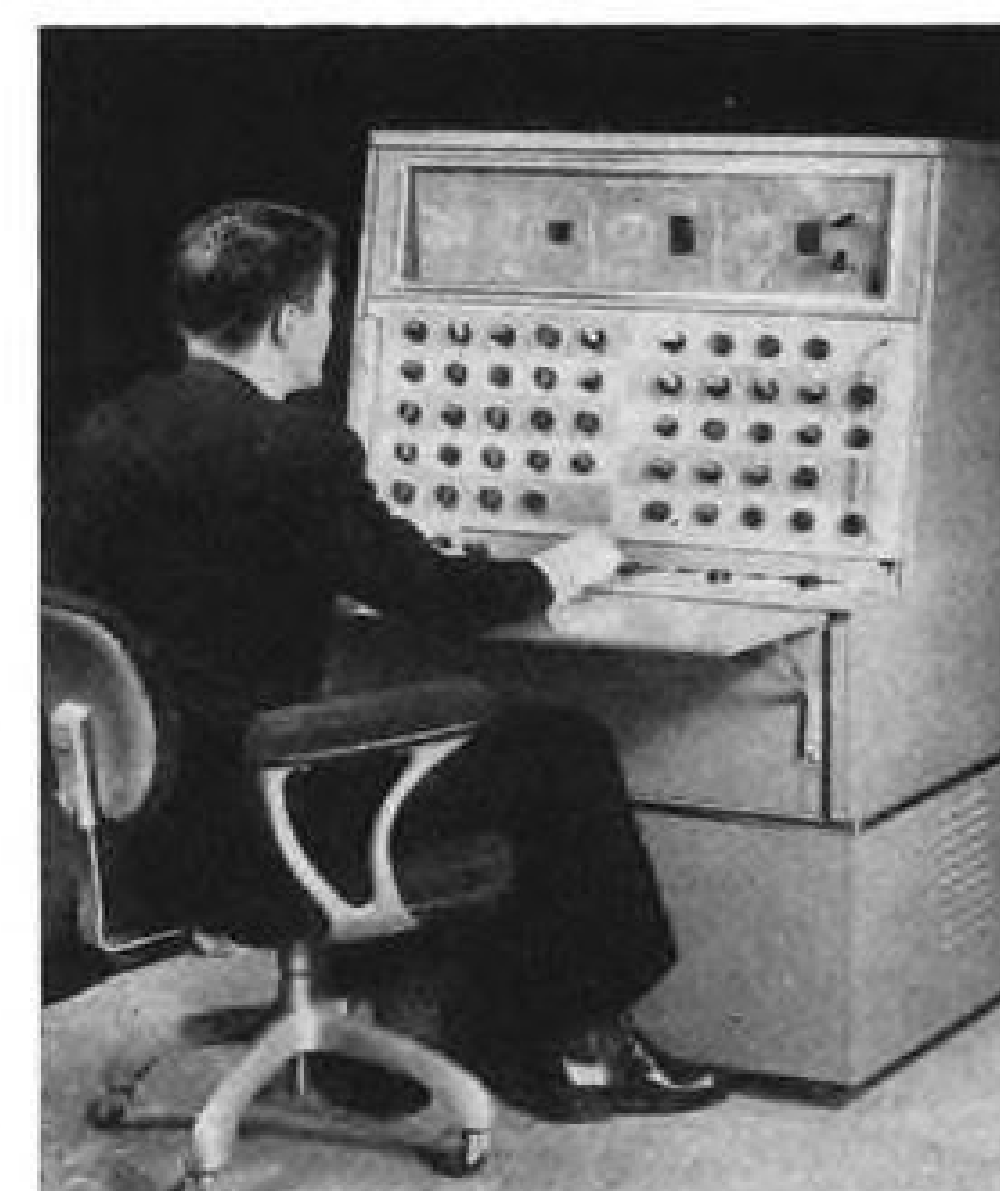
rate of 500 complete assemblies per hour. Although ACF officials say they are interested primarily in selling unmounted modules, they are willing to take on the added step of mounting on printed circuit boards if an equipment manufacturer so desires.

► **Smoother the Way**—ACF officials are eager to work with interested equipment manufacturers to help them convert equipments from conventional to Compac-module-type construction, training their engineers in the necessary techniques. Several outside firms already have brought in equipments for experimental ACF conversions.

The advantage of using Compac module construction may be economic, improved quality product, or a combination of both, Henry believes.

► **Bold Venture**—The Alexandria operation unquestionably represents a bold gamble for ACF Industries. However, with the TV receiver industry alone able to consume an estimated 90 million modules annually, ACF officials feel confident they'll have no trouble selling a large portion of their 12-million-module annual output, particularly when the military missile market is included.

In addition to the Compac module operation, ACF Industries' electronics division has two other departments. One, called Data Processing, under Ar-

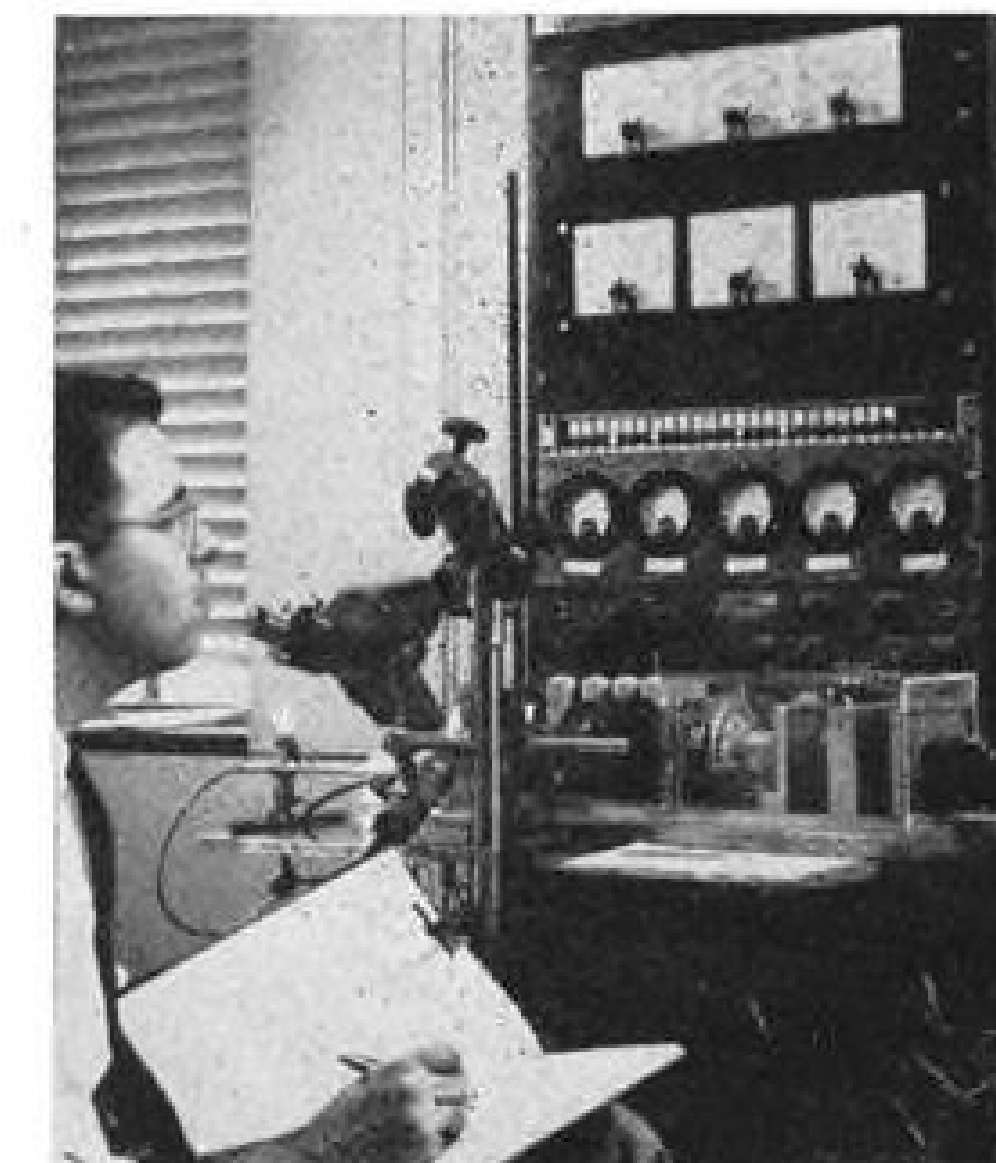


Aerodynamic Sliderule

New aircraft performance computer, designed specifically for use by aeronautical engineers, requires no special training because inputs are in a form familiar to airframe designers. Developed by Link Aviation, the new Aerolog Performance computer calculates such steady-state characteristics as rate of climb, maximum speed, lift coefficient, and climb angle. Computer, accurate to 0.1% full-scale, is quickly changed to new problems and can handle speed and weight inputs up to Mach 4.0 and 1 million lb. Link Aviation is located at Binghamton, N. Y.

nold Lesti, is developing speedy digital-to-analog and analog-to-digital converters.

The Instrumentation department, under W. A. Yates, presently devoting much of its efforts to supporting the module manufacturing department, will eventually develop instrumentation devices.



'MR. METICULOUS' assembles transistors.

Bell Unit Automates Transistor Assembly

A new machine for mechanized assembly of junction transistors, which automatically performs a series of 15 operations including tests of electrical characteristics, has been developed by Bell Telephone Labs.

The new device, called "Mr. Meticulous," can assemble a four-element (tetraode) transistor in less than one minute. The machine is designed for laboratory use.

► **What It Does**—Here is what Mr. Meticulous does: A tiny n-p-n sandwich of germanium is placed in a machine clamp, then a thin strand of gold wire is pressed against one end of the germanium pellet.

The machine edges the wire along the pellet, in minute steps of 1/20,000-in., making electrical measurements after each step.

When the center base layer is reached, the machine automatically measures its width, rejects the pellet if its thickness exceeds tolerances.

If the pellet passes this test, the machine retraces its step to the other side of the central base layer and counts forward a predetermined number of steps. At this point, a charge of electricity bonds the gold wire to the pellet, then the machine attaches the other end of the wire to one of the transistor base pins.

The pellet of germanium is then rotated end-over-end and the same series of operations is repeated.

Finally, the machine runs a series of electrical tests to check transistor operating characteristics. If the unit fails any one of these tests, it can be automatically rejected, BTL says.

New Device Doubles Recording Rates

Highspeed, direct-writing recorder, capable of reproducing signals with frequency components as high as 500 CPS, now as possible through a device developed by the American Chronoscope Corp., New York.

The system will be used to measure magnitude of forces and accelerations experienced in new designs of aircraft and engines.

Present models can mark the recording paper at rates of 5,000 marks per second. In the new device, called "Electro Inker," repetition rates reach as high as 10,000 marks per second.



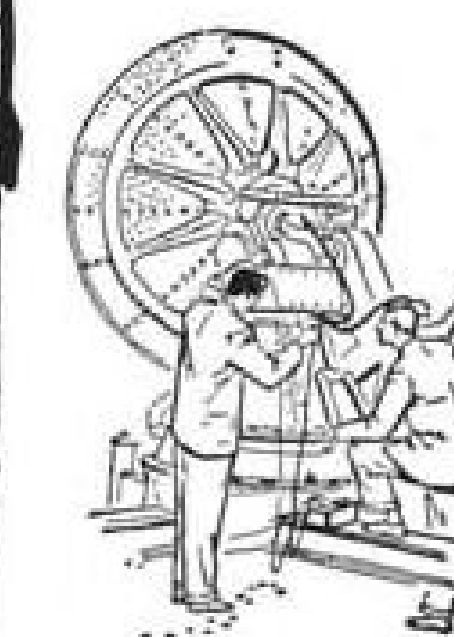
► **Cause of Tacan Troubles**—Two out of every three failures of the military Tacan navaid system are caused by faulty vacuum tubes, a Navy spokesman tells AVIATION WEEK. Excessive failures lead observers to conclude that some tubes may be operating too close to design limits. Troubles are fairly evenly divided between ground and airborne equipments.

► **Common Avionic Power Supply**—Navy aircraft of the future may have a commonplate B+ power supply serving all of a plane's avionic equipment, to eliminate need for each individual equipment to carry its own. Navy is taking first step by talking with avionic equipment manufacturers to see if it is feasible to standardize on a few B+ voltages, instead of the dozens now found.

