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APR. 26, 1954

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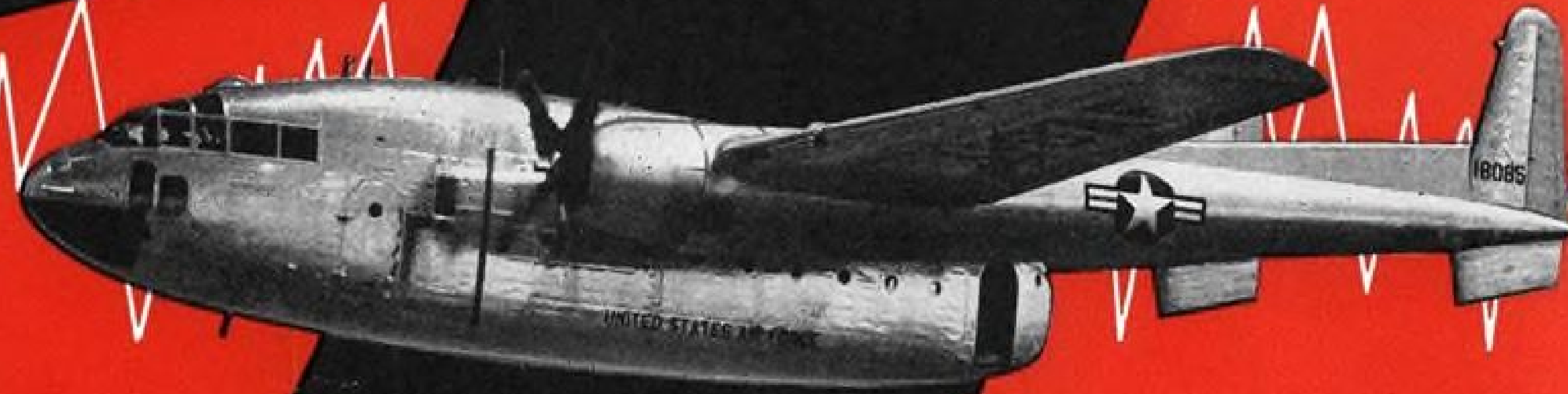
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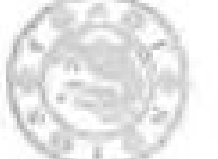


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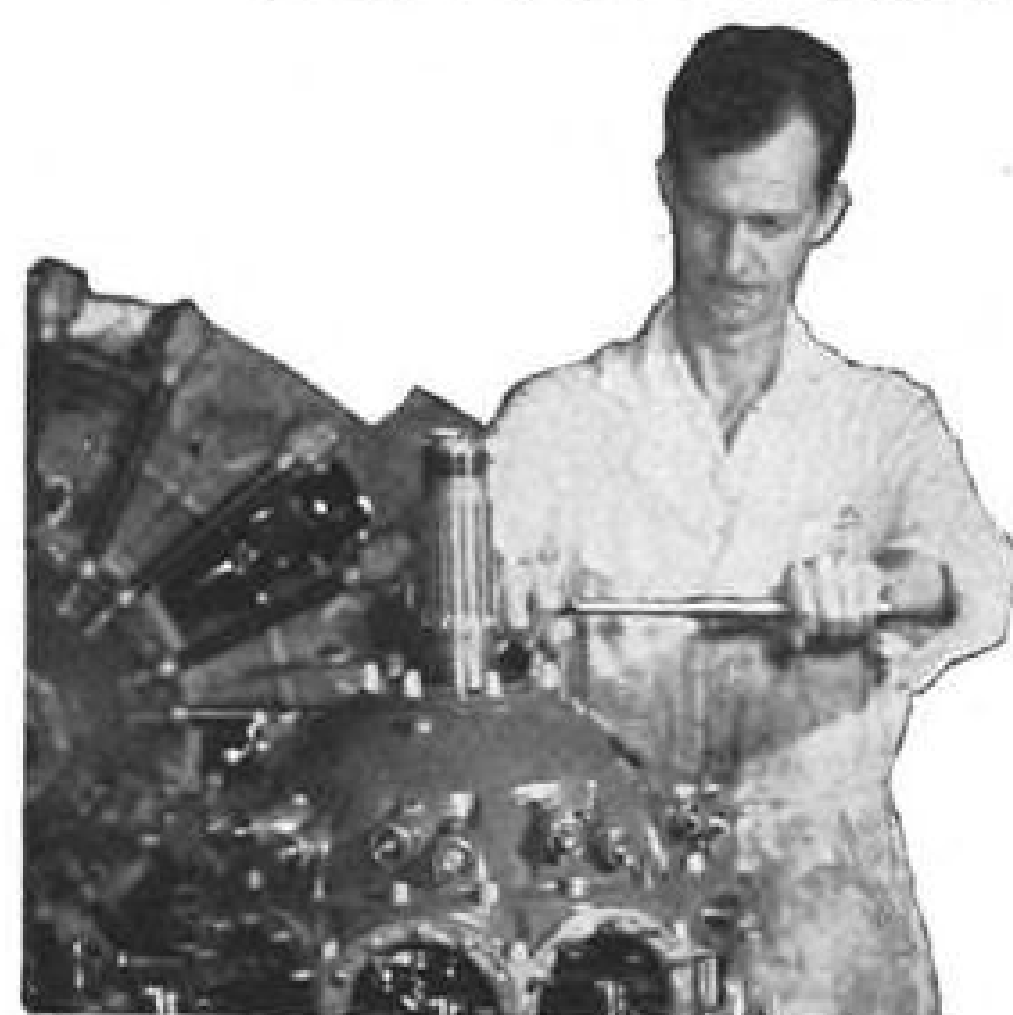
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April 26, 1954

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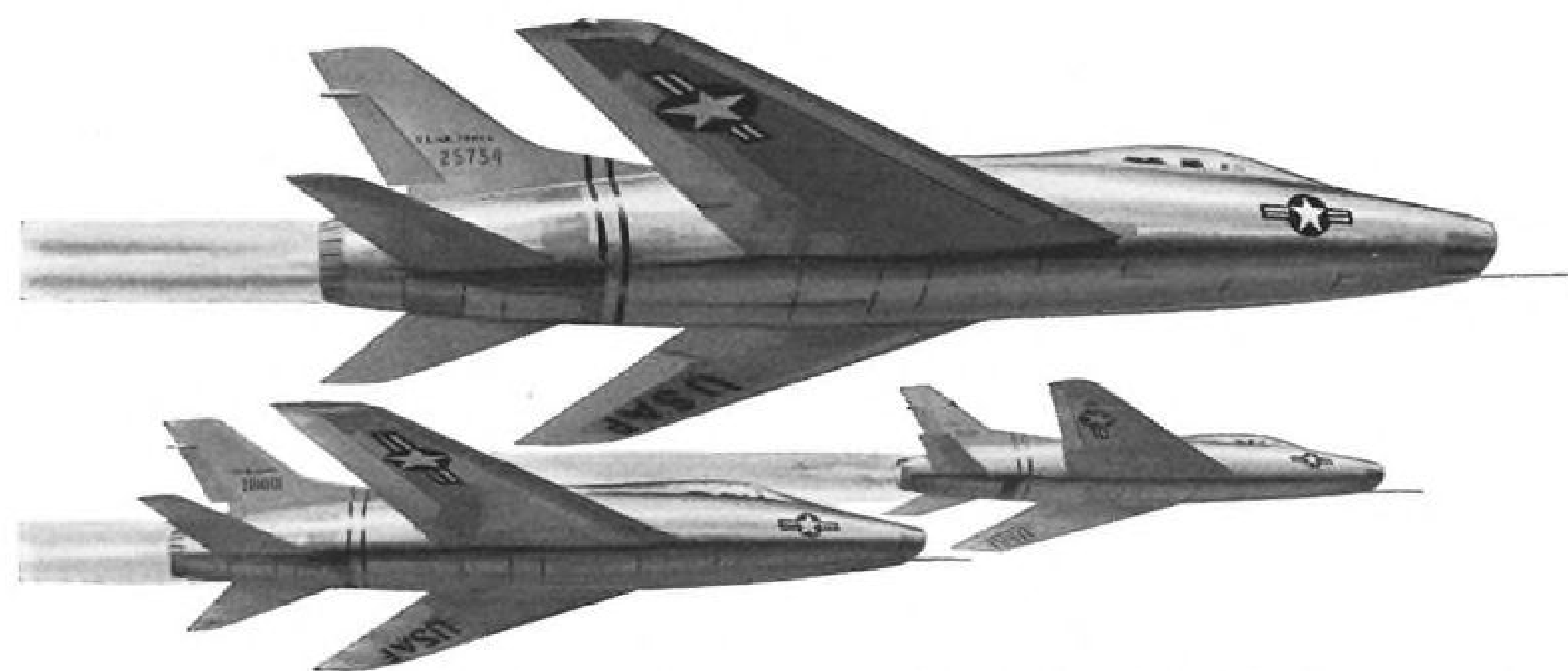


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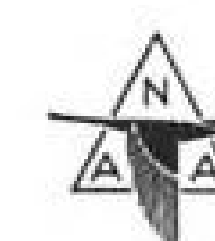
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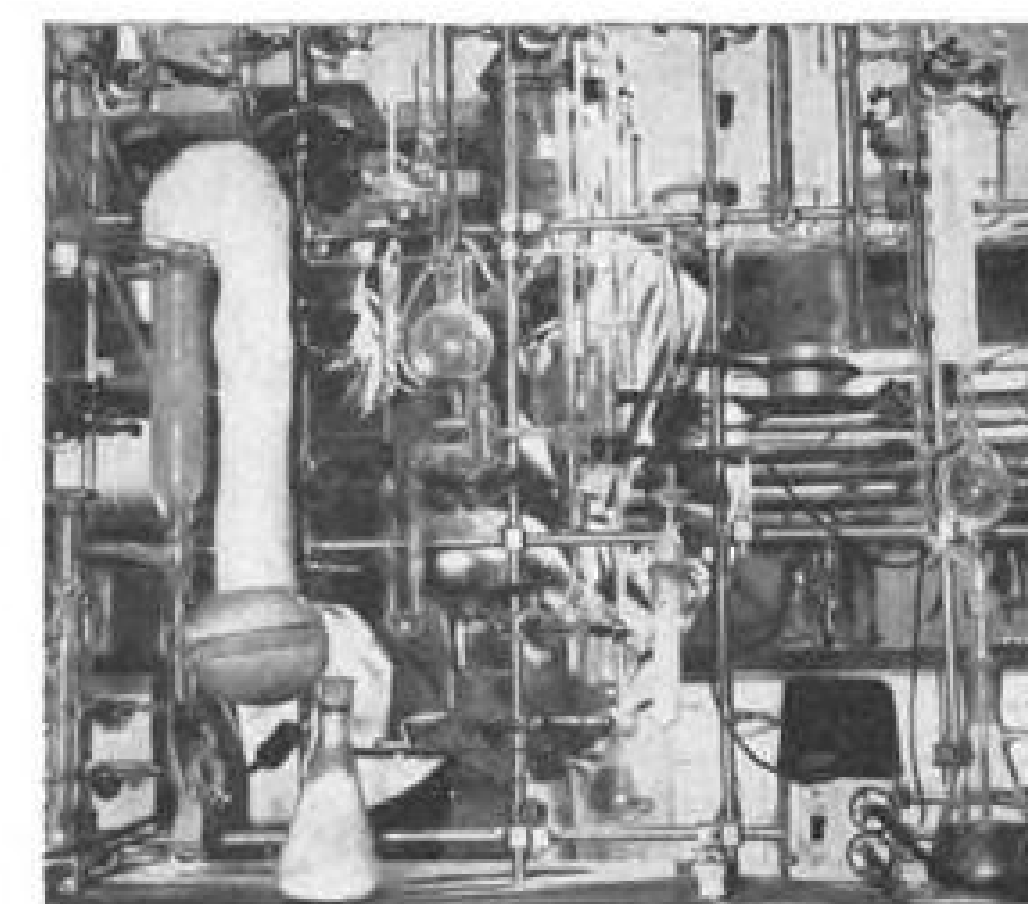
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## NEWS DIGEST

### Domestic

Aviation jet fuel requirements of USAF and Navy have increased 3,000% since 1948 and will continue to soar, reports National Petroleum News, a McGraw-Hill publication. Projections set by the armed services petroleum purchasing agency for fiscal 1955: some 83-million barrels.

Atomic aircraft engine ground test facilities will be built by Arrington Construction Co. at the Atomic Energy Commission's national reactor testing station near Idaho Falls, Idaho. The \$2,021,200 second-phase contract covers first test area buildings and service facilities for a prototype propulsion reactor.

Panagra has authorized Douglas Aircraft Co. to modify its DC-7s now on order for full installation of the new Bendix Radio RDR-1 airborne storm-warning (X-band) radar. Panagra now is testing an AN/APS-42 (military) radar in a DC-6B (AVIATION WEEK Mar. 8, p. 7).

Flight Safety Foundation is publishing a monthly business pilots safety bulletin, says the new accident prevention digest was started in response to requests by business aircraft operators. Yearly subscription rate: \$25.

Bendix Aviation Corp. reports its ignition analyzers will be installed as standard equipment on American and National Airlines' DC-7 fleets, already are in use on Delta-C&S and United Air Lines' DC-7s.

New \$5-million laboratories at the Air Force Cambridge Research Center, Bedford (Mass.) Airport, will be dedicated this week (Apr. 26) by USAF Secretary Harold E. Talbott. AFRCRC Electronics Research Directorate and service groups will occupy the new facilities. Geophysics Research Directorate is expected to move to Bedford within two years when additional facilities, now planned, are constructed.

Solar Aircraft Co. has received a \$6.6-million order for San Diego production of components for Pratt & Whitney Aircraft J57 jet powerplants being manufactured by Ford Motor Co.'s Airplane Engine Division under license from P&WA.