► **Oops**—Despite major strides in miniaturization made by the avionics industry, not even Lear can build an 800-channel VHF transmitter-receiver which weighs "25 lb. including inverter," as reported in the Jan. 31 issue. The 25-lb. weight does, however, include the inverter.

► **Stacked Tube Improved**—Sylvania Electric has improved its new ceramic stacked tube to the point where it weighs 60% less and has operational characteristics (including inter-electrode capacitance) equivalent or superior to its glass-envelope mil equivalent, a company official reports. Tube can be operated at 300-400C and is extremely

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rugged and long-lived. Life tests at room temperature show that G_m drops only 10% after 2,000 hours operation, only 25% after 7,000 hours. Lack of funds has forced BuShips to drop plan for Sylvania to build service-test quantities for field evaluation. With the crying need for long-lived high temperature tubes, this appears regrettable.

► **Transistorized Radar**—Navy BuAer's electronics division reportedly is considering the transistorization of a fire control radar in order to cut overall system weight.

► **Copter Autopilot Philosophy**—Current thinking at Navy BuAer is that helicopter manufacturers are in a better position to system-engineer a helicopter autopilot, using components and sub-assemblies purchased from established autopilot makers. Philosophy is based on fact that weight is a more critical consideration than in fixed-wing aircraft, thus requires even closer integration of autopilot and control system. Autopilots developed by Bell and Sikorsky use components made by Lear and Kearfott.

► **Automatic Punch for Printed Circuits**—A new RCA tape-operated machine designed to punch automatically any desired pattern of holes in printed circuit boards offers significant savings in time and cost. For quantities of over 1,000, RCA says the machine operates at 1/20 the cost of conventional punch-die techniques, and 1/80 the cost of drilling. Machine can handle printed circuit boards up to 6x17.6 in. in size. New taped instructions are easily prepared and can be installed in the machine in only three minutes, RCA says. The automatic punch machine is expected to sell for around \$14,500. —PK

New bulletins and brochures of interest to persons in the avionics field include the following:

- **Antenna design calculations** for determining field patterns and synthesis of antenna arrays are described in Laboratory Report No. 14. (6 pp.) Technology Instrument Corp., 531 Main St., Acton, Mass., or P.O. Box 3941, No. Hollywood, Calif.
- **Precision wirewound resistors**, impregnated, available in 0.1 to 2-watt sizes, 0.1 to 1,000-ohms, 75 to 2,000 v., are described in Bulletin L-35. Use letterhead. Shallcross Manufacturing Co., Collingdale, Pa.
- **Precision phase meter**, Model P-1060, for measurement of phase difference at audio frequencies. Bulletin 950. (4 pp.) W. L. Maxson Corp., 460 W. 34th St., N. Y. 1, N. Y.
- **Digi-Coder**, complete line of digital converters for changing shaft position or electrical analog voltages into digital code, is described in Cat. 58-10. (12 pp.) Fischer & Porter Co., 302 Jacksonville Road, Hatboro, Pa.
- **Aircraft instrument simulators**, in a variety of types, have identical appearance to those used in aircraft, but are activated by electro-mechanical means instead of by natural forces (pressure, temperature, etc.) (4 pp.) Link Aviation Inc., Binghamton, N. Y.



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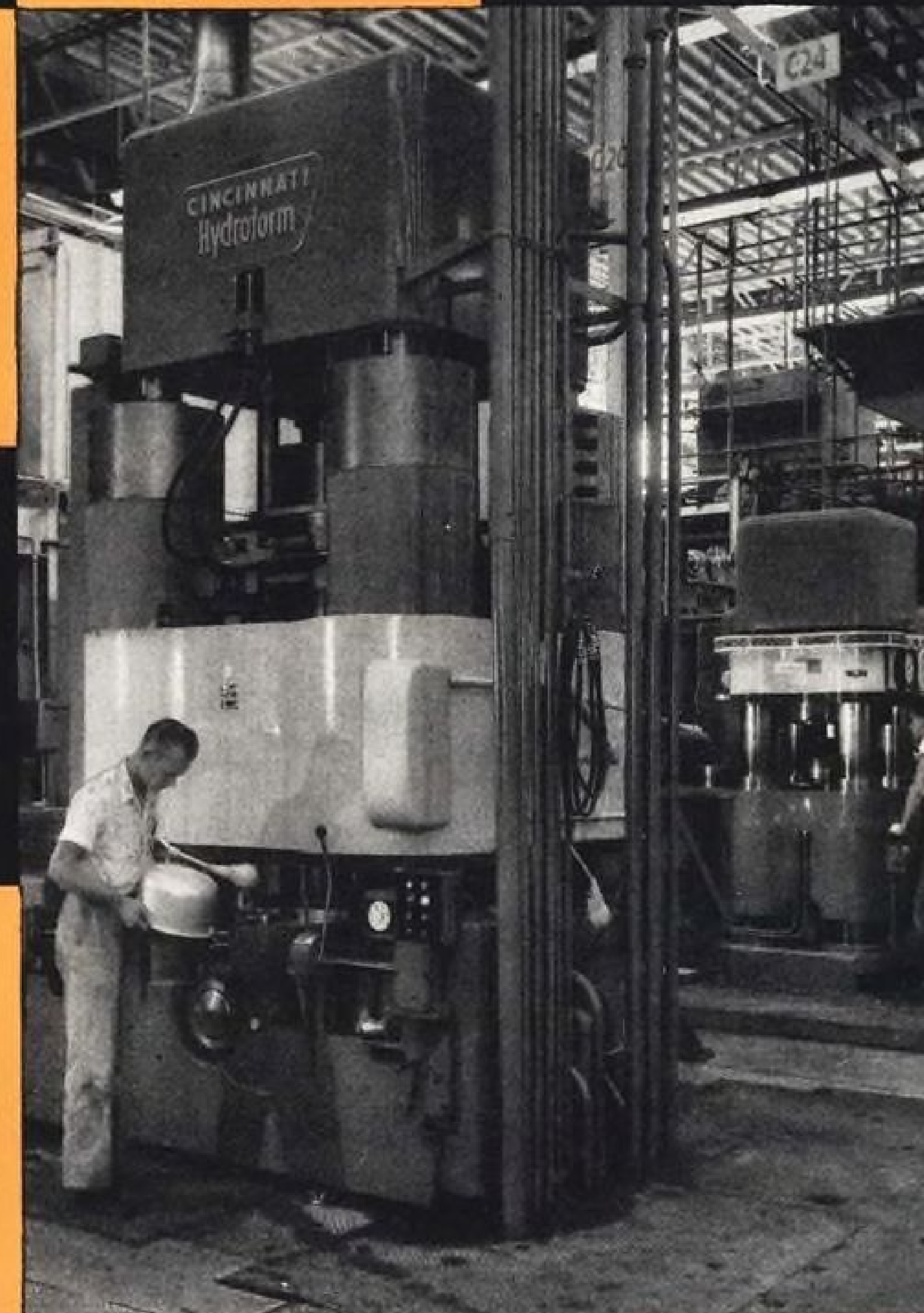
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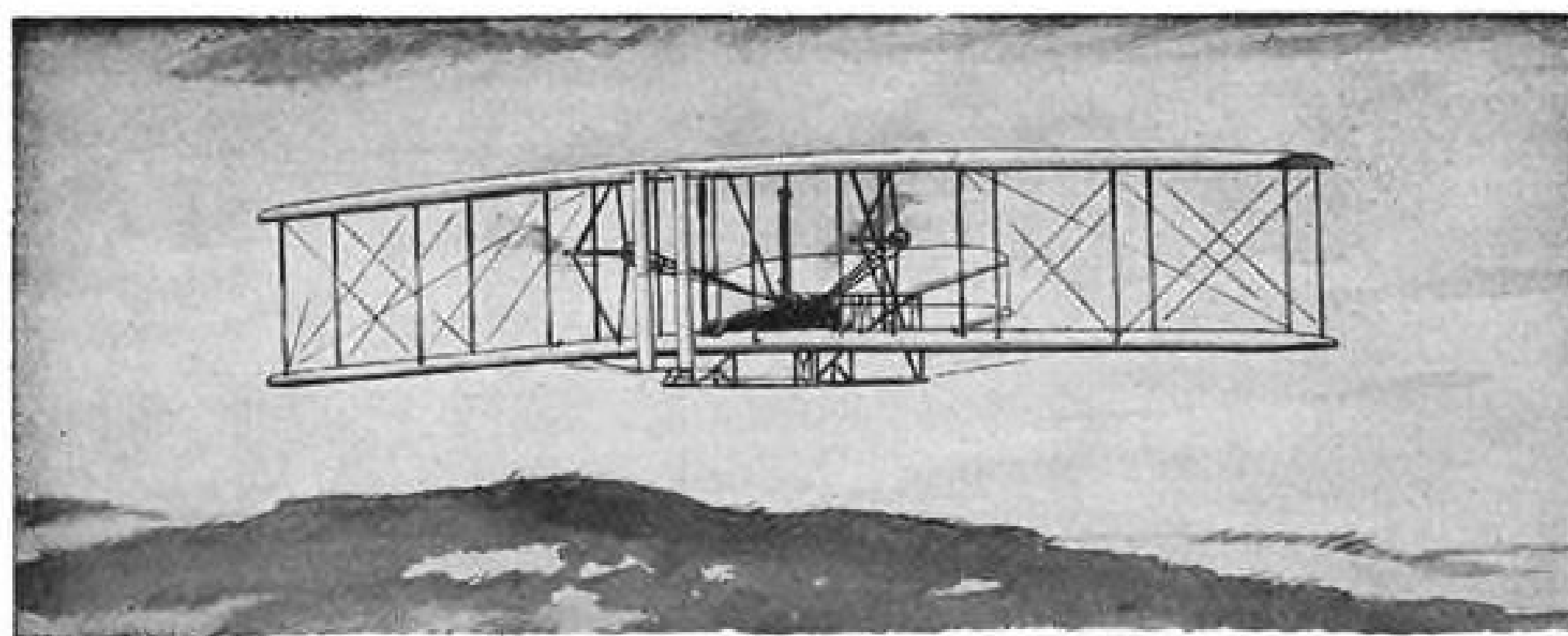


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AVIATION CALENDAR

- Mar. 8-10—Air Line Pilots Assn., third annual safety forum, Shoreland Hotel, Chicago.
- Mar. 11—Institute of the Aeronautical Sciences, National Flight Propulsion Meeting (restricted), Hotel Carter, Cleveland, Ohio.
- Mar. 14-16—Society of Automotive Engineers, production meeting and forum Netherlands Plaza, Cincinnati.
- Mar. 14-18—American Society of Tool Engineers, first Western Industrial Exposition, Shrine Auditorium and Convention Hall, Los Angeles.
- Mar. 20-23—Aero Medical Assn., 26th annual meeting, Hotel Statler, Washington, D. C.
- Mar. 21-24—Institute of Radio Engineers, national conference, Waldorf-Astoria Hotel, Kingsbridge Armory, New York.
- Mar. 29-Apr. 1—American Society for Metals, ninth Western Metal Exposition and Congress, Pan Pacific Auditorium and Ambassador Hotel, Los Angeles.
- Mar. 31-Apr. 1—Symposium on Boundary Layer effects in Aerodynamics, Britain's National Physical Laboratory, Teddington, England.
- Apr. 5-7—Radio Technical Commission for Aeronautics, spring assembly and joint meeting with the Institute of Radio Engineers, Los Angeles.
- Apr. 6-10—World Plastics Fair & Trade Exposition, National Guard Armory, Los Angeles.
- Apr. 13-15—American Society of Lubrication Engineers, 10th annual meeting, Hotel Sherman, Chicago.
- Apr. 14-15—American Ordnance Assn., symposium of Proving Ground Instrumentation Committee, Patrick Air Force Base, Florida.
- Apr. 16-20—American Association of Airport Executives, 1955 annual convention and business meeting, El Conquistador Hotel, Tucson, Ariz.
- Apr. 18-21—Society of Automotive Engineers, Golden Anniversary Aeronautic Meeting, Aeronautic Production Forum and Aircraft Engineering Display, Hotel Statler and McAlpin Hotel, New York.
- Apr. 18-21—American Society of Mechanical Engineers, Diamond Jubilee spring meeting, including four aviation sessions, Lord Baltimore Hotel, Baltimore.
- Apr. 20-22—American Rocket Society, spring meeting, Baltimore.
- Apr. 27-29—Society for Experimental Stress Analysis, spring meeting, Hotel Statler, Los Angeles.
- Apr. 27-30—American Helicopter Society, 11th annual forum, Hotel Mayflower, Washington, D. C.
- Apr. 29—Eastern regional meeting of Institute of Navigation, Friendship Airport, Baltimore, Md.
- Apr. 29-30—New England radio-electronics meeting, sponsored by Boston and Connecticut Valley sections of IRE, Sheraton Plaza Hotel, Boston.
- May 2-5—Society of Aeronautical Weight Engineers, national conference, Hilton Hotel, Ft. Worth.
- May 4-6—Fourth International Aviation Trade Show, 69th Regiment Armory, New York.