Beverly E. Howard is the new president of the Aeronautical Training Society, national organization of military contract schools. He is associated with



### Pearl Harbor Gets Super Connie Picket

Here is the first of a fleet of radar-packed Lockheed WV-2 Super Constellation pickets Navy has assigned to Pearl Harbor, Hawaii, to watchdog vast Pacific areas against potential aggression by sea or air. The four-engine WV-2, recognizable by the large radomes projecting above and below its fuselage, carries approximately six tons of electronic detection equipment. Note the wingtip auxiliary fuel tanks.

the Hawthorne School of Aeronautics, Moultrie, Ga. Other officers: E. Merritt Anderson of Anderson Air Activities, Malden, Mo., vice president; Wayne Weishaar, Washington, D. C., secretary-treasurer.

U. S. lightplane exports totaled 62 planes during March, valued at \$942,040, bringing overseas shipments for the first three months of 1954 to 144 units at \$2,383,032, Aircraft Industries Assn. reports.

### Financial

Pan American World Airways' net income climbed to a record \$10,803,000 in 1953, compared with the previous year's \$6,673,000. Operating revenues increased to an all-time high \$217,950,000, 6.2% higher than for 1952.

New York Airways reports a net profit of \$48,241 for 1953, compared with 1952's \$3,284. The helicopter airline's operating revenues totaled \$1,244,389, compared with \$131,661; non-operating income increased from \$2,687 to \$16,684.

Piedmont Airlines claims inadequate mail pay in 1953 forced the company to taken an \$84,051 loss for the year. The airline's fixed-base division had a net profit of \$60,578. Consolidated loss of both divisions: \$23,473.

Republic Aviation Corp., Farmingdale, N. Y., had a net income of \$924,905 from sales totaling \$44,255,223 during the first quarter of 1954, compared with a \$1,901,870 and \$97,566,626 in sales for the first three months of 1953.

Delta-C&S Air Lines' net profit for

the first quarter of this year totaled \$167,000 from gross revenues of \$13,098,000. The airline reports a \$144,000 loss on its International Division, operated without subsidy since Delta and C&S merged May 1.

United Air Lines will pay a regular quarterly dividend of 25 cents June 15 to common stockholders of record May 14.

### International

Britain's Hawker Siddeley group and its new subsidiary, High Duty Alloys (Canada), Ltd., have purchased the stock of Canadian Steel Improvement, Ltd., Toronto company formed in 1951 with government assistance to produce jet engine blade forgings for Avro-Canada's Orenda powerplant program.

Hubert Scott-Paine pioneer British aircraft designer who helped organize Supermarine Aviation Works, died Apr. 15 at Greenwich, Conn. He was 62.

Aircraft fuel system components designed and produced by Britain's Flight Refuelling, Ltd., will be manufactured and sold in France by Societe Carburateur Zenith under a 10-year license.

Continental aircraft engines will be produced by Fuij Automobile Co. in Japan under a contract calling for a down payment of \$150,000 to the U. S. powerplant builder, royalties of \$75 each for the first 400 engines and \$50 thereafter up to a total of \$75,000.

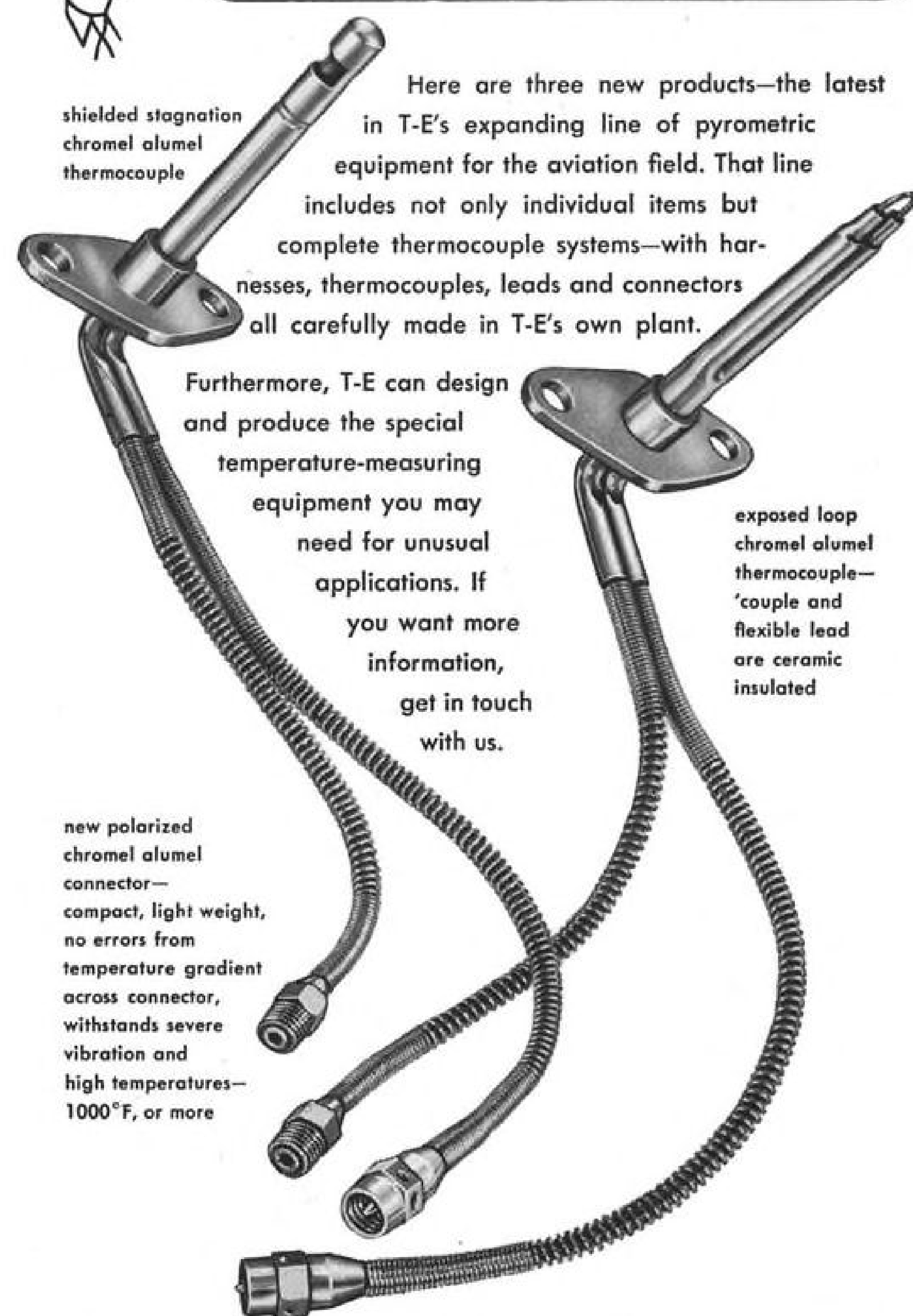
Spain's Aerotecnia has sold patents for its Madrid helicopter to French aircraft builder Cnase for approximately \$62,800.



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## Washington Roundup

### Budget Battle Unlikely

There won't be any significant battle over the Administration's "new look" budget for fiscal 1955 when the House of Representatives takes it up this week. "I don't look for any sharp battle on the floor as far as the committee is concerned," Rep. George Mahon, ranking Democrat on the Military Appropriations Subcommittee, said.

Rep. Samuel Yorty and a handful of other Democrats may make efforts for a boost in Air Force funds, but without the support of Democrats on the Appropriations Committee these probably will fizzle.

The staunch support of the USAF program by Air Force Secretary Harold Talbott and USAF Chief of Staff Gen. Nathan Twining erased any inclination in the committee for a concerted fight for a bigger USAF program. "The best we can do is go along with the Pentagon team," Mahon remarked. Senate's Military Appropriations Subcommittee, headed by Sen. Homer Ferguson, will start hearings on the defense budget after the House completes action.

### Atomic Engine

An improvement in the atomic aircraft engine program has been accomplished by USAF, aimed at developing test engines faster and providing adequate facilities for their testing (AVIATION WEEK Apr. 19 p. 15; Apr. 5, p. 13). Confirmation of this USAF program shift was given to Congress by Defense Secretary Charles E. Wilson in a formal document summarizing military policy changes and improvements.

### Navy Trainer Fight

Politics snarled the award of the Navy trainer design competition to Beech Aircraft Corp. (AVIATION WEEK Apr. 19, p. 16). Temco Aircraft Corp. was the other competitor. Beech received notice from Navy that their design was "acceptable . . . for procurement." Congressional pressure, however, caused top Pentagon officials to side-step the issue by calling for new cost proposals with minor design changes.

### ARDC Shift

Appointment of Maj. Gen. Thomas Power, former vice commander of Strategic Air Command, as chief of the Air Research and Development Command to fill the hole left by shift of Lt. Gen. Donald Putt to the air staff is being interpreted to mean more emphasis on development of atomic and hydrogen weapon delivery methods.

It is no secret that efficient delivery methods have been lagging badly behind Atomic Energy Commission nuclear weapons development. Part of this lag is inherent in the air weapons development cycle of five to six years compared with an atomic weapons development cycle of less than half this time.

### Industry Sitdown

Individual firms in the aircraft manufacturing industry have been staging a quiet sitdown strike against the Air Coordinating Committee air policy study. Although Aircraft Industries Assn. has been working hard to pre-

pare an industry statement, it is getting little co-operation from its members.

Aircraft manufacturers would prefer to see a full-dress air policy study by an independent group, such as the Presidential Air Policy Commission of 1947. Republican Carl Hinshaw and Democrat Stuart Symington have been plugging for such a group in the House and Senate, respectively.

### Overhaul Claims

Some engine manufacturers are apt to be embarrassed by testimony of top USAF and Navy BuAer officials on the average and allowable overhaul intervals being achieved on turbojet engines used by the services.

Some manufacturers have been advertising 1,200-hr. allowable between overhauls for their jets. USAF Assistant Secretary for Materiel Roger Lewis told the House Appropriations Committee the 1,200-hr. figure represented "a pious hope" rather than actual fact.

Highest USAF allowable overhaul interval for jet engines is now 800 hr. for an unspecified type. Highest Navy allowable overhaul interval is 1,000 hr. for the Pratt & Whitney J42.

### Air Force Academy

Odds inside the Pentagon favor Colorado Springs as the site to be picked for the new USAF Academy.

### Windtunnel Study

Bureau of the Budget has directed Defense Department and National Advisory Committee for Aeronautics to make a study of all windtunnel facilities available and planned for aeronautical research, with a view toward avoiding duplication of facilities.

### Engine Policy Switch

USAF officials gave a complete breakdown of the 9,000 aircraft engines cut from the procurement program last fall (AVIATION WEEK Sept. 28, p. 14) when testifying before Congress on the fiscal 1955 appropriations bill. The \$449.5-million engine slash consisted of:

- 5,831 General Electric J47 jets costing \$45,000 each.
- 1,024 Curtiss-Wright J65 jets, costing \$80,000 each.
- 2,237 Pratt & Whitney R2800 piston engines, costing \$45,000 each.

When USAF announced the "economy" engine cuts last fall it refused to provide a public breakdown of the engines being canceled or their prices.

### Research Operations

Cost effectiveness studies by Army's Operations Research Office are proving very helpful in guiding military decisions on new weapons.

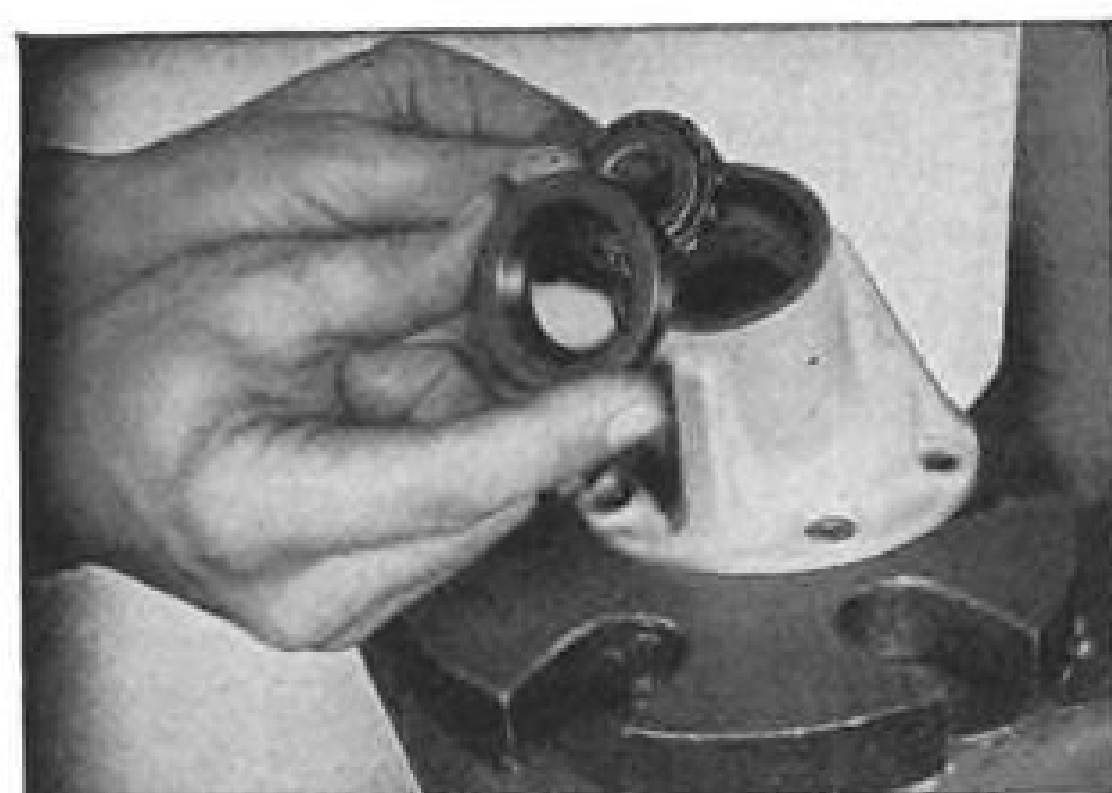
Recent ORO study on air defense weapons shows that despite the cost of each Nike guided missile, the annual cost of maintaining this type of air defense for a given effectiveness is only a fraction of that of other anti-aircraft weapons now available to the Army, says Maj. Gen. John F. Uncles, Army R&D chief.