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Marietta, Georgia

EQUIPMENT

Two New Floats Pass Amphibian Tests

Cessna 180 and de Havilland Beaver operators will soon have available new amphibian floats designed to increase the utility of these single-engine aircraft.

Following successful tests of the new double-duty landing gear here and in Canada, the Cessna floats are now in pilot production and will be available to purchasers in May; the de Havilland-modified gear is being readied for production early this summer.

• **Cessna 180 floats**, developed by Edo Corp., College Point, L. I., N. Y., are a modification of the 180's standard Edo 249-2870 seaplane floats. The new gear is designated 289-2700, the last four digits representing the pounds-displacement of each float. Price is \$7,775 a pair, uninstalled, compared with the \$3,995 cost of standard floats. Installation takes two men one day.

• **De Havilland Beaver floats** are modifications, by the aircraft firm, of a set of Edo 4580 floats built by Edo's Canadian licensee, MacDonald Bros. Aircraft Co., Ltd. DH-Canada has not yet disclosed price of its amphibian gear.

► **Small Payload Penalty**—Both of the new amphibious landing gears are stated to inflict only negligible penalties on established performance.

Edo says that the Cessna gear weighs only 150 lb. more than standard floats and the plane's 225-hp. Continental engine can handle this extra weight and still provide the plane with acceptable performance. Total weight of the 289-2700 floats is 528 lb., including all fittings, struts, bracing and the like. Removal of the normal strut landing gear subtracts 100 lb. from this figure.

As an example of amphibian performance, Edo states that the Cessna 180's climb rate is 985 fpm. at gross weight of 2,820 lb., with wheels retracted into the floats. With the wheels extended the climb rate is 870 fpm.

The amphibian gear is stated to require no special flying technique. Runway landings are said to be "unusually soft." The Electrol shock absorbers have 8½-in. stroke. Goodyear single-disk brakes provide excellent stopping qualities even immediately after exposure to water operation, Edo says.

De Havilland states that its amphibious Beaver suffers no measurable performance penalty when operating from the water. The plane is airborne in 900 ft. at gross weight in zero wind. In land operations, takeoffs and landings



CESSNA 180 amphibian can land in the water, extend its wheels and taxi up ramp.



DH BEAVER amphibian retracts main wheels into float bottoms, nosewheels over bows.

are said to be affected only slightly. Fully loaded, zero-wind takeoff requires only 700 ft., the company reports.

► **Design Details**—Although the two landing gears resemble each other in outward appearance, there are obvious points of difference technically.

• **Cessna 180 wheel retraction** is accomplished by two independent electro-mechanical operating systems—one in each float—which actuate the quadricycle wheels in five to six seconds. Normal current draw of the fractional horsepower motors is 11 amp., Edo tells AVIATION WEEK.

Each motor simultaneously retracts its bow and mainwheels through a screw-jack and run-around cable system. Initial movement unlocks the gear in either extended or retracted position.

The Scott nosewheels pivot up to the nose of the floats and form rubber bow bumpers to protect the floats in water operations. Some current shimmy difficulties with the nose gear are being ironed out satisfactorily, according to Edo.

Mainwheels are located behind the

float step in a hydrodynamic "dead spot," so require no doors to seal off their location, Edo states.

A red light in the cockpit signals when the gear is extended, to warn the pilot against making an inadvertent wheels-down landing in the water.

• **Beaver wheel retraction** is by hydraulic jacks at each wheel unit, operated by a hand pump and selector control in the cockpit. Both mainwheel and nosewheel systems have mechanical downlocks, automatically released at the retraction cycle. There is an indicator in the cockpit to show wheel position.

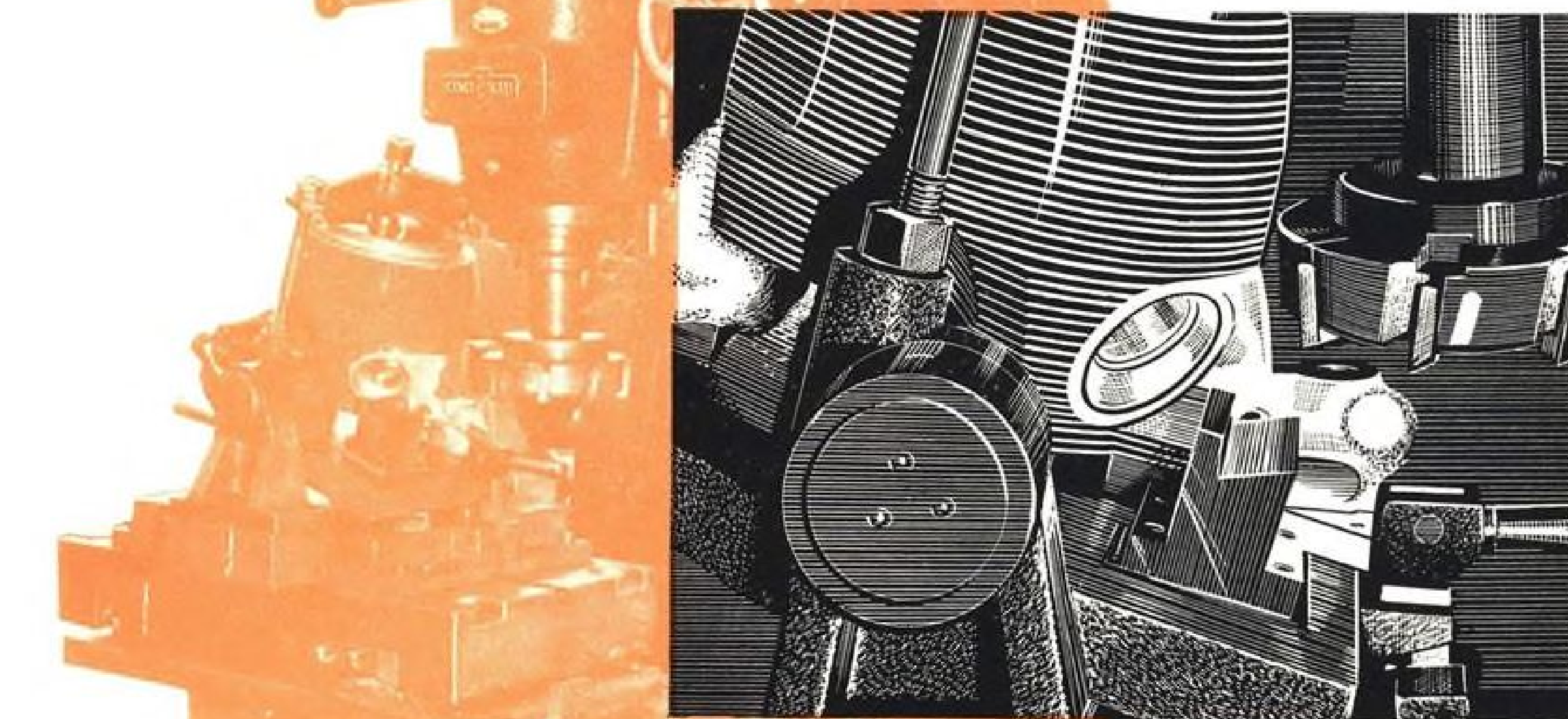
Mainwheels are suspended below the floats aft of the step on levered rubber shock absorbers and retract into wells in the float bottoms. Functioning components of the shock and retraction system are fully enclosed in the float shell and are not exposed to the water.

The free-swiveling nosewheels rotate over the float bows when retracting and project over the float decks. A centering lock is provided to prevent nose-wheel misalignment when retracted.

OK carbide cutter

OK MILLING CUTTERS IN THE AIRCRAFT INDUSTRY—NO. 7

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OK CARBIDE CUTTER. ON CINCINNATI VERTICAL FINISH-MILLS RIGHT ANGLES OF INTAKE AND EXHAUST PUSH ROD FACES, OF PRATT & WHITNEY AIRCRAFT WASP MAJOR ENGINE CLIMB-MILLING ONE AND CONVENTIONAL-MILLING THE OTHER

THE close tolerances specified by the aircraft industry are a challenge to the "world's most modern milling cutters" and the "world's most modern milling machines."

The picture shows one of thousands of milling machine operations. Note the tilting fixture which makes possible face and periphery milling, of both sides of the cylinder head.

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Blades are simple wedge-shaped blocks. (The wedge is world's strongest mechanical device). Blades once set, cannot move. Mated serrations prevent tipping and slipping, provide a scale for blade advancement to compensate for wear, reduce grinding to less than .005" per blade on cutters in which the fine adjustment feature is incorporated. No locks, blocks, screws, pins or gibs are needed.

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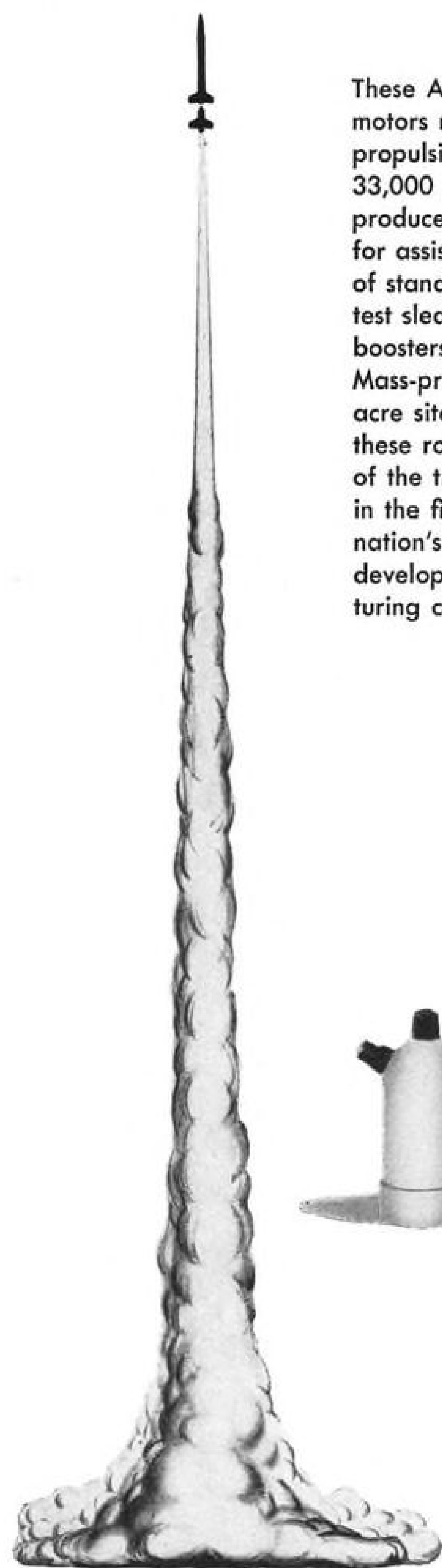