Gen. Uncles reports that industry is showing interest in the use of operations research as a tool of management.

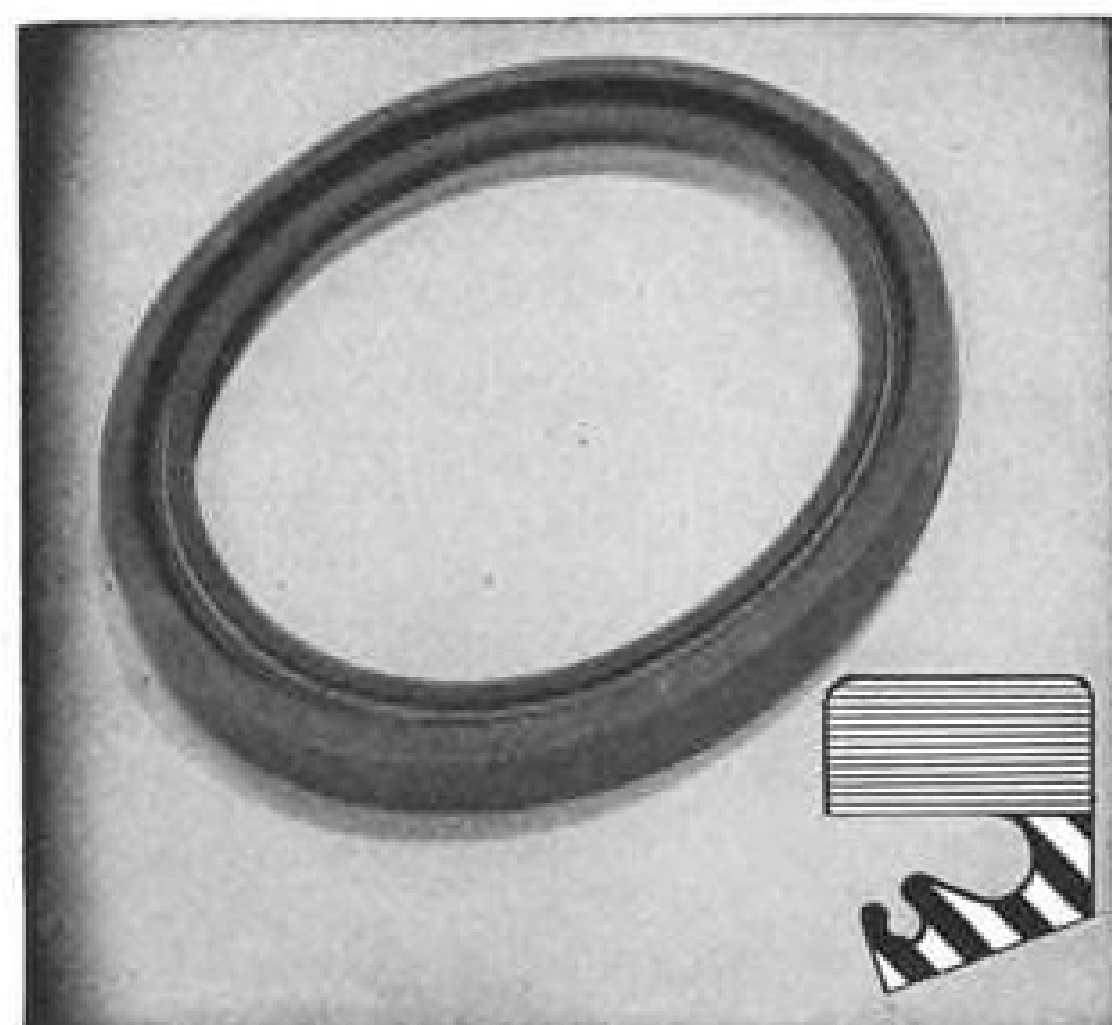
—Washington staff



## J-M Clipper Seals fly with the Sikorsky HO5S helicopter...



Clipper Seal being installed in the intermediate gear box of the Sikorsky HO5S helicopter to seal oil in, keep abrasives out.



Photograph and cross section of Type LPD Clipper Seal. This is just one of numerous styles available to solve tough sealing problems.

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## WHO'S WHERE

### In the Front Office

Alexander H. d'Arcambal has been elected president of Niles-Bement-Pond Co., West Hartford, Conn., filling the vacancy created by the death of Frederick U. Conrad last month (AVIATION WEEK Mar. 22, p. 7). Charles W. Deeds is new board chairman, Richard W. Banfield executive vice president.

R. S. Gates has been appointed executive vice president of Collins Radio Co., Cedar Rapids, Iowa. Other new vice presidents: L. E. Bessemer, manufacturing; R. T. Cox, research and development; J. G. Flynn, Jr., sales, and M. W. Burrell, second v.p.

Otis E. Kline has been promoted by United Air Lines to vice president-coordinator of operations.

William T. Beebe has moved up from personnel director of Delta-C&S Air Lines to vice president-personnel.

Frank E. Wallis is new vice president-sales of Zenith Aircraft, division of Zenith Plastics Co. at Gardena, Calif. Also elected: Charles Brucker, vice president-procurement; William E. Braham, vice president-engineering; Floyd H. Huhn, vice president-manufacturing, and Victor Sokolove, treasurer.

Walter H. Dickman has formed Waldick Engineering Co. at Garden City, N. Y., to represent aircraft and industrial product makers on the East Coast.

Col. Leslie A. Skinner (USAF Ret.) has resigned as vice president and manager of engineering for Oerlikon Tool & Arms Corporation of America, Asheville, N. C.

Charles H. Shuff, onetime deputy to the Assistant Air Force Secretary, is new assistant to the president of Westinghouse Electric International Co., New York.

### Changes

Air Vice Marshal C. E. H. Allen has joined Dunlop Rubber Co.'s Aviation Division at London as liaison with the British government and aviation firms.

Joseph P. Villo has been promoted to manager of Standard Pressed Steel Co.'s Aircraft and Allied Products Division.

C. Merlin Wahlberg is new assistant controller for Republic Aviation Corp., Farmingdale, N. Y.

Crockett A. Harrison has joined the administrative staff of the vice president-group executive of Bendix Aviation Corp., Teterboro, N. J.

H. G. Conway has been named chief engineer for Short Bros. & Harland, Ltd., Belfast, Northern Ireland.

### Honors and Elections

Mundy Peale, president of Republic Aviation Corp. at Farmingdale, N. Y., has been awarded France's Legion of Honor.

Charles A. Parker, executive director of National Aviation Trades Assn., last week received the third annual Amvets Certificate of Merit for contributions to aviation.

Dr. John P. Marbarger, research director for the Aero Medical Assn. at the University of Illinois, has received United Air Lines' annual Tuttle Award for "outstanding research in 1953."

## INDUSTRY OBSERVER

► Strike at North American Aviation, Inc. last fall and technical problems with the Republic F-84F have been the only two sore spots in the USAF production program for the past 12 months. USAF Secretary Talbott cited "engine and structural difficulties with the F-84F" as the reason "we have had serious production delays in the F-84F program."

► Cost of the Pratt & Whitney J57 split-compressor turbojet is now \$250,000 per engine, according to USAF.

► Cessna T-37 jet trainer is being put into production on the initial low-rate manufacturing plan developed by USAF (Aviation Week Apr. 12, p. 13).

► Navy has reduced critical metal content of jet engine turbine blade forgings by as much as 60% in some cases.

► USAF has resolved the battle over asphalt vs. concrete runway by specifying that wherever blacktop construction is used, there must be a thousand-foot concrete area at each end of the runway. USAF specifies the concrete areas to prevent deterioration of asphalt from jet fuel spillage and engine blast during runup and the early portion of the takeoff run.

► Douglas is developing a new advanced version of its Skyray Navy carrier-based fighter, designated the F4D-2. The new version will feature some configuration changes from the F4D-1 model now in production at the El Segundo Division.

► Boeing Airplane Co. is developing a larger version of its B-52 Stratofort bomber aimed at increased range and better accommodation of the hydrogen bomb.

► Navy has abandoned its program to convert DC-3s to Super DC-3 transports because of price increase set by Douglas for the program. Vice Adm. Ralph Oftsie, Deputy Chief of Naval Operations for Air, recently told the House Appropriations Committee that the Super DC-3 program was a good buy at its original price but with the new figure submitted by Douglas the Navy felt it wiser to use its money for modern twin-engine transport equipment. Navy already has bought one Convair 340, is negotiating an order for more.

► Watch for Navy hydro-ski development to continue on a new tack. Experiments with the twin hydro-skis on the Convair XF2Y-1 have indicated operational difficulties for this configuration but have opened exploration of a promising new configuration.

► The French are the latest to adopt the all-flying "slab" tail configuration for highspeed fighters. Dassault Mystere 4B and 4N are being modified with a slab tail for better control in the transonic range.

► Study on reliability of electronic equipment in all the military services made by the Defense Department showed the following causes of failure: tube failure, 67%; design errors, 13%; component failures 10%; improper maintenance and installation 7%; manufacturing errors, 3%.

► North American Aviation has a USAF contract to develop an aircraft fuel measuring system using radiation techniques.

► USAF reveals that the first experimental B-52 purchased cost more than \$20 million while first production model Stratoforts now being built at Boeing's Seattle plant will cost \$8.7 million each. B-52s to be built at Boeing's Wichita plant will cost \$15.7 million each for the initial increment.

► Largest British production program on a really modern jet aircraft has been on the Canberra twin-jet bomber, of which some 400 have been produced by three aircraft companies. In contrast, fewer than 100 Hawker Hunter fighters have been built to date.



## Defense Reveals Scope of Missile Buildup

- **Military programs \$4.7 billion since '51; Army takes wraps off Corporal, Honest John artillery weapons.**

By G. J. McAllister

New official indications of the scope and direction of the guided missile program were revealed last week in testimony released by House Appropriations Committee.

If Congress approves Defense Department's fiscal 1955 request of \$625 million, the guided missile program will have received during the fiscal years 1951 through 1955 \$4.7 billion for research and development, production

and procurement, facilities expansion and tooling. The amount is distributed approximately as follows:

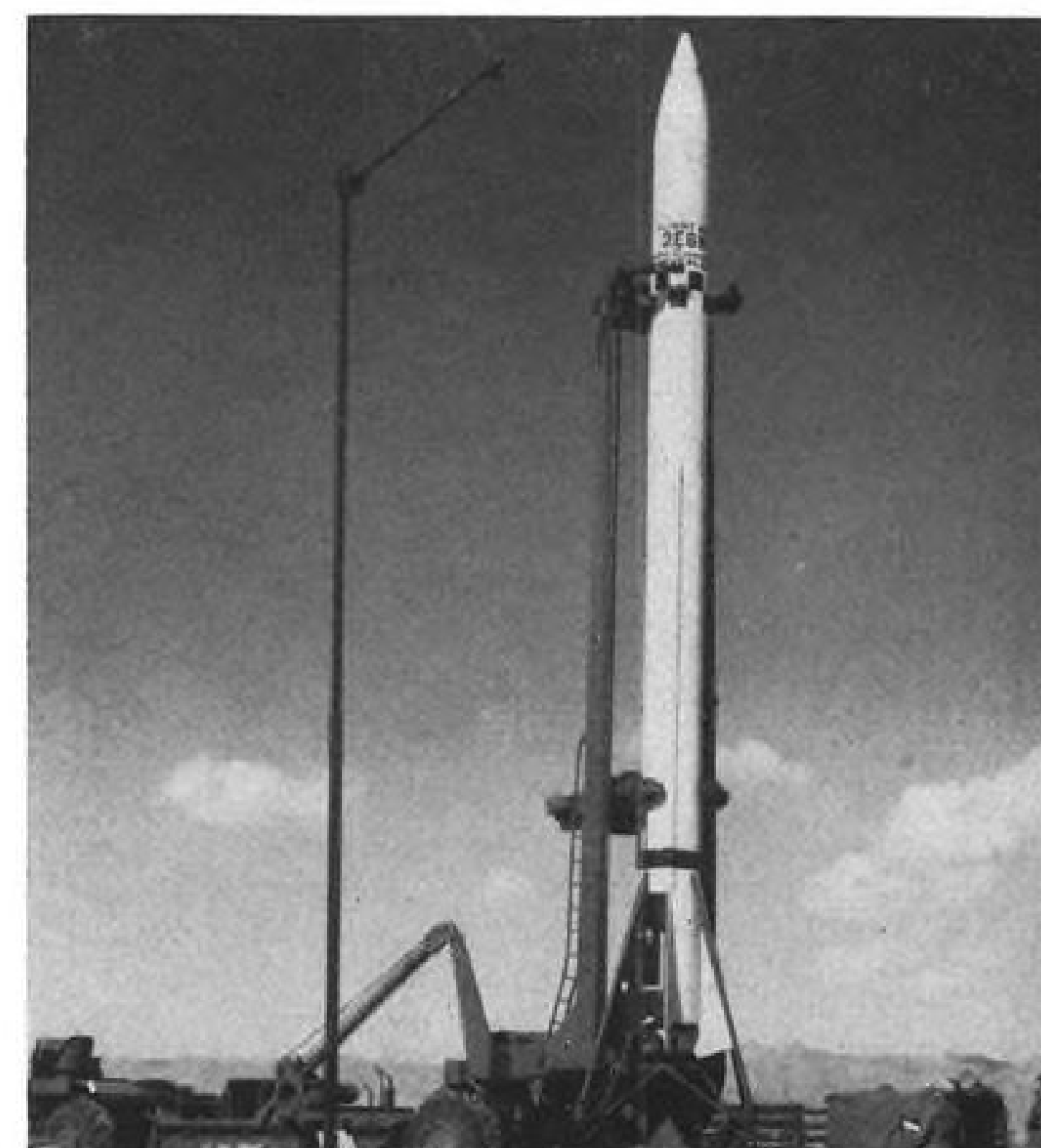
- \$2.9 billion for procurement and production.
- \$1.6 billion for research and development.
- \$200 million for facilities expansion and tooling.

Defense Department estimates that \$900 million will be expended in fiscal 1955 on these phases of the missile program.

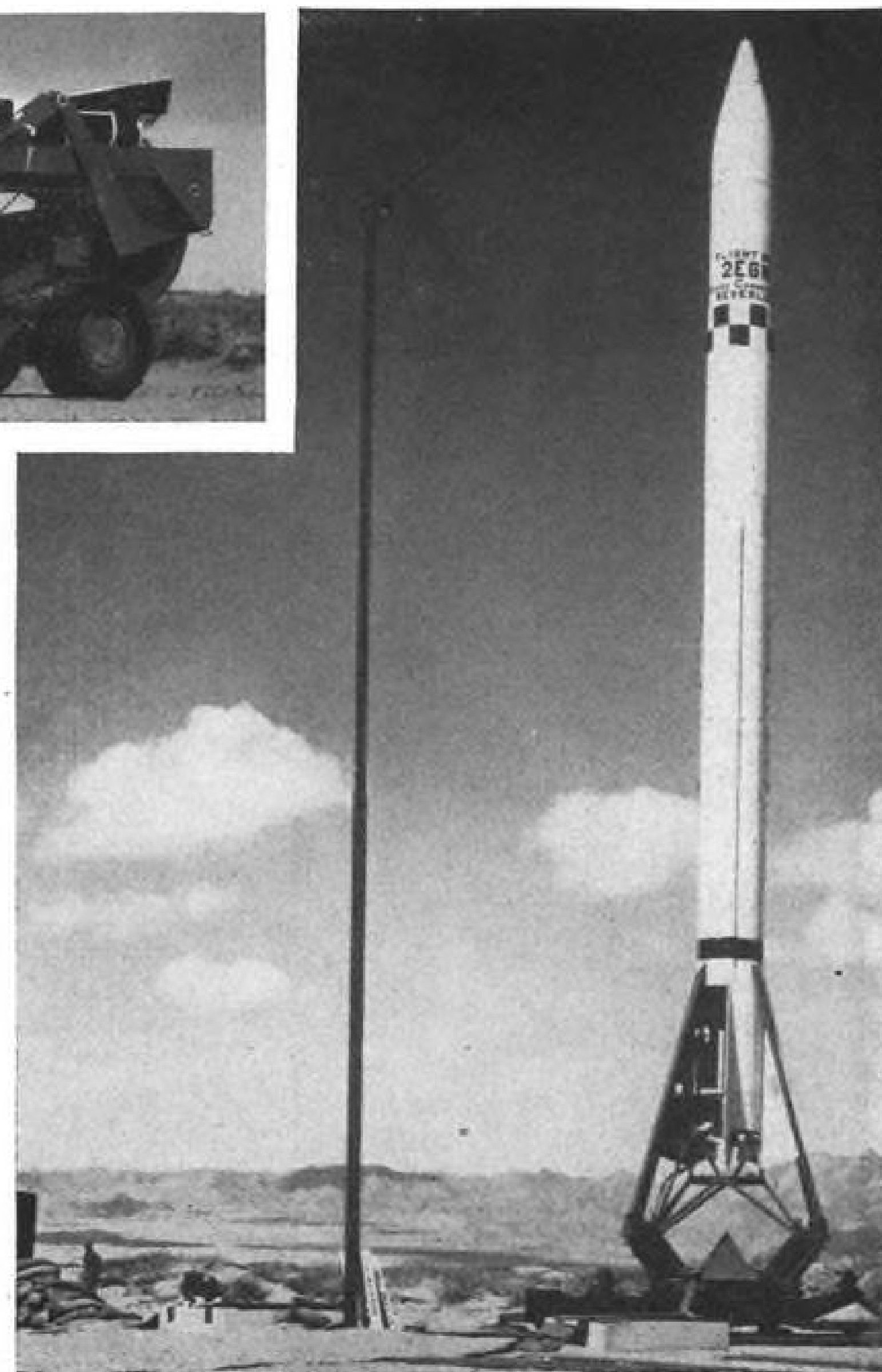
New technical information and trends include:

- **First photos** and information on two Army surface-to-surface missiles—the Corporal missile and the Honest John artillery rocket. Both weapons are being delivered to troop units for regular use.

- **Marine Corps** is seeking \$980,000 to buy control systems for a new guided missile system called LaCrosse which is to be used to provide close support for ground troops. Test program will involve the missiles and two types of ground control equipment—one for operations when the target can be seen and the other when the target is invisible, said Lt. Col. Floyd M. Johnson,



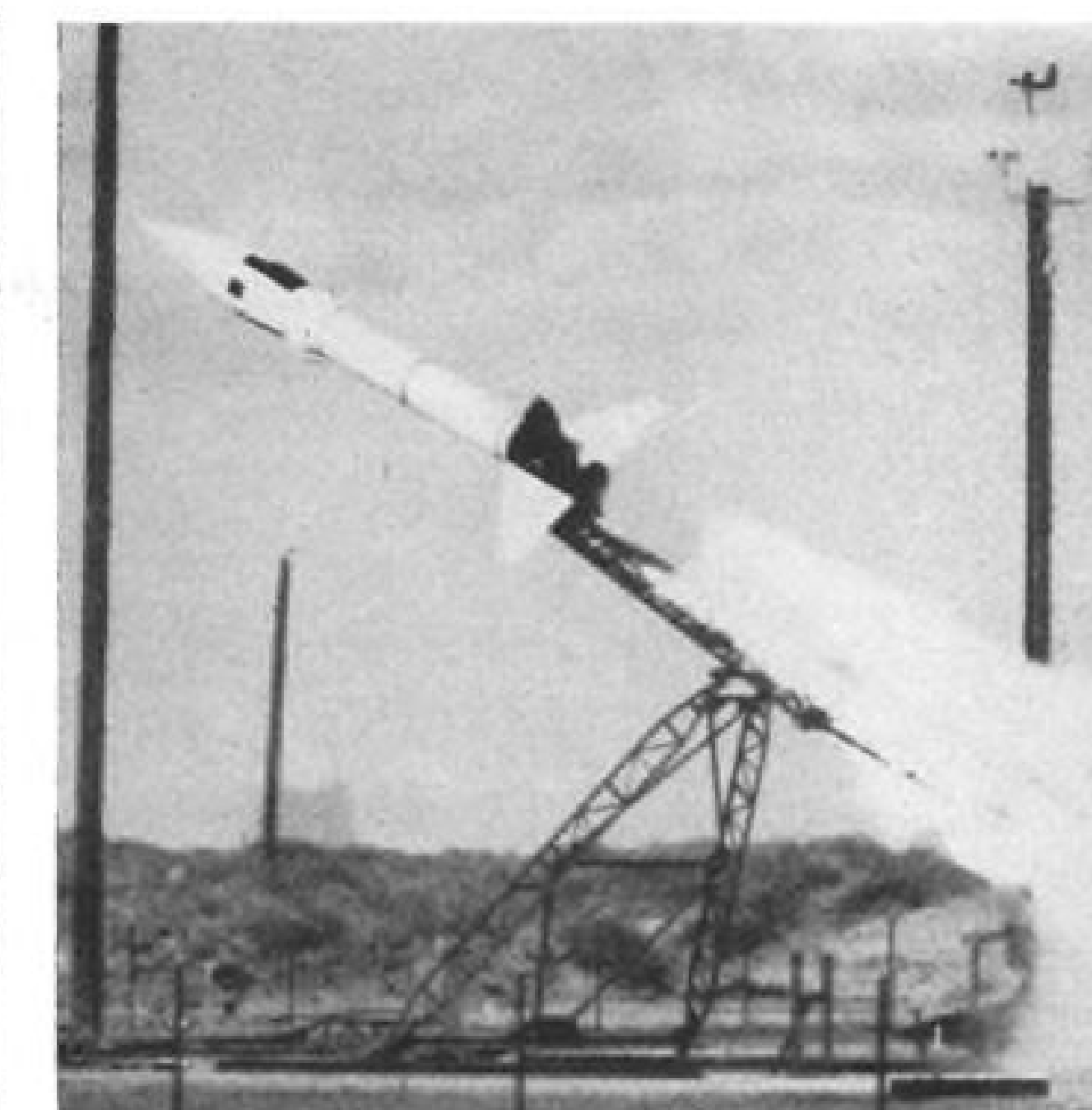
**CORPORAL** surface-to-surface missile, among latest additions to Army arsenal, is transported to launching site and . . .



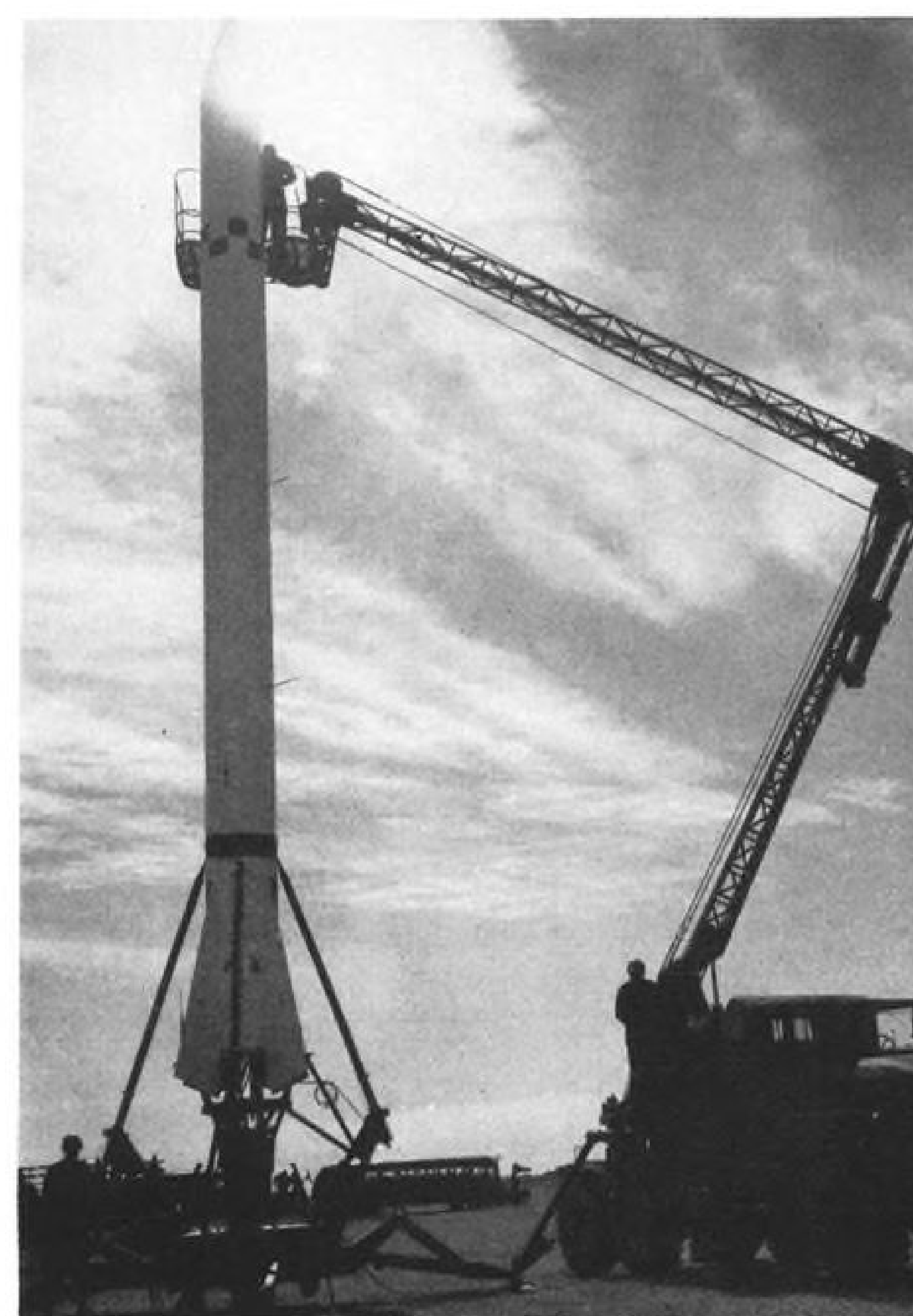
**ERECTED** (above) by special vehicle to stand in four-armed cradle above conical flame deflector. Then Corporal missile is . . .