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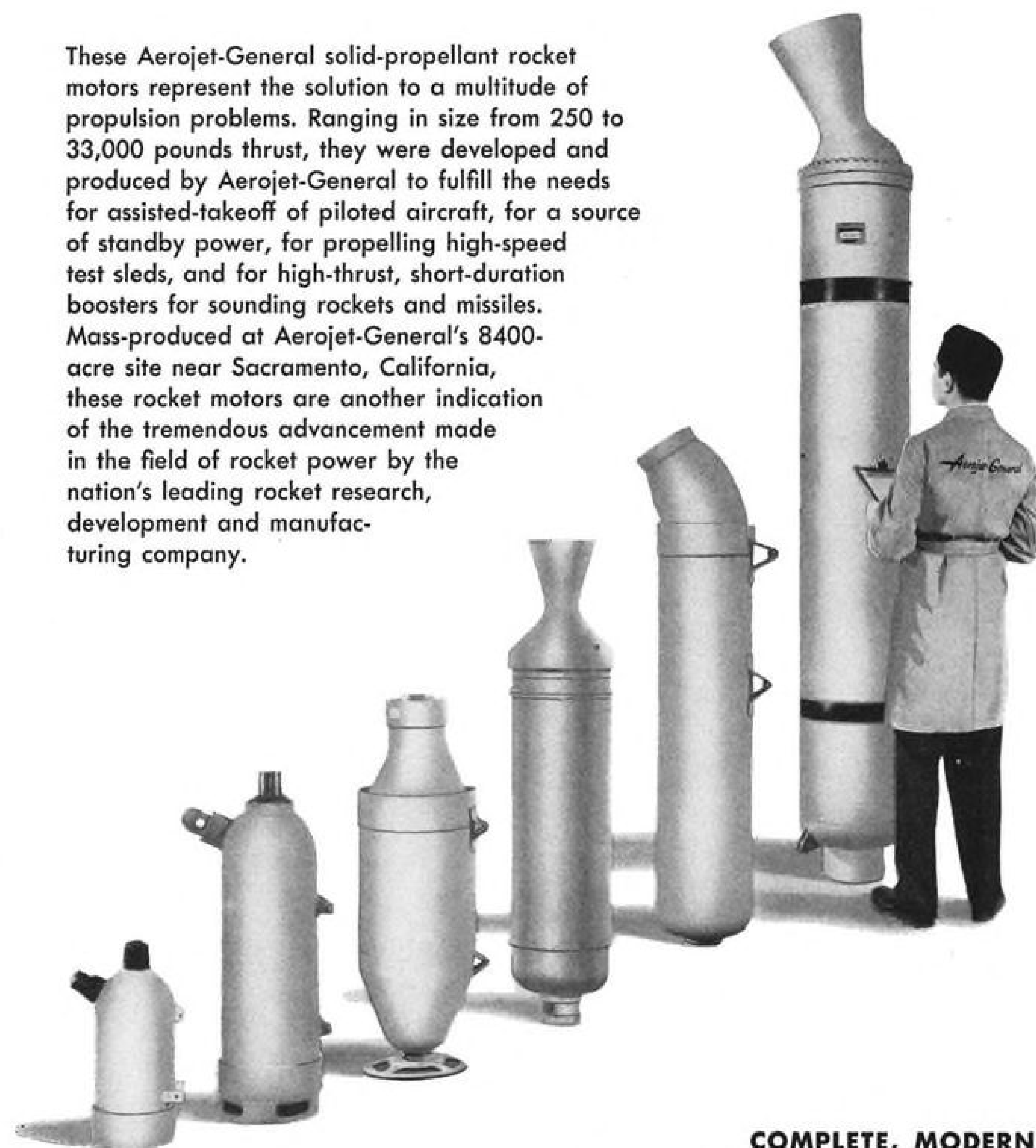
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THE OK TOOL COMPANY INC., Milford, New Hampshire

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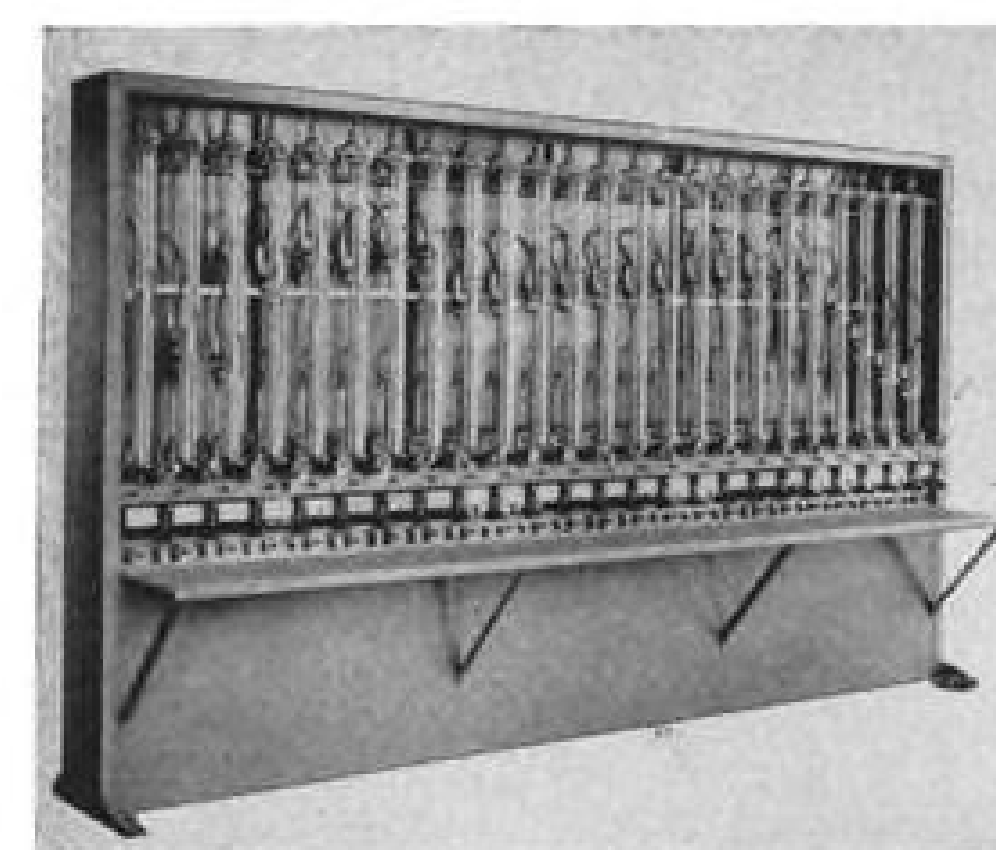
NEW AVIATION PRODUCTS

New Altitude Test Chamber Brings 25 Mi. to Earth

For high-altitude environmental tests of new equipment, a special chamber in which conditions up to 130,000 ft. may be duplicated has recently been delivered to the Aeronautical Division, Minneapolis-Honeywell Regulator Corp.

The equipment has 24 cu. ft. of work area and relative humidity can be controlled from 5% or less within a range of 160F to 200F. Temperatures as high as 500F may be reproduced, and changes may be made at the rate of 10 deg. per minute, the manufacturer states.

American Research Corp., 11 Brook St., Bristol, Conn.



DUAL-PURPOSE manometer and barometer.

New 24-Channel Unit Is Manometer-Barometer

A special adaptation of standard products for the General Electric Co. results in a dual-purpose unit serving as either a differential manometer with 24 channels or a barometer.

The equipment consists of standard Ideal manometers and micro-readers with flowmeters having shutoff valves. Lowest reading of the scale verniers is 0.001 in. As barometers, pressure measurements can be made from 0 to 31 in. of mercury.

Ideal Laboratories, Inc., 3913 Evans Ave., Cheyenne, Wyo.

Carburetor Tester Works On the Ground and Aloft

Airplane carburetor performance can be tested with the engine running, either on the ground or in the air, using the new Greer HCT-1 equipment. The portable unit is designed to work with pressure-type carburetors, such as the Stromberg injection models.

Two flexible lines connect across the carburetor's air control diaphragm.

Autosyn-type fuel flowmeter is connected into the flow path to the carburetor. Tester is enclosed in a portable case with removable cover.

Greer Hydraulics, Inc., N. Y. International Airport, Jamaica 30, N. Y.



LOAD BANK (right) being used with multi-purpose starter (left).

Cooled Load Banks Test Generator Units

New, convection-cooled load banks, used for complete pre-operational generator set check-out, have been put on the market by Consolidated Diesel Electric Corp. Load banks are designed to give a.c. or d.c. systems an accurate test to prevent faulty initial operation and "hot" starts.

The compact, lightweight units are self-contained and may be used in the shop or in the field. They come in stationary, skid, trailer or caster-mounted models.

Consolidated says that the units feature unbreakable, jointless and rustproof resistor grids and ruggedized, sealed instruments and switches.

Consolidated Diesel Electric Corp., Stamford, Conn.

Adjustable Speed Drive Provides Stepless Control

A new adjustable speed drive can be fitted with various types of easily applied controls, from an alternating-current power source, providing stepless speed control for a large number of special process requirements, the manufacturer says.

Dynaspede Coupling is a stationary-field liquid-cooled eddy-current device having no rotating electrical components and thus providing maintenance economics.

The liquid cooling feature allows wide speed range at constant or reduced torque and, under certain conditions, constant horsepower.

Dynamic Division, Eaton Manufacturing Co., Kenosha, Wis.

Semi-Automatic Lathe Makes Wheels Fast

A complete landing gear wheel, except for the hub, is machined in one operation by a special semi-automatic lathe that can take wheels up to 18 in. in diameter. Floor-to-floor time for a 14-in. wheel is given as less than a minute.

Wheel is chucked in a special hydraulic chuck; then a tracing slide quickly advances to the turning position and contours the wheel's outside diameter and flange. Then the overhead slide and two other tools machine both surfaces and simultaneously knurl the flange.

Morey Machinery Co., Inc., 383 Lafayette St., New York 3, N. Y.

ALSO ON THE MARKET

Shuttle fixture finish-reams 1,200 rocker arms an hour, maker reports. Device is mounted on a Michigan Standard Hydro 5 and has two stations. Interchangeable nesting plates for any shape or size rocker arm will fit fixture, it is stated. Arms are ejected automatically on completion into tote pans. Finish is between 20 and 30 micro-inches.—Michigan Drill Head Co., P.O. Box 4643, Detroit 34.

Plastik-Tul is a viscous metal-filled plastic material that can be molded to conform to models or patterns and hardened for production of jigs, fixtures, plugs, gages, forming dies, and the like. It may be drilled, tapped, sawed or otherwise worked with ordinary metal-working tools. Type 100 is viscous and is used with a putty knife; Type 200 is fluid for pouring into a form.—Industrial Development & Manufacturing Corp., Needham, Mass.

Koils Kradles supply a loop of material up to 32-in. wide and 60-in. diameter to punch presses, shears, roll-forming equipment, slitters and similar machines. Devices will operate intermittently or continuously, using Varilop control. Guide plates center stock on power-driven rolls.—Benchmaster Manufacturing Co., 1835 W. Rosecrans Ave., Gardena, Calif.

Up to 100 circuits can be opened instantaneously on a non-shortening basis using explosive disconnect that will incorporate a 3-sec. time delay, if desired, the manufacturers says. Unit can be reconnected, reloaded and used through several cycles. Item is integrated with body of a standard electric plug and receptacle.—Beckman & Whitley, Inc., 906 E. San Carlos Ave., San Carlos, Calif.

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COCKPIT VIEWPOINT

By Capt. R. C. Robson



What's Your Heading

In the last few months there has been a rash of new ideas aimed at simplifying cockpit instrumentation—universally admitted as being a tough job. Some new gadgets have been announced, new groupings arranged and a few old devices remodeled, all with the intended purpose of making it easier to steer our aircraft from place to place.

There are, of course, as many opinions on this subject as there are people, and foolish indeed is the man who becomes involved in it if he doesn't have to. Numerous hard-working organizations have tried for years—without complete success—to settle the many issues in this field.

There is however, a common, and somewhat disturbing fault to be found with all this new work. It is the continued lack of emphasis on direction indication.

Without quarreling with the need for clocks, the ADF, ILS and assorted gages, it still is a fact that the one bit of information most dear to a pilot's heart is, "Which way am I going?" As it stands now this knowledge is so lost in a welter of confusion that one can just barely tell north from south.

► **Cross-Pointer Problem**—It used to be that a man-sized directional gyro stood front and center on the panel for all to see. This was back in the days when "turn right" and "turn left" information was obtained via the earphones. With the advent of the electronic cross-pointers, it seemed that everyone promptly forgot that the pilot might still like to know his direction.

Watching a pilot new to ILS trying to chase the needles down the approach path is a good illustration of the problem. He hasn't realized yet that the cross-pointers are merely a visual substitute for the old "earphone information" and should be used in the same way.

The important thing is to establish a line of position—a constant heading which will hold the desired course.