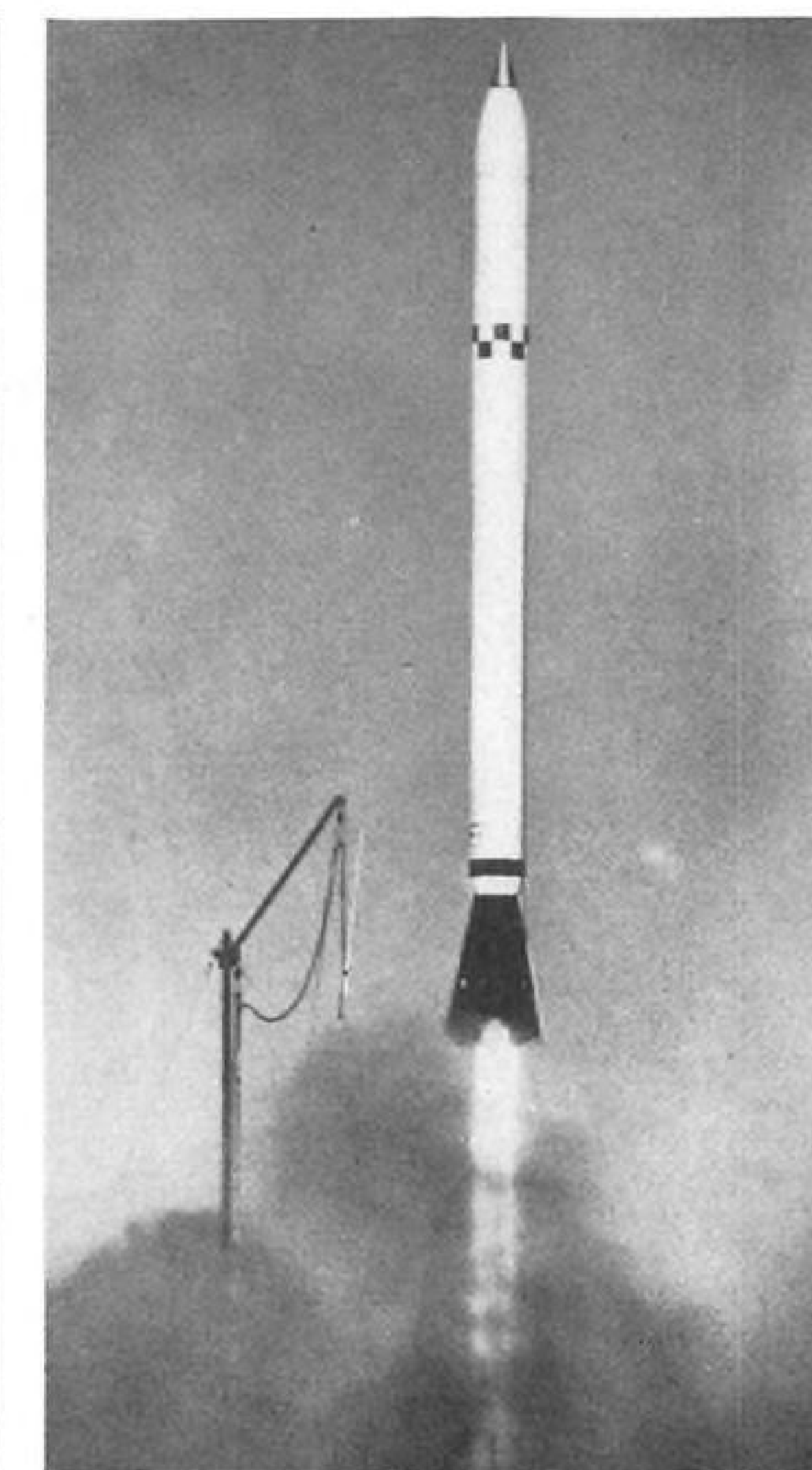
**HONEST JOHN** is heavy field artillery rocket with mobility exceeding some current conventional artillery. Fired from special truck which combines transport and launcher, Honest John is unguided, can carry atomic or conventional warheads with equal ease. Diameter is 30 in.



**LAUNCHED** from test track, Honest John takes off at supersonic speed. Simple design of rocket makes for easier producibility and higher reliability. First large unguided rocket to be used by Army, it is aimed much like a gun.



**SERVICED** from mobile work platform at end of long hinged arm mounted on truck. Sandbags protect crew as missile is checked . . .



**AND LAUNCHED** on 100-mi. flight to target. Corporal was developed from Corporal E research rocket.



chief of USMC research and development.

Group equipment costs about \$600,000 and the missiles about \$380,000. The program was started by USMC in 1947 and is now under the control of Army Ordnance.

• **Doubts that the Nike** anti-aircraft missile is the answer to Army's air defense problem, "even with the known enemy capability of today," were stated by Maj. Gen. John F. Uncles, Army research and development chief.

"We do not pretend that Nike can fulfill all air defense requirements. We know that it must be supplemented by other weapons to provide a weapons system to give maximum air defense effectiveness. . . . Not all of our air defense eggs are in the basket marked 'guided missiles,'" Gen. Uncles told House committeemen.

An energetic publicity campaign has been conducted on the Nike. Army plans to obligate about \$28.5 million in fiscal 1955 for anti-aircraft missile research and development, compared with an anticipated obligation of about \$36 million in the current fiscal year.

• **Sparrow air-to-air missile** now is considered by Navy to be sufficiently reliable for service use. Navy reported that it had conducted sufficient operational tests on Sparrow 1 to indicate that it was an effective air-to-air weapon and that it took less time to train pilots in the use of this missile than conventional aircraft armament.

Navy said other versions of the Sparrow also indicated promise in test operations.

• **Air Force** confirmed that it is developing parasite pilotless bomber for strategic bombing operations to extend the capability of these aircraft to strike strongly defended targets. Bell B-63 Rascal is the only USAF missile of this type announced to date. USAF also said it is developing completely automatic pilotless bombers to provide future weapons systems for effective and economic attack on enemy strategic targets.

## The Corporal

Components of the Corporal bombardment missile include the missile, a mobile launcher and guidance equipment. The new Corporal does not differ greatly from the Corporal E research weapon, except in tail surfaces. The trapezoidal fins of the E model have been replaced with drastically reduced delta surfaces. Vanes protrude into the jet exhaust of the rocket motor to provide control at low speeds of the initial takeoff stage. It resembles the World War II German V-2.

► **Greater Firepower**—The mobile launcher combines transport and launcher. It is equipped with a bull-

## Contract Change

Navy reports it is in the process of converting its guided missile contracts from cost plus fixed fee to a fixed-price-incentive-type contract. Navy's Bureau of Ordnance switched its largest single missile contract to a fixed-price contract late in 1953. Navy says the conversion in missile contracts is aimed at "providing a definite incentive to industry to reduce costs and operate at maximum efficiency."

dozer blade for leveling the firing site. The launcher is a comparatively simple device consisting of a light, metal take-off pedestal. A hydraulically operated erector places the missile in firing position on the takeoff pedestal.

The missile is winched into an erect position while it is still clamped in yoke on the main lifting beam. A special truck with a work platform at the end of a hinged arm moves in for any last-minute servicing needs.

Corporal follows a ballistic trajectory in its flight to the target. Weather and visibility place no restriction on its use. It travels at supersonic speed and is powered by a rocket motor. It is capable of engaging targets far beyond the ranges of conventional artillery, including the 280-mm. atomic gun and the Honest John rocket. Atomic or conventional type warheads can be utilized.

"The weapon gives the field commander far greater firepower on the battlefield and enables him to strike selected targets deep in the enemy's rear areas," the Army says.

## Missile Policy

USAF guided missile program for fiscal 1954 and 1955 has been re-evaluated to continue emphasis on research and development instead of production, Assistant Air Force Secretary Roger Lewis says.

"Our guided missiles program as finally determined," Lewis told Congress, "reflects an emphasis on research and development. In general it was found as a result of a careful technical studies and evaluations that some programs for which production had been planned were not yet ready for production and that production orders placed or programmed should be deferred. . . . Large production will be ordered as soon as the state of development and design warrants."

► **Cal Tech Experiments**—Development of the Corporal started in 1944 when the California Institute of Technology began experiments in the rocket propulsion of artillery range missiles. Army Ordnance established a jet propulsion laboratory which was operated under contract by Cal Tech.

A full-scale guided missile program was inaugurated which led to the development of the Corporal. Early predecessors of the Corporal were the Private, Private First Class and the WAC Corporal.

Corporal is now manufactured by the Firestone Tire and Rubber Co. and Gilfillan Brothers, Inc. Firestone makes the missile shell and Gilfillan the guidance equipment.

## Honest John

Honest John is a free-flight rocket without guidance control. It consists of a rocket weighing several tons and a self-propelled launcher. The rocket itself is made up of a forward compartment which houses the warhead, a rocket motor in the middle and a fin assembly at the tail.

The warhead pedestal and motor and fin assemblies are put together at the factory. Final assembly of the warhead and fins to the rocket are made near the firing site. The rocket is aimed in much the same manner as a gun is laid on a target. Normal crew training and standard fire control techniques are used.

► **Mobility**—It has considerably more battlefield mobility than conventional artillery, and one high-explosive round delivers the effect of hundreds of artillery shells, Army says.

The process from study to production moved rapidly for the Honest John. Army Ordnance first studied a large-caliber artillery rocket in May 1950. Douglas Aircraft Corp. submitted proposals based on Ordnance specifications, and first firing tests were completed at White Sands, N. M., in August 1951. Large-scale production by Douglas was started in January 1953.

## Lockheed Pays Top Officers \$817,600

Robert E. Gross, president of Lockheed Aircraft Corp., received a salary of \$130,830 during 1953, the firm reports to Securities & Exchange Commission.

Other top executive salaries: C. A. Barker, vice president & treasurer, \$92,595; Cyril Chappellet, vice president, \$71,430; Courtlandt S. Gross, executive vice president, \$98,085; Hall L. Hibbard, vice president, \$71,280; and Carl B. Squier, vice president, \$62,370.

All officers and directors received a total of \$817,607.

## Atomic Attack

• **Twining reports Russia** has modern bombers.

• **But Wilson claims Soviet** could not penetrate U.S.

Sharp differences between Defense Secretary Charles E. Wilson and top Air Force officials on the vulnerability of the United States to Russian atomic air attack and on the quality of Soviet airpower were revealed in congressional testimony.

Wilson and USAF leaders appeared before the House Appropriations Committee's Subcommittee on Armed Services in support of the Defense Department fiscal 1955 appropriation bill.

► **Reds Convert**—Gen. Nathan F. Twining, USAF Chief of Staff, told the congressmen that Air Force intelligence indicated Russia's large force of long-range bombers is "now beginning to change over to more-advanced long-range bomber types" than the Tu-4 copies of B-29s with which it has been equipped.

Twining said that, coupled with the Russian buildup of a medium and heavy bomber force capable of delivering nuclear weapons against the United States, "the Soviets have also created a large force of light jet bombers with a supporting airbase structure which adds additional atomic threat to our interests in the European and Far Eastern theaters. . . .

"The Soviets have continued their great effort to build up an air defense system. They have completed replacement of piston fighters with jet fighters and are continuing to make improvements in their jet fighters.

► **Satellites Integrated**—"There has been a rapid expansion of early warning ground-controlled intercept radar coverage with improved modern equipment," the USAF Chief said. "Of major importance has been the integration of the satellite air forces into an efficient organizational structure for the overall Soviet bloc air defense system."

In answer to a question from Rep. Clarence Cannon—"What is the speed of the fastest Russian plane capable of carrying an A-bomb?"—Wilson cited 250-mph. speed of the Tu-4, copied from the B-29.

Wilson later acknowledged that he thought it was a mistake to underestimate the quality of Russian equipment or pilots and said he believed the Russians were working "on their research side pretty hard."

► **Attack Query**—Wilson told the congressmen he believes the U.S. is "vulnerable but not highly vulnerable" to

enemy air attack. Pressed by Democrats Clarence Cannon and Paul Mahon on how many Russian bombers could get through the continental air defense system to U. S. targets, Wilson replied:

"Adm. Radford is going to appear before you tomorrow or whenever you want him, and he has a good analysis of the situation on how many we could stop. It would depend partly on what time of day they came. It would depend partly on how much warning we had and it would depend on whether they did it now or three years from now."

Cannon asked Wilson if he thought Russian bombers could penetrate U.S. air defenses.

"No, I would not say that. I would rather say that I do not expect the Russians to try it in the near future," Wilson replied.

Cannon retorted: "But the very fact that they (Russians) continue to make both planes and atomic bombs and the very fact that you say we have an uneasy armistice indicates they might drop in on us at any time of day or night."

Wilson: "I do not think that is the conclusion to draw."

Cannon: "What is the conclusion, Mr. Secretary?"

Wilson: "That we are militarily strong enough to deter aggression and the Russians are not going to start a war by dropping a bomb on us when they know there is going to be immediate and massive retaliation. Also we know we can greatly improve our warning system and our ability to stop bombers. If you analyze the places the bombers would come from, how they would do it and what they have to do it with and if you are worrying about it, I think you will sleep a little better at night after hearing Adm. Radford's testimony."

Cannon: "Then while you will not say that none of those Russian planes will reach their target you think fear of retaliation rather than difficulty of

getting through might prevent such an attack?"

Wilson: "Yes. They would lose many bombers and trained crews and I do not think they could keep it up. It would be a terrible thing for our people to take for awhile."

When Radford testified he answered the same questions off the record.

Gen. Twining and USAF Secretary Harold Talbott later told the congressional committee that nothing had occurred to change the accuracy of the late Gen. Hoyt Vandenberg's statement two years ago that 70% of an attacking Russian bomber force could penetrate continental air defense and reach U.S. targets.

## Marquardt Builds New Jet Thrust Reverser

Van Nuys, Calif.—Marquardt Aircraft Co. this week announced its entry into the reverse thrust field with a variable area exhaust nozzle that the company says will provide positive control of forward thrust independent of engine rpm.

The nozzle also may be used in flight to increase range and endurance of turbojet engines, according to President Roy E. Marquardt. The new nozzle will provide up to 35% reverse thrust, the firm predicts. The device has not been tested yet.

► **Thrust Spoiler**—Unusual feature of the development is its forward thrust control. This will allow jet pilots to make landing approaches with nearly full engine power while using the device to spoil forward thrust.

"Approaches can be made with nearly full engine power with all forward thrust spoiled," Marquardt says. "After landing the reverser can be actuated to full reverse thrust and, in the event of an error in landing judgment, the pilot can go instantly from full reverse to full forward thrust and become airborne without delay."

► **Paying for Weight**—The nozzle may be used to adjust exhaust area to meet requirements for maximum engine thrust on takeoff, regardless of ground temperatures, and to meet the requirements for water-alcohol injection boost. It also may be trimmed in flight to an area that will achieve the minimum specific fuel consumption for a given cruise thrust requirement, the company reports.

Marquardt predicts this feature on long-range bombers will more than pay for the added weight of the nozzle in fuel saved. The nozzle weighs less than 100 lb.

Initial application for the new device will be for non-afterburning engines. It will be ready for test soon, the firm reports.

## Dayton Air Show

The 1954 National Aircraft Show will be held at the Dayton (Ohio) Municipal Airport during the Labor Day week-end Sept. 4-6.