► **Likes Big Gyro**—Regardless of how "ultimate" some of the new gadgets may seem, it still is a fact that the successful instrument pilot nails down his heading, with only occasional reference to the ILS, prior to the outer marker and from there on he steers his known heading. As a matter of fact, the ILS can be turned off at the outer marker and, if the heading has been correctly established, the approach will work out fine.

Instead of the skimpy miniaturized and camouflaged toys we are using now, many pilots advocate a return to the giant size. The five-inch, air-driven directional gyro that was in more general use a decade ago is still tops.

A direction indicator should show accurately $\frac{1}{2}$ deg. changes, instead of the present $2\frac{1}{2}$ deg. estimate. And it should have instantaneous action—none of this slopping around for several minutes after each turn while the swings are averaged out. It should be easily readable too, and the rotation kept in the natural direction.

► **Direction Important**—It even is important that this instrument look different than others. To allow any confusion, to take any chance that the indicator can be overlooked is psychologically wrong. The set of the nose should at all times fairly shout its direction to the pilot so that, like it or not, he is always conscious of it.

Besides instrument approach use, there are other reasons for accurate information on direction. Terminal area traffic lanes get ever narrower and radar controllers expect aircraft to fly precise tracks. Even in cruising there is a definite economic advantage. A constant heading, especially on the long nonstops, saves many air miles of travel. In brief, direction is always important—let's treat it accordingly.

DAY AND NIGHT ALL WEATHER ATOMIC BOMBER DESTROYER

VERBATIM FROM HANSARD*

HOUSE OF COMMONS, OFFICIAL REPORT, THURSDAY, 4TH MARCH, 1954

The Under-Secretary of State for Air (Mr. G. Ward):

"The development of the Javelin is going well. It will be difficult to exaggerate the importance of the all-weather Javelin. Modern bombers and their equipment have much increased the advantages enjoyed by the attacker. We therefore need for our Defence, aircraft capable of operating with high performance in all weathers. The Javelin should be able to fly and fight at a height of over 50,000 feet and to have a speed of between 600 and 700 miles an hour; and at these great heights and speeds it will be a fighting weapon equipped with modern armament and modern radar capable of finding and attacking the enemy in all conditions."

Mr. Emrys Hughes (South Ayrshire):

"Does it work at night?"

Mr. Ward: "Yes, indeed. An aircraft of this kind has the great advantage of flexibility. When the Javelin is in service many new tactical opportunities will be opened to us which should greatly improve the quality of our defence by day and by night."

The Javelin is now in full-scale production. Airmen know it is the most important aircraft in Europe. No other aircraft in the world compares with it.

*Hansard is the official record of the Parliamentary debates of the House of Commons.



DAY AND NIGHT ALL WEATHER FIGHTER
Gloster Javelin



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Congress Challenges CAB Feeder Policy

- **Senate Commerce Committee and Board member Adams support permanent certificates for local lines.**
- **But certification of scheduled helicopter operations meets strong opposition in the aviation subcommittee.**

By Katherine Johnsen

Opposition of Civil Aeronautics Board and Commerce Department appears to have made little impression on congressional committees already strongly in favor of permanent certification of the 14 local service airlines.

The opposition testimony was challenged, rather than digested. Members of Senate Commerce Committee variously suggested that CAB—in its intent to keep the carriers on temporary certificates and constantly subject to Board review—had a “mother hen” attitude, was “too paternalistic,” and didn’t want to give a “diploma on graduation.”

Key developments in the certification flight were:

- **CAB member Joseph Adams** took clear-cut issue with the Board’s three-member majority—Chan Gurney, Josh Lee and Hamar Denny—and supported legislation directing permanent certification of the local lines. “It is time for us to recognize that these carriers are here to stay, just as the smaller communities which they serve are here to stay,” Adams testified.

- **Rep. Carl Hinshaw** launched a drive to include helicopter services in permanent certification legislation for local carriers but met outspoken opposition in hearings before the Senate Commerce Committee.

Legislation introduced by Hinshaw would give permanent certification to helicopter services whose temporary certificates had been renewed once:

The appeal of C. M. Belinn, president of Los Angeles Airways, a helicopter service, received this observation from Sen. Mike Monroney, chairman of the aviation subcommittee: “We are not ready . . . without greater experience in passenger traffic than has been shown . . . to include (helicopter services) into automatic certification for permanency.

“We feel the problem is different in serving a metropolitan area . . . than it is to filling in the continental gaps in our airline map.

“I think you would be asking us to do the impossible . . . if you would expect us to try to get permanent cer-

tification for a company (Los Angeles Airways) that began flying passengers only in November of last year. I would not try to support such a proposal.”

- **Commerce Department Undersecretary Walter Williams**, who joined CAB’s majority in opposing permanent certification legislation, disclosed that his department originally had taken a different position in discussions with the Budget Bureau.

Commerce had proposed legislation authorizing permanent certificates for local lines with a proviso setting an end date for subsidy payments, Williams said.

- **‘Matter of Semantics’**—Monroney suggested that the opposition and support for permanent certification could be boiled down to “a matter of semantics.”

Two points are unanimous, he observed: Local service is a permanent part of the air transport network; there should be “flexibility” in altering existing local routes.

Monroney summed up the conflict this way:

- **CAB feels** that it must have authority to review certification periodically to revise and perfect airline routes.

- **Members of Congress** feel that the 1938 Civil Aeronautics Act—granting the Board authority to alter, amend and suspend routes—is sufficient. In addition, Monroney observed, legislation

proposed by Sen. Warren Magnuson, chairman of the full Commerce Committee, would explicitly give CAB authority to reserve from permanent certification “those intermediate points which have over a reasonable period of time, generated insufficient traffic and revenues to reimburse . . . for direct costs and a reasonable share of indirect costs. . . .”

- **‘Not So Clear’**—CAB’s general counsel E. T. Nunneley reported that CAB interpreted the 1938 act as giving it authority to deal with “points.” But the act, he said, “is not so clear” as to the Board’s authority to revoke or alter “entire route segments” on a carrier’s system.

Adams said “it is likely” that local service airlines still will be going through periods of temporary certification 20 years from now if the Board’s policy is not changed.

Points stressed by Adams in challenging the majority Board opinion were:

- **“Some of the claimed benefits of permanent certification** are conjectural (as stated by the Board majority); but my grounds for urging permanent certification are simply that it is time we recognized the necessity for an indefinite continuance of the services rendered by these carriers—whether or not permanent certification will be a means of bringing about a long list of immediate and far-reaching benefits.”

- **However**, “I am also convinced that the alleged calamitous results which will follow permanent certification, claimed by those who oppose it, are also highly conjectural, and have been emphasized out of all proportion. The claimed stultifying effect on the ambitions of these carriers to do a good and efficient job, to increase traffic and revenues and to cut costs are most doubtful, and highly theoretical.

“In supporting the validity of these and other claims that permanent certification would destroy initiative, raise costs and the like, the majority is completely overlooking . . . the power and the duty of the Board to see to it, in our mail pay decisions, that inefficiencies of this type just don’t happen—and that if they do we have a duty to make sure that the federal government doesn’t pay for them.

“We have this duty right now relative to all our carriers. We have this duty as to our carriers whether they are permanent or temporary certificated.”

- **Differing Views**—Adams said the 20% increase in business that the local lines



Vibration measurement in AIRCRAFT ENGINEERING

The D-489 MUIRHEAD-PAMETRADA WAVE ANALYSER

You may examine this instrument at the I.R.E. Show
Booth No. 490, New York, March 21-24, 1955,
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Aircraft designers will be quick to appreciate the advantages of an instrument which can trace the source of mechanical vibrations quickly and conveniently, for it is on the elimination of such vibrations that passenger comfort and safety depends. The Muirhead-Pametrada Wave Analyser has been specifically designed for this purpose, and with its aid measurements of amplitude and frequency of the most complex vibration can be made at any frequency between 19c/s and 21kc/s. An additional unit extends the useful range down to 2c/s.

FEATURES

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Frequency accuracy $\pm \frac{1}{2}\%$ over most of range.

High selectivity characteristic for greatest discrimination against adjacent frequencies.

1/3rd octave filter characteristic for noise measurement or rapid localization of principal vibration components.

Band-pass characteristic for measurements when frequency is fluctuating.

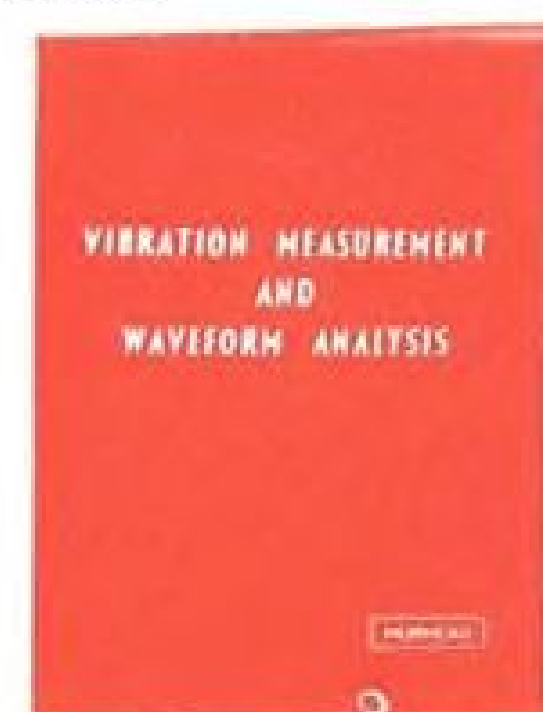
Can be used for airborne tests on a 400c/s supply; normally operates from 110V, 60c/s.

The Analyser has other aircraft applications apart from vibration measurements. For instance, it can be used to measure spurious frequencies present in an aircraft electrical installation, which can cause serious interference with radar and radio equipment.

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AND
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accomplished in 1954 over the preceding year could be recognized by the enactment of permanent certification legislation.

But Gurney had a different interpretation: "This demonstrates . . . that permanent certification is unnecessary to the carriers in their striving towards the goal of economic self-sufficiency."

Gurney added: "Just as permanent certification would have a softening influence on the carriers themselves, so could the fact that the U. S. government has undertaken in effect permanently to make up their deficits constitute an open invitation to all those with whom the local service carriers do business to raise their prices for goods and services. The bargaining power of the local service lines to hold down their costs would be largely emasculated."

The Board's other three points of opposition, Gurney summarized as:

- "It would make more difficult the improvement of the route systems. . . ."
- "It would saddle the government with an annual subsidy bill of over \$20 million for the indefinite future."
- The "proportion of subsidy to total revenues is still too high—an average of 47%—to warrant permanent certification to all carriers in the group."

Cairo Plans Heliport

(McGraw-Hill World News)

Cairo, Egypt—A central air terminal, with a rooftop heliport to speed travel to and from the airport, is to be built in Cairo by the Ministry of Municipal and Rural Affairs.

A \$450,000 loan will be used to put up the structure, which will house the Egyptian Civil Aviation Department, aviation industry offices, tourist agencies, and telegraph office and stores. Vehicle parking space will be in the basement.

Red Airlines Undercut IATA Rates in Austria

(McGraw-Hill World News)

Vienna—Soviet-dominated Czechoslovakian Air Lines (CSA) and the new East German Lufthansa are taking freight and passenger business away from western air carriers in Austria by charging cutrate fares and ignoring customs and import rules.

Informed observers here expect the Czech and East German carriers to become the most active commercial airlines in this country.

► **Soviet Support**—Both are operating in Austria without the government's permission. They were able to ignore this formality because of support from Russia through the Soviet state transport agency Juschwnestrans, with assistance from the Red air force and army.

But the official Austrian travel bureau acts as agent for the two airlines and receives commissions on all sales.

► **Lufthansa Freight**—East Germany's Lufthansa started operating into Austria this year, airlifting optical and mechanical goods to Vooslau air base in the Soviet occupation zone. They were brought for resale in the Communist retail outlet system in Austria or for export to western and eastern countries.

Reliable sources report these flights will be intensified at rates below those charged by western airlines. This is possible because East Germany, like all countries behind the Iron Curtain, does not observe tariff minimums set by International Air Transport Assn.

Actual freight cost is cut below the listed rate because transportation charges can be made in East German marks.

Artificial monetary value of the Red mark is 2.4 for each U. S. dollar,

compared with the official exchange rate of 4.2 West German marks for \$1. But often up to six East marks are paid in Berlin for one West, with a corresponding good rate for dollars.