The Dayton show is sponsored by the non-profit Air Foundation of Cleveland, headed by Fred Crawford, and will be the only aircraft show officially designated by the Defense Department for participation of the military services.

In addition to a military flying display and a program of jet- and piston-powered aircraft races, the show will feature exhibits by the aircraft industry.



Comet Operators Face Replacement Problem

Second grounding of de Havilland Comet jet transports has begun to stir new developments in the transport field from several directions around the world.

Although confirmation was difficult, industry observers indicated to AVIATION WEEK that British Overseas Airways Corp. is searching for long-range piston airliners to fill the gaps caused by withdrawal of its Comets.

A BOAC spokesman said he had heard of no moves to pick up new equipment, but added that it is "quite logical." He noted that the airline canceled its twice-weekly South Atlantic service immediately after the recent Comet grounding and diverted the Canadian Argonauts used there to handle services formerly handled by the jet airliners.

► **Bid for 377s?**—Report that BOAC might get Boeing Stratocruisers from Northwest Airlines could not be confirmed. NWA sources point out that Northwest only recently has added a third Stratocruiser transcontinental service to its domestic run and is getting ready to start a big newspaper advertising campaign promoting 377 services. NWA also points out it will be sometime before its first Super Connies are available and that replacement of the Stratocruisers would be difficult in today's tight transport market.

Australian sources expressed some concern over orders for Comet 2s placed by British Commonwealth Pacific Airlines and Qantas Empire Airways. The feeling there is that Australian carriers probably will search for additional U. S. planes, possibly Super Constellations, to replace the Comets now on order.

► **Postpones Comet Order**—From To-

kyo came word that Japan Air Lines is postponing delivery of its two Comets for two years.

A Royal Canadian Air Force source notified AVIATION WEEK that it has not yet completed modification on its Comets, that the planes still are grounded. Whether the RCAF planes will fly again after the modification program depends on conclusions reached in the United Kingdom, the informant added. He emphasizes that RCAF has not experienced any trouble like that in BOAC's last two crashes.

► **Comet 2s Slowed**—De Havilland has slowed Comet 2 production and ended overtime for workers on the plane at its Hatfield plant. The manufacturer apparently feels that there is not much point in speeding Comet 2 output since crash investigations might dictate further modifications.

De Havilland also felt the impact of its difficulties with the Comet in another of its products. The daily press greatly overplayed some recent trouble experienced by DH Sea Venom jet fighters and said all Venoms were being grounded as a result of structural difficulties. Actually, only a few Navy fighters were involved.

The trouble centered around a routing defect which caused a small fatigue crack to develop on the lower wing surface along side and aft of the plane's landing gear well. The half-dozen or so Sea Venoms flying were called into the shops and a modification made which enabled them to be returned to service. The hundreds of RAF Venom fighter-bombers and all-weather fighters have not been grounded, although they are restricted in certain operations below 10,000 ft. until modified.

The retrospective modification calls for riveting a 16-in. x 12 in. plate over the former plate. The change also is being incorporated in the production line.



New Generation of Fighters Joins RAF

Indicative of new British highspeed swept-wing fighters that are beginning to go to Royal Air Force is this first group of Supermarine Swift Mk. 1s lined up at the company's Chilbolton Airfield prior to delivery.

It has been revealed officially that the Swift's standard armament consists of 30-mm. Aden cannon. A photo-reconnaissance version of the British fighter also has been developed.

Army Aircraft Buying To Double in 1955

Aircraft purchases by the Army in fiscal 1955 will be double that of the previous fiscal year, Army officers told House members.

Army plans to spend \$60 million in fiscal 1955. Army denied that the accelerated procurement program means the establishment of an Army air force.

"There is no conflict between the Army utilization of helicopters, which takes the vast majority of dollars in the aircraft program, and the needs of the Air Force or Navy. Army has need for helicopters which in no way conflicts with the Air Force use of helicopters," said Brig. Gen. Louis Cotulla, chief of requirements, G-4 (logistics).

During the first six months of fiscal 1954 Army obligated \$97.8 million for aircraft.

► **Convertiplane**—Most important development in Army aviation, according to Col. A. W. Betts of Army's research and development staff, is the convertiplane (AVIATION WEEK Feb. 15, p. 17).

It will undergo windtunnel and other extensive tests before final service trials, he reported.

Col. Betts also told the House Appropriations Committee that the Army plans to develop a new utility helicopter. "This will be very similar to the standard helicopter," he said, "to provide the Army with a satisfactory flying ambulance for rescuing the wounded. . . ."

► **Drop Kits**—Army also reported that an aerial delivery kit, capable of dropping a 2½-ton truck, is being delivered to troops.

"We are working on drop kits going as high as 18,000 lb. The problems here are not insurmountable, but they do require a rather extensive drop test program," Maj. Gen. Uncles, Army research and development chief, said.

Air National Guard officers said they expect to have 577 liaison planes and 76 helicopters attached to ANG units by the end of fiscal 1955. They expect delivery of some 95 aircraft during fiscal 1955.

**American, Capital, EAL Report Salaries**

Three airlines last week reported these executive salaries for 1953 to the Securities & Exchange Commission:

American. C. R. Smith, president, received \$71,250; William J. Hogan, vice president-treasurer; C. W. Jacobs, vice president, and O. M. Mosier, vice president, each received \$41,625. All officers and directors were paid a total of \$551,805.

Eastern. E. V. Rickenbacker, board chairman and general manager, received \$50,700; Paul H. Brattain, first vice president, \$31,700. All officers and directors received a total of \$302,800.

Capital. J. H. Carmichael, president, received \$48,000; R. G. Lochiel, vice president and treasurer, \$30,000; and C. H. Murchison, chairman of the board's executive committee, \$18,000.

**Navy Blames Cutback On Engine Problems**

Development problems with specific jet engine types forced Navy to reduce its fiscal 1955 aircraft procurement program for several fighter types and increase the quantity of trainers, top Navy officials testified before the House Appropriations Committee.

James Smith, Assistant Secretary of the Navy for Air, and Rear Adm. Apollo Soucek, Chief of the Bureau of Aeronautics, did not identify either the engines of the fighter aircraft involved in the shift but indicated the emphasis on trainers will enable the Navy to order 1,455 planes during fiscal 1955 instead of 1,322 originally scheduled before the fighter programs were curtailed.

► **Modernization**—Navy is scheduled to take delivery on 2,766 new aircraft during fiscal 1955 in contrast to 2,282 delivered during fiscal 1954.

Modernization of Naval Aviation is now about 45% complete, according to Vice Adm. Ralph Oftsie, Deputy Chief of Naval Operations for Air. Even after the completion of the current procurement program, Naval Aviation still will be only 87% modernized at the end of 1956 and will be short about 800 modern aircraft to achieve full modernization.

Other highlights of congressional testimony given by Navy officials include:

- Procurement of \$123 million worth of special radar picket aircraft for continental defense.
- Modernization of one Midway-Class carrier and three additional Essex-Class carriers with canted flight decks.
- Equipping all operational carriers with a new fuel blending device enabling carrier-based Navv jet aircraft to use cheaper jet fuels instead of high-octane gas now used aboard carriers because of piston engine requirements.
- Average cost of Naval aircraft will rise from \$814,450 for fiscal 1954 to \$1,292,720 in fiscal 1955.

► **Air Program**—The following program has been designated as the force level at which Naval Aviation will be maintained for the foreseeable future:

- 16 carrier air groups.
- 15 carrier anti-sub warfare groups.
- 3 Marine air wings.

In addition, both Navy and Marines

will maintain the necessary aircraft to support operations of these combat forces.

**ACC Opposes Closing 31 AirNav Ranges**

Retention of 31 of the 55 low-frequency air navigation radio ranges proposed for decommissioning was recommended last week by Air Coordinating Committee.

Decision by its Airspace Subcommittee was due to "justifiable civil or military requirements," ACC said.

► **CAA Decision**—The decommissioning program was established by Civil Aeronautics Administration in October 1953 (AVIATION WEEK Nov. 10, p. 14). The program was to be geared to implementation of the omni-directional airway system. The Airspace Subcommittee found that because of the general lack of VOR/DME airborne

equipment, only 22 of the 55 low-frequency ranges could be shut off without seriously impairing the system.

ACC is continuing to study two other facilities included in the 55 proposals. There are 330 low-frequency ranges operating in the U. S., and final decision on the closing of specific ranges will be made by CAA.

► **New Shutdowns**—ACC is expecting proposals to decommission about 15 more low-frequency ranges.

Ranges recommended by the Airspace Subcommittee for decommissioning: Barre-Montpelier, Vt.; Douglas, Ariz.; Carlsbad, N. M.; Burlington, Iowa; Fairfield, Utah; Evansville, Ind.; Monroe, La.; Joplin, Mo.; Coeur d'Alene, Ida.; Kirksville, Mo.; Campbellton, Ga.; Lafayette, Ind.; Dayton, Ohio; Watertown, S. D.; Laredo, Tex.; Willmar, Minn.; Walnut Ridge, Ark.; St. Joseph, Mo.; Colorado Springs, Colo.; Thermal, Calif.; Salinas, Calif.; and Rodeo, N. M.

USAF Procurement Program

(Fiscal 1953-1955)  
(In millions)

	Fiscal 1953 obligations	Fiscal 1954 obligations	Fiscal 1955 obligations
Complete aircraft .....	\$6,286	\$2,499	\$2,360
Initial aircraft component			
spares and parts .....	1,756	1,236	1,037
Related aircraft procurement .....	645.7	849.1	282.0
This includes:			
(A) Industrial machinery, equipment, facilities .....	195.1	276.9	45.0
(B) Training items .....	69.5	34.9	18.0
(C) Aircraft ground handling equipment .....	189.2	153.1	65.0
(D) Preproduction costs .....	124.5	238.7	114.0
(E) Service test material .....	67.4	145.4	40.0
Modification of in-service aircraft and component equipment .....	217.5	371.0	180.0
Guided missiles .....	243.6	678.4	470.0
This includes:			
(A) Guided missiles, complete ...	162.8	374.2	303.4
(B) Initial component spares and parts .....	14.9	25.0	23.4
(C) Preproduction planning and facilities .....	15.0	128.5	61.0
(D) Modification and modernizations .....	.....	15.0	10.6
(E) Auxiliary equipment .....	14.0	133.5	71.4
(F) Guided aerial targets .....	36.9	2.0	.....
Industrial mobilization .....	5.97	13.4	15.0
This includes:			
(A) Reserve plants .....	1.22	2.89	3.44
(B) Reserve machine tools and production equipment .....	2.26	7.76	8.89
(C) Industry preparedness program .....	1.79	2.04	2.0
(D) Mobilization planning .....	.699	.718	.661
Procurement and production administration .....	65.2	61.0	61.9
Total, aircraft and related procurement .....	\$9,221	\$5,711	\$4,405



## Airport Aid

- Murray calls proposed \$33 million adequate.
- But UAL official attacks lack of terminal funds.

Undersecretary of Commerce Robert Murray says his \$33-million airport aid program is sound, that it provides adequate funds, has sufficient flexibility and higher aims and places greater reliance on the nation's airport operators.

"In a field as dynamic as aviation," he told the Airport Operators Council meeting in Tampa, Fla., "the federal government cannot have a static, unchanging policy toward its own role in airport development."

► **Effective Policy**—In outlining his program (AVIATION WEEK Mar. 22, p. 67), Murray attacked the former Administration's airport policy as an unsound investment of federal funds.

An airport policy, to be effective, he says, must:

- Be of sufficient size to be worthwhile.
- Have sufficient flexibility to concentrate funds in areas of most urgent need.
- Not dilute funds available by expend-

ing them in small amounts over many projects.

► **Spread Thin**—"The wheezing one-cylinder program of fiscal 1953, the last year for which funds were appropriated by the last Administration and which we, of course, must conclude was at a satisfactory level for those in charge of our government machinery," he says, "at that time totaled \$11 million for the entire U. S. . . . considerably less than the cost of constructing one modern terminal type airport."

"Moreover, no state was able to receive a sum of any significance. Thirty-nine states each received an apportionment of less than \$200,000. Nine states were each apportioned less than \$100,000."

Past programs have been characterized by a lack of selectivity in the projects eligible for airport aid, Murray charges, saying they included airports of primarily local interest as well as those of significant national interest.

► **Fulfills Needs**—"Our aim is to carry out a truly national airport program rather than attempting to meet a variety of local objectives," the Undersecretary says. "In so doing, we believe that we shall be fulfilling the needs which are most urgent from the standpoint of an adequate air transport system."

Breaking down his airport aid program, he reports that the states immediately would be apportioned \$15 million, compared with the \$8,815,000 in fiscal 1953.

Here is the way a few states would fare, according to Murray:

"Kentucky would be apportioned \$244,000 as against \$143,000 in 1953. Ohio's share would be \$503,000, as against \$296,000. Iowa \$266,000, as against \$157,000 last year."

This would still leave \$15 million to be placed where it will "do the most good," he adds.

"We must always be ready to adapt our federal airport policies to current needs," Murray declares, "and not remain wedded to some earlier concepts that may have seemed valid in their day. In the present budgetary situation, every program needs to be critically reviewed to guarantee the maximum national benefit from every dollar of federal expenditure," he says.

► **Terminal Need**—S. V. Hall, assistant vice president-facilities of United Air Lines, told the meeting that terminal buildings—an item excluded from the Murray airport aid program—have lagged at the DC-3 stage of air transport development, resulting in congestion, inefficiency and mediocre service to customers.

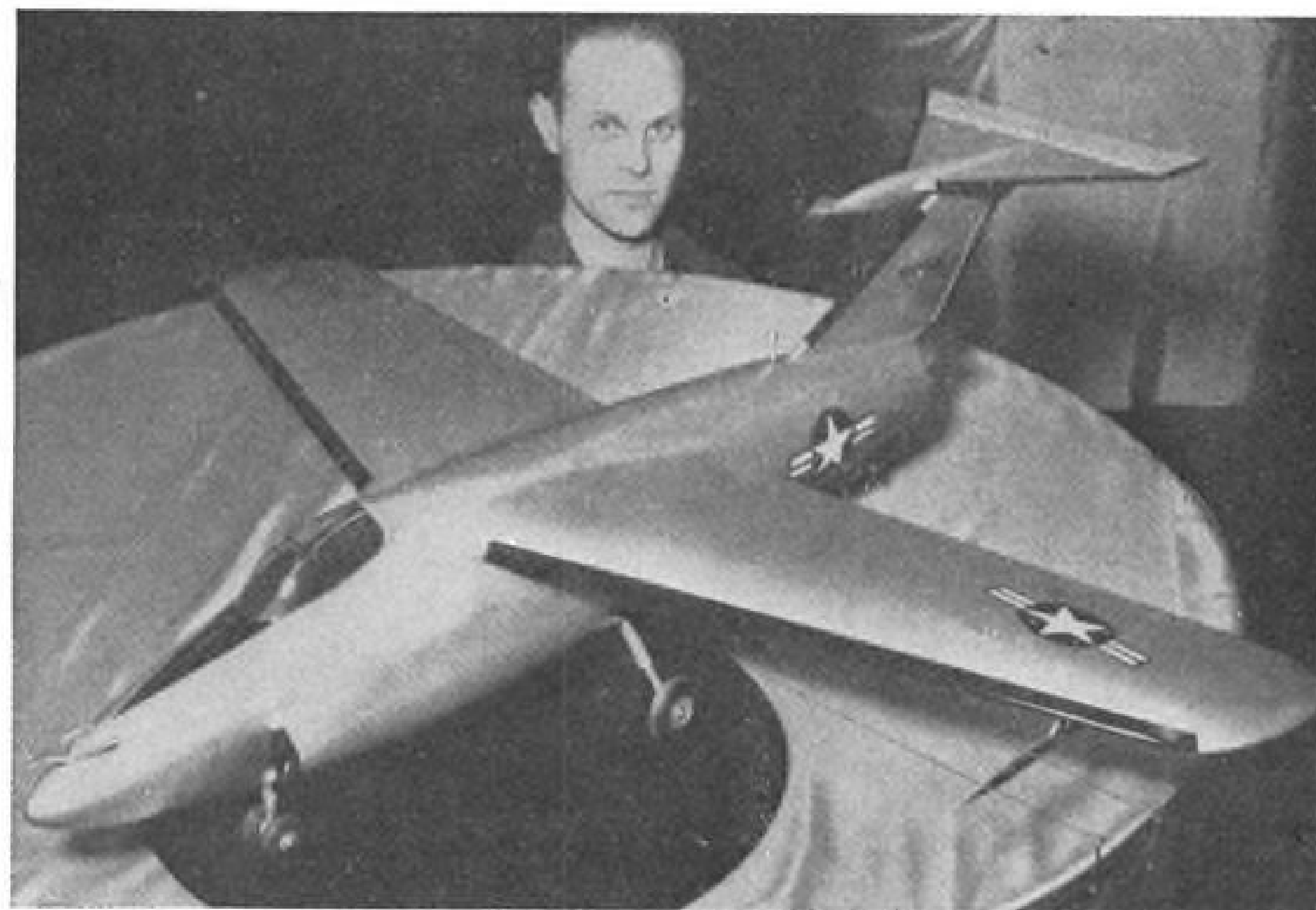
"Our problems will increase if we continue to build merely larger and larger terminals," Hall points out. "When a new terminal is built, it is imperative that, in addition to architectural treatment to please customer's eyes, equal effort be expended to provide facilities to handle customers expeditiously."

New terminals should include means for eliminating much of the expensive mobile ramp equipment currently required, Hall says, adding that such equipment for a DC-6 now calls for an investment of more than \$50,000. He recommends mechanized handling of cargo at terminals and the installation of fixed servicing facilities.

## American Time Limit

If American Airlines can operate its westbound nonstop DC-7 flights in the scheduled 7 hr., 55 min., 50% of the time from now until July 1, Civil Aeronautics Administration is willing to permit continuance of the flights with single crews during the summer months.

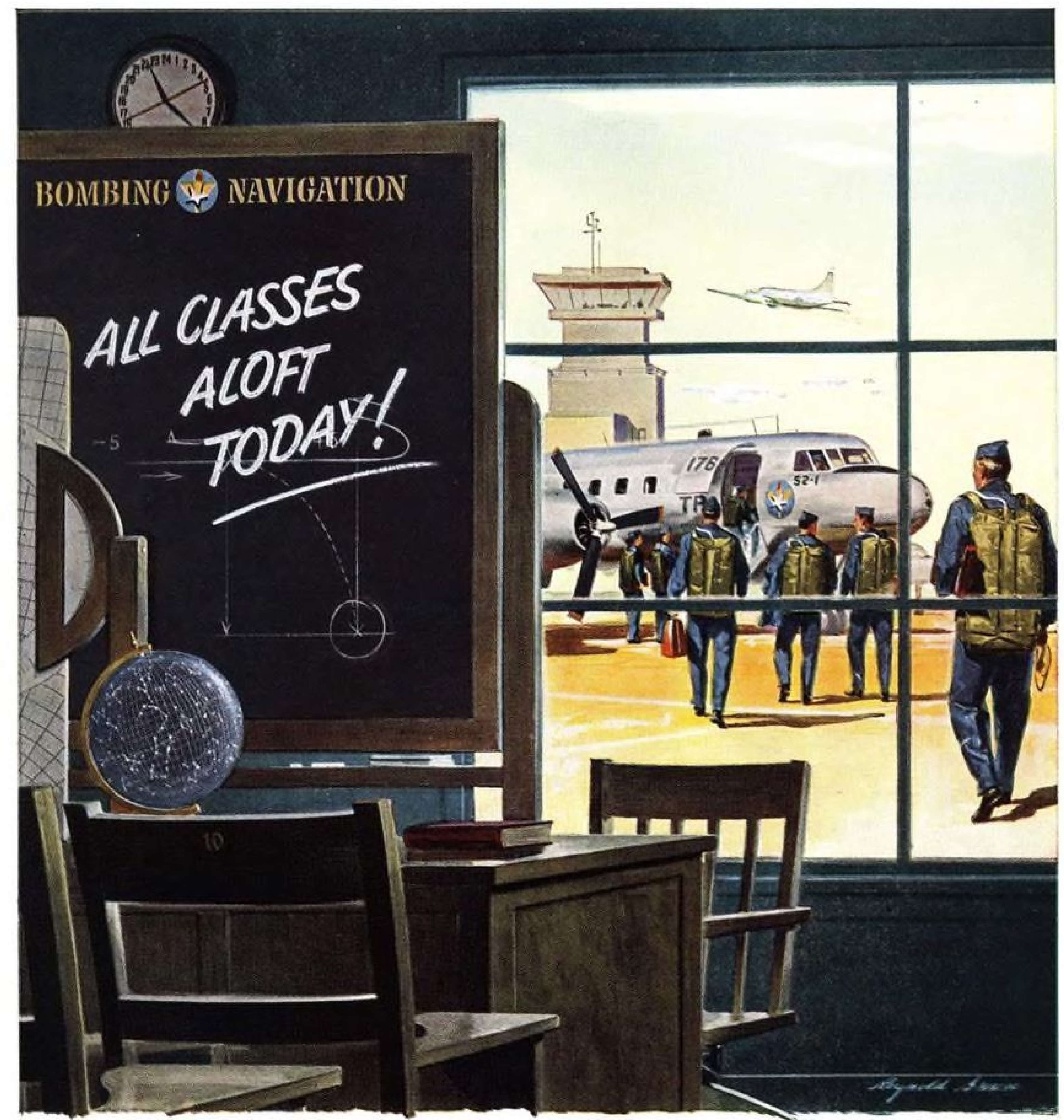
Since American put the DC-7 into service last November, it has averaged 9 hr., 9 min. on its westbound flights, principally because of the prevailing westerly winds that must be bucked during the winter months. It has had no difficulty maintaining its 7 hr., 15 min. eastbound flight schedule. Civil Air Regulations limit working day of flight crew to eight hours.



## Grumman Jaguar Model Wins Prize

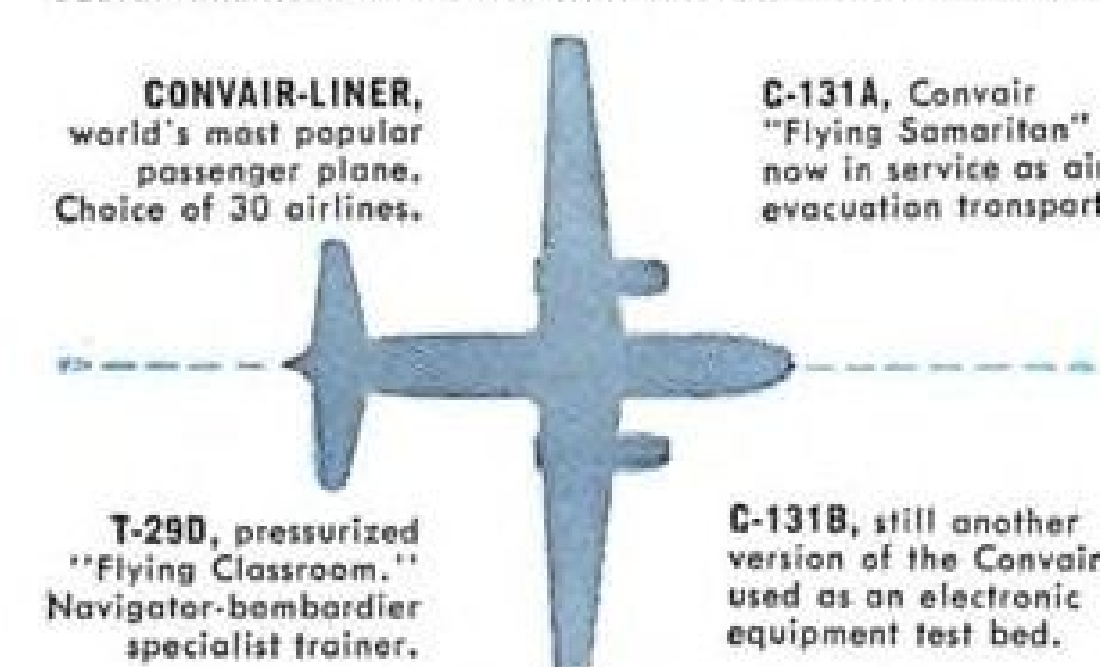
A close look at the unusual configuration of Grumman's XF10F-1 Jaguar Navy fighter, unlike any hitherto built by the company, is afforded by this accurately scaled flying model that won "best-in-show" honors in a company-sponsored employees' hobby show. Photos of the actual XF10F-1 never have been released for publication; this model picture was reproduced from the Grumman Plane News. The model reproduces Jaguar characteristics closely and, like its full-scale version, is jet powered. Of particular interest

on a Grumman design are the high-mounted wings (which on the actual plane have variable sweep), the jet intakes positioned low on the fuselage on either side of the cockpit, dual nosewheels, main landing gear retracting into fuselage and the T-tail with small delta-shaped section on streamlined boom projecting from movable horizontal stabilizer. The XF10F-1 project was canceled after the Jaguar had been flight tested at Edwards AFB, Calif. (Aviation Week Apr. 13, 1953, p. 10).



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The Training Command's latest version of the T-29 is the "D"—a combination navigation-bombardment school to train students in all phases of radar, optical bombing, and navigation with the same type of equipment installed in combat aircraft.

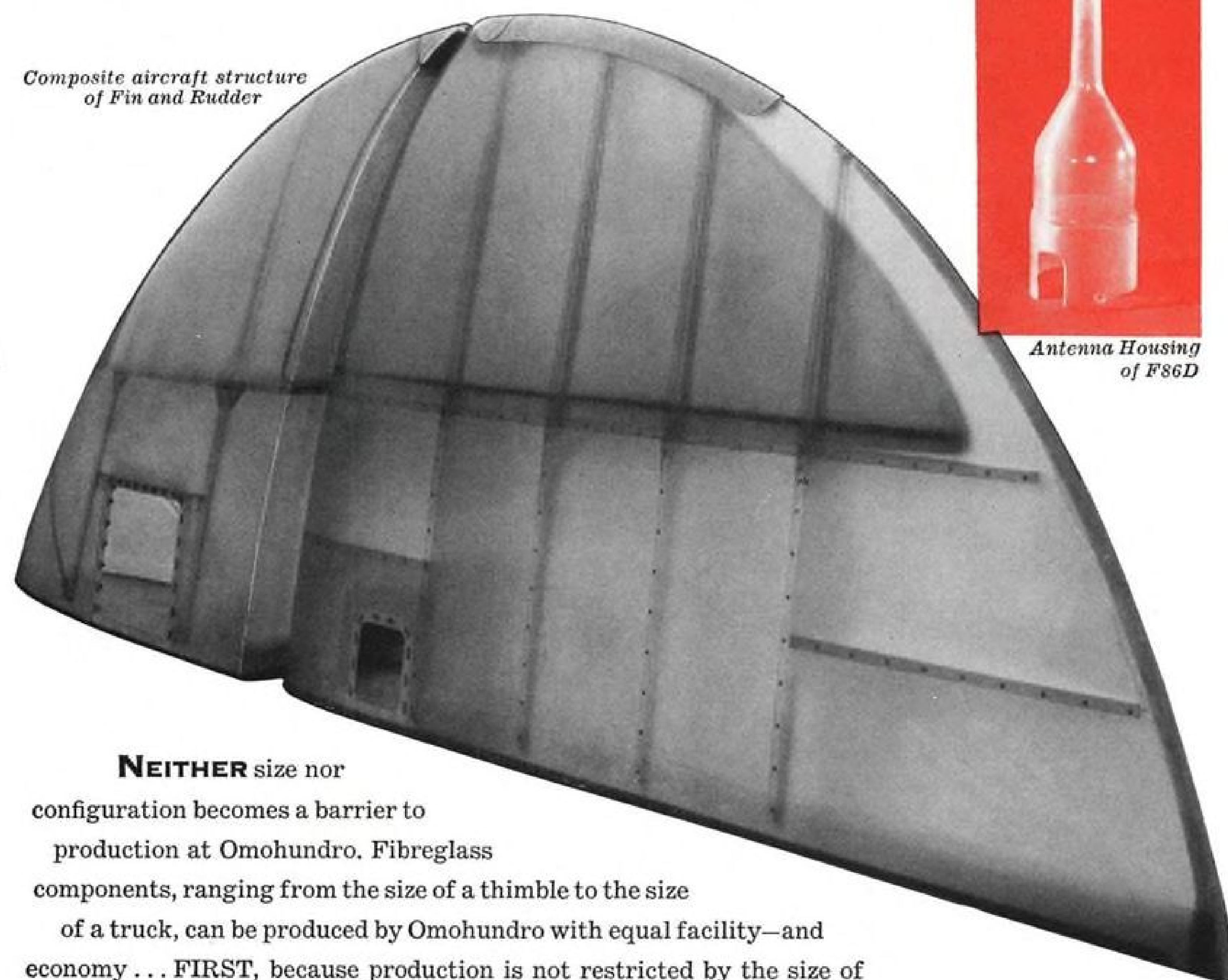
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**THIRD**, because exclusive processes like membrane molding, developed by Omohundro, make possible the production of almost any part, no matter how complex in configuration. For expeditious and *economical* production, contact Paul Omohundro Company, Box 696, Paramount, Calif. TORrey 6-7001



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## Military Construction Bill: \$896.9 Million

Authorization request for construction totaling \$896,976,600 at Air Force, Navy and Army bases now is before Congress.