► **CSA Passengers**—Czechoslovakia's CSA is operating under identical conditions. The airline now is increasing its passenger business by charging low rates for roundtrips to the East German Leipzig spring fair.

If the flight fee is paid here in schillings, the charge is equal to about \$42.31. From East Berlin, the official fare is 97 marks (\$40.41). But this can be cut even more by a well-informed and scheming passenger with contacts in East Germany.

Since IATA rules are not observed, this involves only simple bargaining.

Johnson Cites Future In Airline Management

Future of the air transport industry will depend largely on maintaining capable airline managements, according to Earl D. Johnson, president of Air Transport Assn.

Prospective members of airline management must not only be as good as present management, they have to be better managers in order to succeed, Johnson said in receiving the University of Denver Aeronautic School's annual achievement award in mid-February.

► **Future Needs**—Johnson emphasized that today's pioneers in airline operation have made great strides, and that future leaders must pick up where they left off. It is not enough that the rising generation of airline managers be as competent as their counterparts of yesterday, Johnson said, but that they bring with them and apply new knowledge, skills and techniques.

The ATA president claimed "the greatest ill which any industry—particularly, a transportation industry—can bring upon itself is to tolerate managements which have become stagnant, which cannot cope with new conditions—learning new knowledge and formulating new techniques." Fortunately, Johnson said, airline managements appreciate that a major solution to the problem is to recruit good young people and develop their managerial capacities.

► **Sound Policy**—Another major problem confronting the airline industry, Johnson said, is the need for a sound national air transport policy, soundly conceived and soundly implemented.

With such policy, he continued, "I am sure the airlines have the ingenuity to solve the serious problem of raising in excess of \$1 billion for the next decade for equipment replacement and fleet expansion."

North Central Gets Detroit-Chicago Route

North Central Airlines has been selected to operate local service between Detroit and Chicago by the Civil Aeronautics Board. The local service carrier plans to inaugurate the new service May 1.

H. N. Carr, North Central president, predicts that acquisition of the route will make his airline "by far the largest local carrier in terms of passenger, mail and express volume." (See editorial p. 82.)

► **Former American Route**—The route involves service between Chicago and Detroit via the intermediate points of South Bend, Ind., and Kalamazoo, Battle Creek, Jackson and Ann Arbor, Mich.—part of American Airlines' Route 7. American is suspended at these intermediate points while North Central serves them, but will continue through-service between Detroit and Chicago.

North Central was chosen over Ozark Air Lines and Lake Central Airlines for the route in an examiner's report issued last November. Both Ozark and Lake Central objected to the decision, but the CAB has decided to make it final.

► **Three Factors**—The majority decision bases the choice of North Central on three factors:

- North Central will be able to institute service more promptly.
- Service can be operated by North Central at the least cost to the government and to the carrier.
- The route integrates best with North Central's system.

The Board found that North Central is in a superior position to inaugurate service over the route. In comparing the carrier with Lake Central, the Board points out that as of Dec. 31, 1954, Lake Central has a net worth of \$11,129, while North Central's net worth was \$730,582. Negative working capital of Lake Central for the period was \$368,529 while North Central's was \$26,453—an improvement from the \$780,869 in negative working capital on Mar. 31, 1954.

Lake Central is financially able to perform the service, the majority says, but its relative weakness would interfere with inauguration of service.

► **Public Interest Factor**—North Central already serves Detroit and Chicago in its system and has facilities at these points. Both Ozark and Lake Central would have to establish facilities at Detroit and expand their Chicago facilities.

In weighing the various contentions of the three carriers, the CAB majority has found that "the broader public

Comet Buyers Switch to DC-7C, 1449

Two trans-Pacific air carriers, Japan Air Lines and Australia's Qantas Empire Airways, last week joined the growing trend toward piston-engine U. S. transports over Britain's jet-powered de Havilland Comets.

Their statements followed government approval in Britain of British Overseas Airways Corp.'s plans to purchase 10 Douglas DC-7s at a cost of \$36 million. But BOAC will keep its order for Comet 2s and 3s on the books and probably increase it from 17 to 20.

JAL said negotiations are underway with Douglas Aircraft Co. for two long-range DC-7Cs to replace Comet 3s now on order. But the Japanese airline would forfeit a down payment of \$1 million if it canceled its Comet orders.

"We want the DC-7C," one official said. "However, \$1 million is a lot of money to lose."

Japan's flag airline must decide this month what action will be taken, he reported. A representative of de Havilland Aircraft Co. now is in Tokyo to confer with JAL over the proposed cancellations.

The trans-Pacific carrier originally ordered Comet 2s in 1953 but switched to the 3 last year after deliveries were delayed when the jet airliners were grounded by a series of crashes and investigations.

Meanwhile, Qantas reported it does not plan to renew the Comet 2 orders that were placed some years ago by British Commonwealth Pacific Airlines and canceled shortly after the two carriers merged last year.

The Australian airline said its fleet of Lockheed Super Constellations would cope with all foreseeable needs until at least 1958 or 1959. If Lockheed Aircraft Corp.'s new turboprop-powered 1449 proves a success, Qantas probably will buy a number of the transports to replace the present fleet.

But Qantas may be forced to order some Comet 3s if Pan American World Airways keeps its orders for the new series on the books and places them on trans-Pacific routes. Reliable sources said this would be a move to avoid political trouble for the Australian government.

interest in this case lies in the choice of North Central."

CAB member Joseph P. Adams agrees with the majority that the route should be integrated into the system of a local service carrier, but he would give the route to Lake Central Airlines.

► **Adams' Argument**—Adams points out that the area served by Lake Central's system has a total population of more than 19 million. He feels that Lake Central's financial weakness is due to an inferior route structure rather than to operating deficiencies or a lack of potential and that the Board should take any opportunity to improve it.

The public interest requires CAB attention to the strengthening of Lake Central's route structure, according to Adams. "Without such strengthening," he says, "the carrier's dependence upon subsidy mail pay support will undoubtedly continue to increase and the majority's decision here may well, therefore, be the first step toward Lake Central's disappearance from our local air carrier group."

Adams finds that the advantages cited by the majority in support of their selection of North Central do not support their decision. He says that either Lake Central or North Central could provide the service adequately and with little or no subsidy, and that the route would fit into the system of either carrier.

► **'Preserving Service'**—"The principal and only significant differences, as I see them, between the applications of

the two carriers," says Adams, "are the much greater present need for the route in the case of Lake Central, and its relative lack of opportunity to acquire high density route mileage elsewhere if denied this route."

"In refusing to recognize and act upon Lake Central's greater need for the route, the majority is ignoring a principle which has been applied with beneficial results over a period of 15 years in the best interests of preserving not only the weaker of two carriers, but much more importantly, preserving the service of that carrier to the traveling public."

Board Approves New TWA-Ethiopia Pact

Continued operation of Ethiopian Air Lines by Trans World Airlines has been approved by the Civil Aeronautics Board in an order extending the current authorization.

The original agreement between TWA and the Imperial Ethiopian government was approved by the Board in 1948. It provided for operation of the Ethiopian air line by the U. S. carrier through the general manager, a TWA appointee.

The new agreement is substantially similar, but it omits a stock purchase privilege Trans World never has exercised and drops a TWA right of appointment of two directors on the Ethiopian board.



Pakistan Starts Flights to London

Pakistan International Airlines has inaugurated service from Karachi to Cairo and London, flying 74-passenger combination first-class and tourist Lockheed Super Constellations. The planes are scheduled to

make the flight in 19 hr. 20 min. PIA began Super Connie service between Karachi and Dacca last year with a three-plane fleet. The Lockheed transports are powered by four Wright Turbo Compound engines.

Private, Business Flying Gains 4%

Private and corporate-owned aircraft in 1953 flew 8.5 million hours, 73% of all U. S. nonmilitary flying and a 4% increase over 1952, the Civil Aeronautics Administration reported last week.

CAA's prediction for 1954, when statistics are completed a year from now: 8.7 million hours, for a further gain of nearly 3%.

► **Business Flying Leads**—Most impressive record in general aviation is that of business flying, which accounted for 42% of all civil aircraft time outside of the scheduled airlines. In 1954, it is estimated business missions accounted for 3.9 million hours or 44% of the total.

CAA's 1953 statistical study, "The Airplane at Work for Business and Industry," is the seventh prepared by the Agency for Market Research and Safety Investigation Projects. Collected from questionnaires sent to registered plane owners more than a year ago, the figures appear about a year late, but include estimates for the preceding 12-month period.

One interesting fact in this year's 81-page booklet is that about a third of the aircraft in civil use, outside of the airlines, were built during the 1946 postwar boom.

Nearly all are two-place trainers built for the flight schools that catered to GI trainees.

The training aircraft are not being replaced but eight out of 10 small planes now are in the 4- or 5-place category.

More than half of the 1950-53 production models are used primarily in business transportation and are not for hire.

► **Copter Exports**—CAA's new report also contains the first official figures on use of the helicopter in general aviation. Helicopter production for nonmilitary use has been modest, exceeding 100 only in 1953 and 1954. Most of the helicopters have been exported. Out of total production of 490 units for civil use that were built between 1946 and 1953, 314 or 65% were sent to other countries.

In 1953, there were 130 certificated general aviation helicopters in the continental U. S., not including those used by certificated carriers. Several of the 130 were flown by the manufacturers for test and experimental work.

► **High Usage**—High initial and operating costs for helicopters are reflected in the flying hours per aircraft, averaging 275 hours a year for each machine, highest of any type. Almost two-thirds of the total flying time was for pipe and power line patrol, surveying, mapping, oil and mineral prospecting and similar missions.

Average utilization in this field was 337 hours.

A number of helicopters were used almost exclusively in patrol, survey and other industrial flying with an annual use ranging from 500 to 900 hours.

► **Classifications**—The CAA study contains classifications of aircraft according to major usage, size, hours flown and year of manufacture.

Highlights:

- Between 1946 and 1953 business flying hours increased 3.4 times to 3.6 million hours and 499 million aircraft miles.

- Aerial application required 722,300 hours, same as the combined revenue operations of American Airlines and Eastern Air Lines.

- Passenger and cargo transportation for hire in general aviation aircraft dropped 18% in 1953, from 703,000 hours to 574,000 hours.

- Instructional flying totaled 1.2 million hours, which was a 17% decline from 1952.

- Pleasure flying showed its first increase since 1949, totaling 1.8 million hours compared with 1.6 million in 1952.

- In 1953, a total of 18,220 general aviation aircraft were used primarily in business transportation not for hire. Companies owned 9,470 of these planes, individuals owned 8,570 and government agencies owned 180.

- Half of the general aviation aircraft

that were flown in 1953 logged less than 100 hours in the year.

- The average general aviation aircraft flew 140 hours, 17,100 aircraft miles and used a total of 2,700 gallons of gasoline.

Colonial Free of EAL Control: Examiner

Eastern Air Lines' control of Colonial Airlines has terminated, according to the findings of Civil Aeronautics Board examiner Edward T. Stodola.

"This conclusion," Stodola said, "is supported not only by a clear preponderance of proof; the evidence in support thereof, as a matter of clear fact, is truly overwhelming."

► **Shares Disposed of**—Originally, 110,524 shares of Colonial stock were under Eastern's influence or control. Of these, all but 4,555 shares were found to have been disposed of at the close of the record in the case. A voting trust has been established for 2,600 of these shares.

Stodola concluded that "except for 1,955 shares, or less than 4/10ths of 1% of a total outstanding stock of Colonial, all of the so-called orbit stock which was the principal basis for the finding of control . . . has been sold or otherwise transferred from its orbit owners."

"There is no evidence," he said, "that any of the shares sold by the orbit stockholders were purchased by persons

or firms under control in any way by Eastern Air Lines."

► **National's Claim**—Eastern employees or their relatives own 4,795 shares of Colonial stock. But the report said none of these employees are under the influence or control of the company.

National Airlines has claimed that large blocks of Colonial stock are under the control of Eastern through various agents. Stodola could find no support for this claim.

He said relations between Eastern and Colonial managements since the merger was turned down and the investigation started last year have been proper and independent.

Sigmund Janas is found by examiner Stodola to be "completely out of the Colonial picture."

SHORTLINES

► **Air India International** is expected to extend its Calcutta-Hong Kong service to Tokyo under the final draft of terms of an air agreement between India and Japan.

► **Compania Mexicana de Aviacion**, Pan American World Airways' Mexican affiliate, has been authorized to reduce its air fares between Mexico City and Los Angeles by Mexico's Ministry of Communications. Reduction permits a roundtrip excursion fare of \$150.

► **KLM Royal Dutch Airlines** has released a film, "Meet the People," which describes the importance of each employee's role in operating a world-wide airline system.

► **Mohawk Airlines** has opened a new service to Westchester County (N. Y.) airport. Stop at Westchester is made on Flight 81 from Newark to Buffalo and on return Flight 88. Other flights connect with 88.

► **Southern Airways** January passenger traffic increased 36% over the same period last year. Passengers boarded were 12,372 in January, compared with 8,310 in January 1954.

► **Trans World Airlines** showed a 10% increase in passenger traffic last month over the volume for February 1954.

► **United Air Lines** predicts the greatest surge of spring pleasure travel in its history. UAL is offering a selection of packaged trips to the Rocky Mountain area, California and Hawaii.

► **Central Airlines'** revenue passenger traffic in January was up 11% over December and up 148% over January

1954. Revenue passenger-miles increased 170% in the past year.

► **United Air Lines** had its best January traffic record in history, flying 290,541,000 revenue passenger-miles, 2,738,000 freight ton-miles, 2,085,000 mail-ton miles and 898,000 express ton-miles.

Nonsked Groups Fail To Agree on Merger

Renewed merger negotiations between the two organizations of non-scheduled airlines—Aircoach Transport Assn. and Independent Military Air Transport Assn.—collapsed last week after two months of discussion.

This was the second unsuccessful effort in less than two years to get the two groups together for single representation of their segment of the industry.

Future prospects of an ACTA-IMATA agreement are not bright, according to transport observers, who predicted little chance of success for the latest attempt to consolidate. Spokesmen for each of the independent associations refused to comment as to why the negotiations broke down.

► **Control Split**—Last week's meeting of the merger committee, appointed by the two groups to work out an agreement, ended without results. An all-day conference failed to resolve the differences encountered and the working committee disbanded.

Major problem splitting the groups was reported to be disagreement as to an organizational setup.

The impasse that developed, observers said, centered over whether ACTA president Hamlin B. Johnston or IMATA president Ramsey Potts would head a new association. Each side apparently insisted that their man take top spot, which completely upset a tentative plan previously agreed upon whereby the two incumbents would be on a par with equal responsibilities as general manager and general counsel.

Capital Reports Higher Net Profits, Revenues

Capital Airlines earned a net profit in 1954 of \$1,746,759 from total operating revenues of \$48,136,745, President James H. Carmichael reported. This compares with net income of \$1,652,289 on operating revenues of \$45,580,524 in 1953.

Net for both years was equal to \$2.10 per common share. There were 831,430 shares of common stock outstanding at the end of 1954, against 787,978 shares at the end of 1953, Carmichael said. The additional shares were issued as a 5% stock dividend in December 1954.

Included in the 1954 net earnings

was a non-recurring net gain of \$454,774 from the sale of operating equipment.

Highlights of Capital's 1954 report included:

- **Gross revenues** increased \$2,556,221 over the preceding year.

- **Operating expenses** were \$45,738,344, compared with \$42,502,031 in 1953. Cost of each available ton-mile flown dropped to 24.2 cents or 5% less than the 1953 cost of 25.5 cents per ton-mile.

- **Passenger revenues** increased 7.2% to \$44,280,868 with the company flying 2,426,961 passengers a total of 765,240,459 passenger-miles.

Capital's total assets were \$24,992,178, an increase of \$3,127,472 over 1953. Earned surplus as of Dec. 31, 1954, amounted to \$4,989,046 after transfer of \$742,353 to permanent capital for the 5% stock dividend.

CAB ORDERS

(Feb. 17-23)

GRANTED:

Western Air Lines authority to continue after Mar. 31 temporary suspension of direct service between Rapid City, S. D., and Sheridan, Wyo.

Wheeler Air Lines, Ltd. permission to make irregular flights between Canada and U. S.

Japan Air Lines application to operate one roundtrip flight between Tokyo and Sao Paulo, Brazil, via San Francisco and New Orleans with certain restrictions.

West Coast Airlines temporary exemption to operate one roundtrip nonstop flight between Pasco-Kennewick-Richland and Spokane, Wash.

Mohawk Airlines temporary exemption until Feb. 24, 1956, to serve White Plains, N. Y., with certain restrictions.

APPROVED:

Agreements between Colonial Airlines and Allegheny Airlines and various other carriers.

AMENDED:

United Air Lines certificate to eliminate The Dalles, Ore., as a point on Route 1.

DISMISSED:

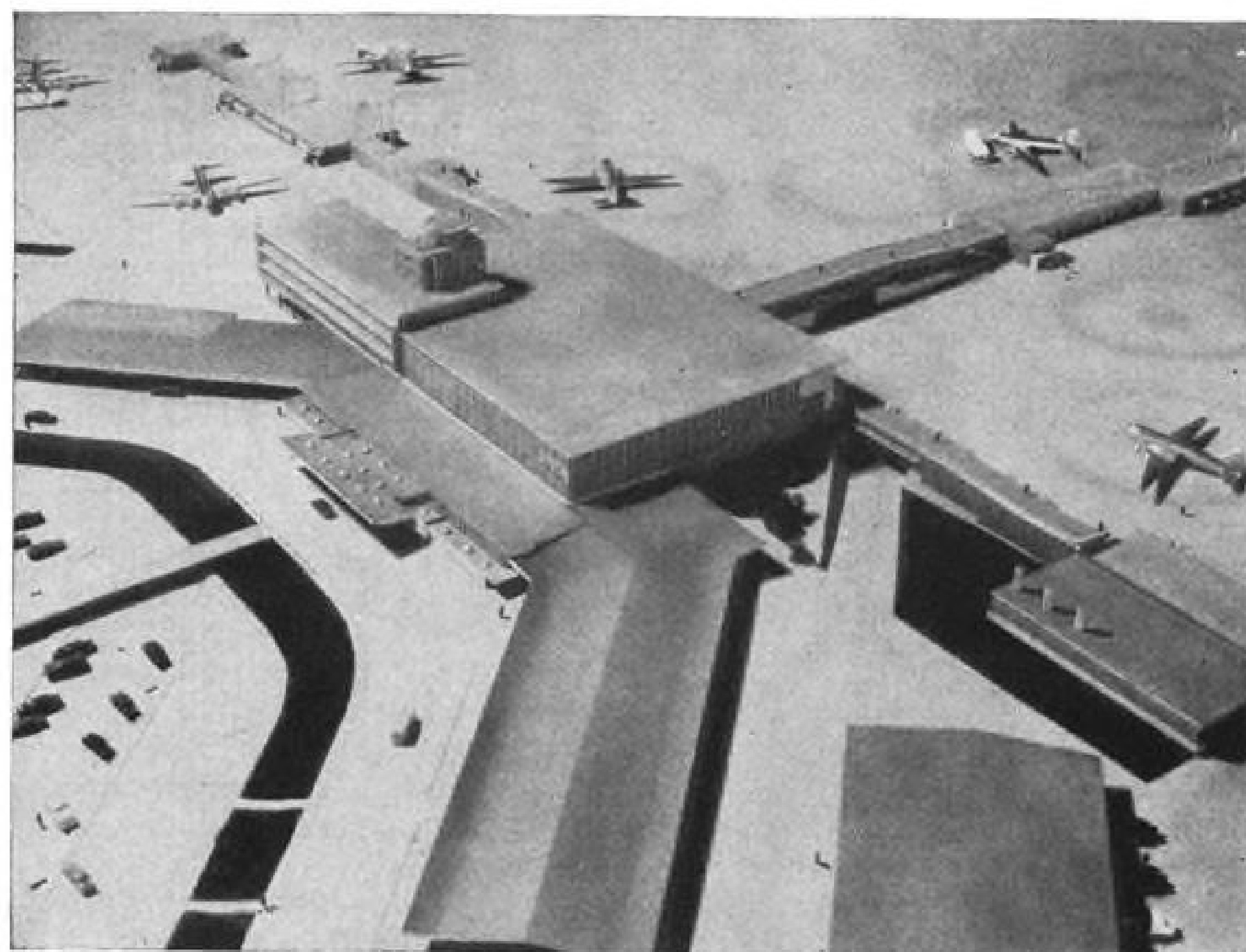
Flying Tiger Line's application to operate three overseas flights at the request of the carrier.

DENIED:

Midet Aviation Corp.'s petition to reconsider a Board order granting National Airlines leave to intervene in Midet's certificate renewal case.

Caribbean-Atlantic Airlines application to operate between Trujillo, Dominican Republic, and Port-au-Prince, Haiti, during the winter tourist season.

Transocean Air Lines application to operate one flight from Munich, Germany, to New York City.



Love Field-Dallas Plans Modern Terminal

A moving sidewalk that will transport passengers from terminal to plane loading gates will be among the highlights of the new terminal being planned for Love Field at Dallas. A scale model of the \$5-million

facility is pictured. Construction will start this year. The three loading "fingers" will have space for 20 Douglas DC-7s and can be expanded. CAA control tower will be atop a five-story office section.

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Instrumentation Engineers—New commitments require additional experienced designers for transistorized fuel gages, thermistor switches, pressure ratio indicators and exhaust gas temperature indicators.

Process Engineers—Additional process engineers are needed to devise methods, processes and assembly techniques for economical mass production for components and systems mentioned above.

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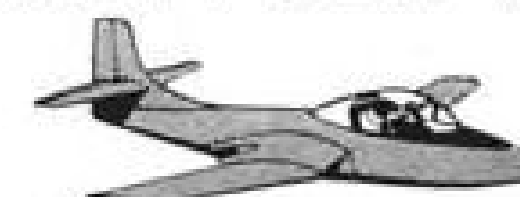
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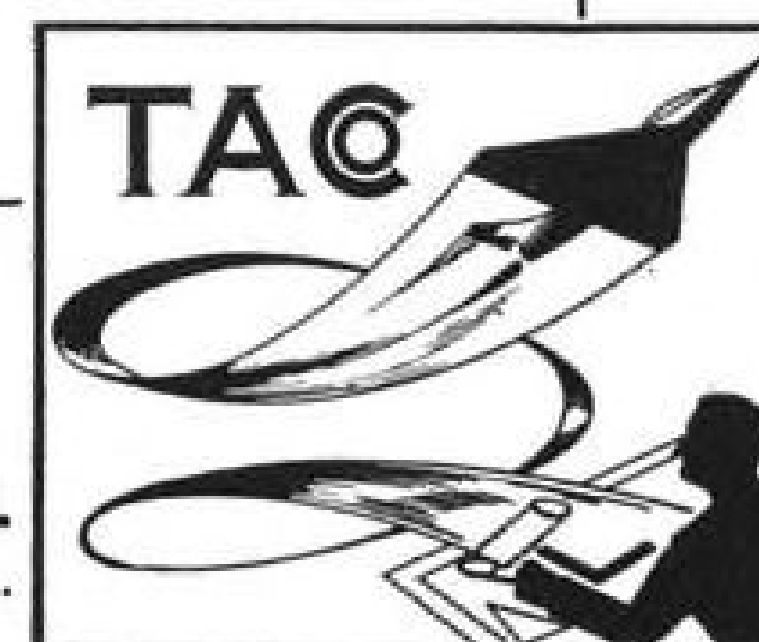
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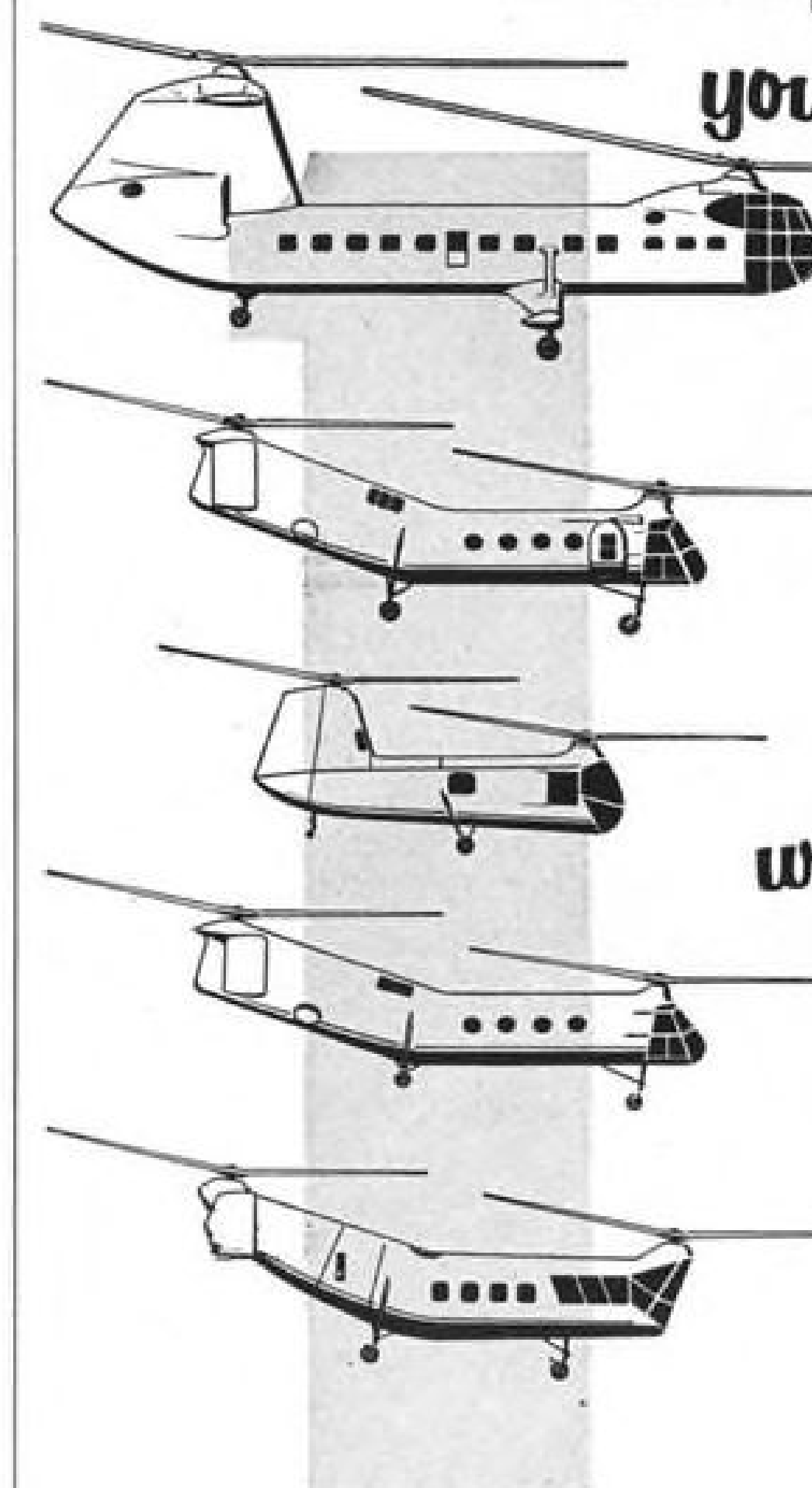
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EDITORIAL

North Central's Record Boosts Feeder Cause

At a time when Congress is carefully studying the case for permanent certification of local service airlines, the 1954 record of North Central Airlines under the leadership of Hal N. Carr should provide potent ammunition for champions of this type of air transport.

North Central, with headquarters in Minneapolis, serves a network of prosperous manufacturing cities and trading centers in Minnesota, Illinois, Wisconsin, North Dakota and Michigan with a fleet of 18 DC-3s. During 1953 it operated with a loss of \$114,588 and continued through the first third of 1954 with monthly losses ranging from \$50,000 to \$70,000 and drastic warnings from Civil Aeronautics Board ringing in its ears. Hal N. Carr, formerly executive vice president and director, assumed the presidency on April 15, 1954, and in the remaining eight months of 1954 organized a cost-cutting and revenue-boosting program that put North Central in the black with a \$170,653 operating profit for the year.

During 1954 North Central increased revenue passenger total by 30%; air mail by 12%; express by 20%; and doubled its charter business. During the first two months of Carr's regime cost per plane mile dropped from \$1.24 to 96 cents. North Central flew 283,571 passengers during 1954 including a record December total of 22,929 in a season when only 10 years ago the midwestern weather used to discourage all but a few hardy air travelers.

Commuter Service

North Central's record during 1954 proves there is a definite market for local service air transport when it is properly exploited. A good example is the Chicago-Milwaukee run where these two large midwestern cities lay less than 100 miles apart, linked for years by only a scant half-dozen flights daily when they were dependent solely on trunk airline service. Now North Central operates 32 flights daily between Milwaukee and Chicago. If the 18 passengers who were aboard on an early morning flight through a typical midwestern snowstorm when we used the service recently are typical examples, this is where a good chunk of Hal Carr's new revenue is derived—from a market in which the trunk airlines were never really interested.

Addition of the Chicago-Detroit route to North Central's system should give Carr another opportunity to exploit commuter-type air service between two major midwestern cities and their business satellites in the southern Michigan-northern Indiana area. It will be interesting to watch North Central tackle this new problem.

Congressmen, members of CAB and others interested in the future prospects of local service airlines should study carefully the 1954 record of North Central Airlines as an example of what can be done.



JESSUP



STAVER

New Staff Appointments

AVIATION WEEK has taken two important steps in its program of editorial staff expansion outlined in the publisher's message of Jan. 24. Alpheus W. Jessup has been appointed managing editor with headquarters in New York. Preble Staver has been added to the Washington staff where he will cover air transport and legislative affairs.

"Bill" Jessup is a veteran foreign correspondent who has been chief of the McGraw-Hill World News Far East Bureau for the past eight years, reporting for AVIATION WEEK, Business Week and other McGraw-Hill publications. During this period he covered the entire air war in Korea from the first F-80 missions from Japan to the final phases of the Sabre-MiG-15 duel in MiG Alley. He also covered the air war in Indo-China during the siege of Dien Bien Phu. Bill is no headquarters war correspondent. During his stint in the Orient he flew combat missions with jet fighters and longrange bombers. In Indo-China, he was one of the few correspondents to accompany French pilots on combat missions in B-26 attack planes. He has a wide acquaintance among the USAF, Navy, Marine and Army leaders who directed air operations during the Korean war.

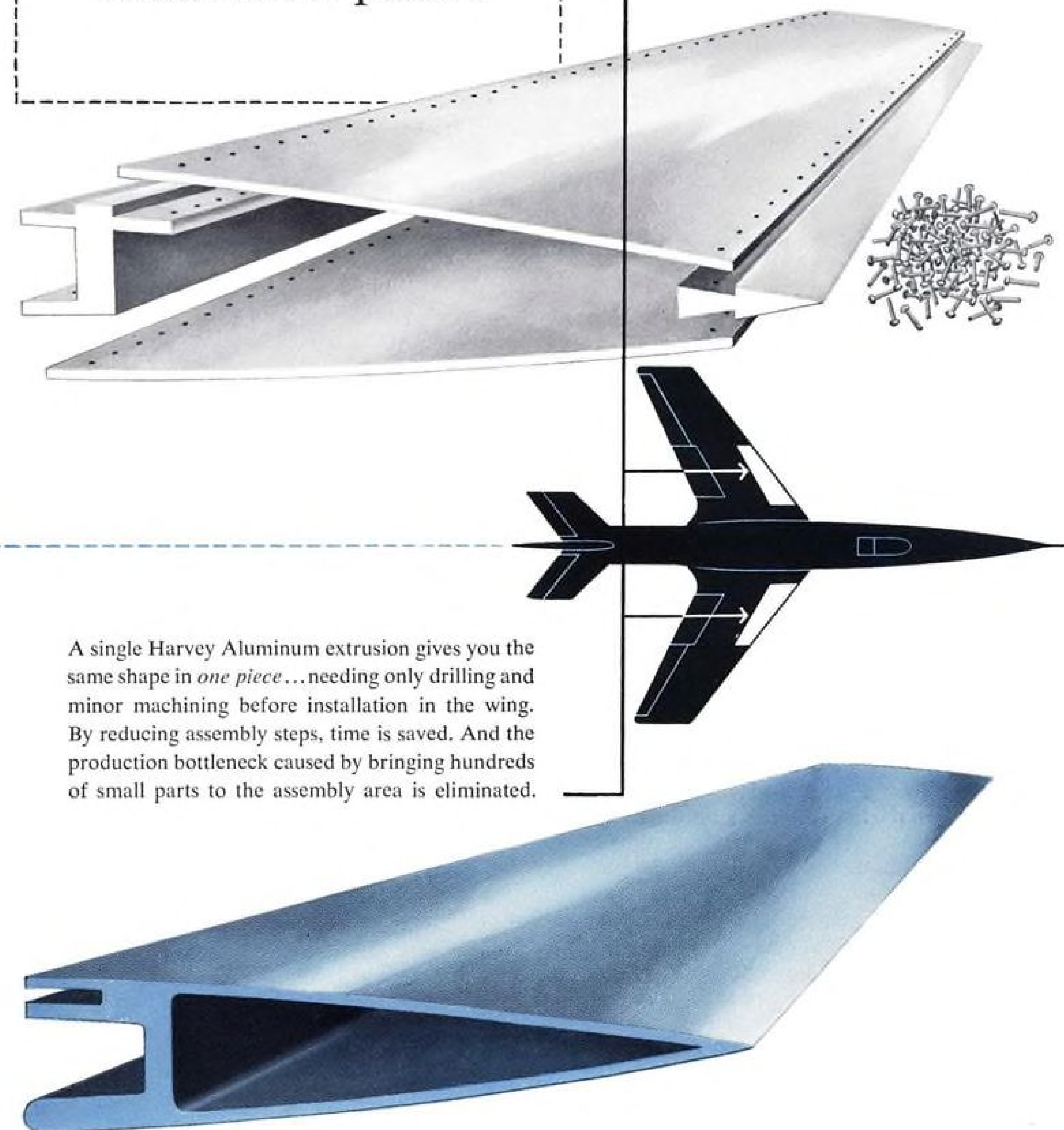
Bill is a graduate of Lehigh University and before World War II worked for daily newspapers and McGraw-Hill's magazine American Machinist. During the war, he was an artilleryman and served in the China-Burma-India theater as an instructor and combat liaison officer with Chinese troops. He was decorated with the Cloud and Banner medal by the Chinese government.

"Pete" Staver has been legislative editor of American Aviation Daily and American Aviation magazine in Washington for the past four years and managing editor of Air Traffic News, also published by American Aviation Publications. Previously Pete had practical experience in the air transport field with Eastern Air Lines and as assistant director of tariffs and publications for Air Cargo Inc. He is a graduate of the Wharton School of the University of Pennsylvania and won the Bronze Star for combat operations on Iwo Jima as a Marine artillery officer.

—Robert Hotz

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Harvey does all three as a leading independent producer of aluminum extrusions in all alloys and all sizes, special extrusions, press forgings, hollow sections, structurals, rod and bar, forging stock, pipe, tubes, impact extrusions, aluminum screw machine products and related products. Also similar products in alloy steel and titanium on application.

HARVEY ALUMINUM SALES, INC., TORRANCE, CALIFORNIA—BRANCH OFFICES IN PRINCIPAL CITIES

Allison T40 Turbo-Prop

lifts

Navy fighter straight up

When the Navy's revolutionary new interceptor — the Convair XFY-1 — takes off and lands, it gets all its lift from its dual rotating propellers which are driven by Allison T40 Turbo-Prop engines.

That means the power package produces greater thrust than the weight of the aircraft for take-off and slightly less thrust than weight for landing. This delicate landing operation requires the engine to deliver positive and dependable power in the exact amount called for by the pilot.

The Allison T40 engine twin power sections deliver a mighty 5850 horsepower for take-off. In level flight the pilot can shut off one power section to efficiently cruise or he can open the throttle wide on both power sections for maximum power and speed.

This VTO fighter was designed to take off and land from a destroyer's fantail or a freighter's deck which means that each ship in a convoy can carry her own defense against attacks for the entire voyage — promising greater safety for these surface craft.

Along with Convair and the U. S. Navy, Allison takes great pride in the spectacular success of this new type aircraft and in the simple accolade — "Well Done."



Allison
Division of General Motors,
Indianapolis, Indiana