Hearings already have started before the House Armed Services Committee, and Senate Committee will start hearings soon.

Air Force received the largest share of the new Authorization—\$312,348,000 for construction at U.S. bases, \$110,325,000 for aircraft control and warning systems and \$9,829,000 for overseas construction. This is in addition to previously authorized USAF construction of \$309,698,000, which has been reprogrammed.

► **Fund Request Near**—Identical authorization bills were introduced by Rep. Dewey Short, chairman of the House Armed Services Committee, and Sen. Leverett Saltonstall, chairman of the Senate Armed Services Committee. An appropriation bill for fiscal 1955 construction will be submitted to Congress soon.

Naval aviation construction request was more than \$70 million.

Air Force authorization request, by commands, include:

► **Strategic Air Command**—Abilene AFB, Tex., \$14,675,000; airfield pavements, fuel storage, communications and navigational aids.

Altus AFB, Okla., \$14,114,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting facilities.

Biggs AFB, Tex., \$1,144,000; airfield pavements, fuel storage, communications and navigational aids.

Campbell AFB, Ky., \$760,000; airfield pavements, communications, navigational aids and airfield lighting facilities.

Castle AFB, Calif., \$7,531,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting facilities.

Clinton-Sherman Airport, Okla., \$1,463,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting facilities.

Columbus AFB, Miss., \$3,558,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting and operational facilities.

Dow AFB, Me., \$8,288,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational facilities.

Ellsworth AFB, S. D., \$2,810,000; airfield pavements, communications and navigational aids, operational facilities, aircraft maintenance facilities.

Forbes AFB, Kan., \$7,853,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting, operational and maintenance facilities.

Great Falls AFB, Mont., \$4,817,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational facilities.

Homestead AFB, Fla., \$4,641,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational facilities.

Lake Charles AFB, La., \$3,136,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational facilities.

Limestone AFB, Me., \$3,363,000; airfield pavements, fuel storage, communications,

## NEWS SIDELIGHTS

Here are some statistics Boeing has released on its 707 prototype jet transport: number of rivets and fasteners in the prototype, 415,000; pounds of steel used for tooling, 475,000; lumber used in mockup, 33,000 board feet Spruce, 88,864 square feet of plywood; lumber used in scaffolding and staging 65,000 board feet of (pardon the expression) Douglas fir.

J. G. Beerer, director of the aerophysics department at North American Aviation's Santa Susana facility, asserts that NAA now leads the nation in the large rocket engine field and is rapidly achieving the same position in the field of small rockets.

Residents in the vicinity of San Fernando Valley Airport at Van Nuys Calif., have filed suit against Lockheed Aircraft Corp., charging that operations at the airport are a nuisance and a menace to their lives. The suit argues that property values have depreciated due to "loud and hideous noises" from aircraft which cause homes to "vibrate, shake and jar." Some 56 families joined in the action, which asks \$1.4-million damages if the company does not cease operations. An attorney for the group says a separate suit against the city will be started to halt flying activities at the field other than Lockheed's. Airport was scene of a public protest last year after a Lockheed T-33 crashed into a residential area in the vicinity of the field. Lockheed moves its T-33 operation to Palmdale next month and is shifting its Guided Missile Division to Van Nuys.

A lion-proof hangar is indispensable on farms adjoining South Africa's famous Kruger National Park. U. C. Campbell, a farmer, says he has had to build one on his airstrip because lions love to hear expensive noises in the form of ripping fabric and bursting plane tires. Recently, he reports, lions became indignant when they couldn't get into the hangar, chewed up picks and shovels standing outside.

Hardwick Aircraft Co., Rosemead, Calif., has purchased what is claimed to be the first privately owned jet aircraft in the U. S.—a surplus Bell F-59A, powered by two GE J31s.

A helicopter feat only recently revealed was the successful airlift of 6,051 Indian troops from aircraft carriers to the neutral zone in Korea following cessation of hostilities. During the airlift, largest in copter history according to United Aircraft Corp., a loaded Sikorsky S-55-type left a carrier deck every two and a half minutes.

Canadair, Ltd., Montreal, actively engaged in guided missile development as well as plane building, has made its first successful missile launching from an F-86E Sabre jet fighter.

Secretary of Air Force Harold Talbott told West Coast newsmen late last month that since the end of the Korean War the Air Force has found it necessary and economical to cut back certain airframe assembly contracts, but "I do not see anything but sustained production in local (West Coast) plants the balance of the year."

Trip Tips is a new cross-country travel service inaugurated by Airway Underwriters, Inc., Ann Arbor, Mich., available free to members of Aero Club of Michigan and National Aero Club who carry airplane insurance with the firm. Pilots planning a cross-country flight can obtain information on suggested routing, recommended airports and air service operators, hotels and motels, restaurants and points of interest. Data also is available on flights to Canada, Alaska, Mexico, Cuba and the Bahamas.

Pittsburgh Pirates this year will be the first big league baseball team to use air transportation solely to fulfill its season's schedule. Capital Airlines will carry the team on 29 trips totaling 10,135 air miles. Longest hop: 888 miles New York-St. Louis.

Glenn L. Martin, the pioneer plane builder, took a look at the radical Horton "wingless" airplane (Aviation Week Feb. 1, p. 17) at Orange County Airport, Santa Ana, Calif., during his visit to the West Coast last month.





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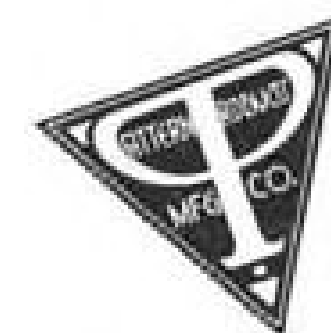


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## \$209-Million Aid Program

The Administration's plan for a \$209-million foreign-aid program of aircraft and related materiel in fiscal 1955 is less than half this year's \$447-million program. Air Force will administer \$165.4 million and Naval Aviation \$43.7 million. Details of aircraft and related foreign aid, disclosed by Maj. Gen. George C. Stewart, director of the Office of Military Assistance, in testimony before the House Foreign Affairs Committee:

	FY 1950-54 Program to be Shipped		FY 1954 Program Value		Proposed FY 1955 program Value	
	Shipped	Shipped	Quan.	Value	Quan.	Value
Day fighters:						
Conventional	175	..	486	\$109,215,500	165	\$38,124,900
Jet	278	1,365	..	..	..	..
All weather:						
Jet	..	172	120	46,404,300	223	81,172,000
Fighter bombers:						
Conventional	827	98	98	11,676,600	52	6,309,400
Jet	1,852	1,962	179	61,319,800	..	..
Reconnaissance:						
Conventional	26	4	2	470,000	..	..
Jet	..	457	57	9,680,200	..	..
Bombers—conventional..	211	50	32	2,580,000	58	10,320,000
Transport—conventional..	201	114	73	12,121,700	20	2,130,000
Trainers:						
Conventional	485	208	17	531,900	..	..
Jet	229	392	16	2,077,500	10	1,298,500
Other aircraft	37	131	76	2,319,300	7	..
Initial spares & equip..	..	..	..	111,660,700	..	26,086,400
Total	4,321	4,953	1,156	\$370,057,500	535	\$165,441,200

	FY 1950-54 Program to be Shipped		FY 1954 Program Value		Proposed FY 1955 program Value	
	Shipped	Shipped	Quan.	Value	Quan.	Value
Fighters:						
Carrier-based	260	213	115	\$16,028,000	..	..
Bombers & patrol, C. B.	479	103	..	..	..	..
Maritime aircraft	112	57	29	35,696,200	16	\$33,722,900
Other aircraft	168	37	14	14,097,600	13	5,132,800
Other aero equip.	..	..	..	11,360,600	..	4,907,200
Total	1,019	410	158	\$77,182,400	29	\$43,762,900
Grand total USAF and Naval Aviation program	5,340	5,363	1,314	\$447,239,900	564	\$209,204,100

navigation aids and airfield lighting and aircraft maintenance facilities.

Lincoln AFB, Neb., \$1,128,000; airfield pavements, communications and navigational aids, operational and aircraft maintenance facilities.

Little Rock AFB, Ark., \$12,338,000; airfield pavements, fuel storage, communications, and navigational aids, operational and aircraft maintenance facilities.

Lockbourne AFB, Ohio, \$8,991,000; airfield pavements, communications, navigational aids, operational and maintenance facilities.

March AFB, Calif., \$6,340,000; airfield pavements, fuel storage, communications, navigational aids and airfield and operational facilities.

Matagorda Island AF Range, Tex., \$607,000; airfield pavements, communications and navigational aids.

Offutt AFB, Neb., \$1,628,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting and maintenance facilities.

Plattsburg Barracks, N. Y., \$19,145,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting and operational facilities.

Portsmouth AFB, N. H., \$14,079,000; airfield pavements, fuel storage, communications and navigational aids, operational and aircraft maintenance facilities.

Sedalia AFB, Mo., \$1,291,000; airfield pavements, communications and navigational aids, aircraft maintenance facilities.

Smoky Hill AFB, Kan., \$304,000; airfield pavements, communications, navigational aids and airfield lighting and aircraft maintenance facilities.

Stead AFB, Nev., \$93,000; communications and navigational aids.

Turner AFB, Ga., \$883,000; airfield pavements, communications, navigational aids and airfield lighting facilities, operational and aircraft maintenance facilities.

Walker AFB, N. M., \$754,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting and operational facilities.

► Air Defense Command—Atlantic City Consolan Sta., N. J., \$72,000; communications and navigational aids.

Bismarck Airport, N. D., \$7,538,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational facilities.

Burlington Municipal Airport, Vt., \$410,000; airfield pavements fuel storage communications and navigational aids.

Duluth Municipal Airport, Minn., \$1,386,000; airfield pavements, communications, navigational aids, aircraft maintenance facilities.

ENT AFB, Colo., \$150,000; communications and navigational aids.

Fargo Area, N. D., \$7,055,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting facilities, and operational facilities.

Glasgow Airport, Mont., \$8,391,000; airfield pavements, fuel storage, communica-



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tions, navigational aids and airfield lighting and operational facilities.

Klamath Falls Airport, Ore., \$4,133,000; airfield pavements, fuel storage, communications, navigational aids and airfield lighting and operational facilities.

K. I. Sawyer Airport, Mich., \$8,556,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational facilities.

Minneapolis-St. Paul Airport, Minn., \$1,484,000; airfield pavements, communications and navigational aids, operational and aircraft maintenance facilities.

Nantucket Consolan Sta., Mass., \$107,000; communications and navigational aids.

Pescadero Consolan Sta., Calif., \$107,000; communications and navigational aids.

Pt. Conception Consolan Sta., Calif., \$72,000; communications and navigational aids.

Portland International Airport, Ore., \$1,722,000; airfield pavements, liquid fuel storage and dispensing facilities, communications and navigational aids, operational

and aircraft maintenance facilities.

Southern California Area, \$4,000,000; expansion of airfield and base facilities, including the acquisition of land.

Stewart AFB, N. Y., \$2,659,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting, operational and aircraft maintenance facilities.

Suffolk County AFB, N. Y., \$821,000; airfield pavements, communications, navigational aids, airfield lighting, operational and aircraft maintenance facilities.

Traverse City Area, Mich., \$8,635,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational facilities.

Wurtsmith AFB, Mich., \$1,740,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and aircraft maintenance facilities.

Yuma County Airport, Ariz., \$1,586,000; airfield pavements, fuel storage, airfield lighting and operational facilities.

► Tactical Air Command—Alexandria AFB,

La., \$1,613,000; airfield pavements, fuel storage, communications and navigational aids, operational and aircraft maintenance facilities.

Bunker Hill Airport, Ind., \$76,000; airfield pavements, communications and navigational aids, operational and aircraft maintenance facilities.

Clovis AFB, N. M., \$2,007,000; airfield pavements, fuel storage, communications and navigational aids and operational facilities.

Donaldson AFB, S. C., \$771,000; airfield pavements, communications and navigational aids and aircraft maintenance facilities.

George AFB, Calif., \$4,774,000; airfield pavements, fuel storage, communications and navigational aids, operational and aircraft maintenance facilities.

Lawson AFB, Ga., \$1,219,000; airfield pavements, communications and navigational aids, aircraft maintenance facilities.

Myrtle Beach Airport, S. C., \$3,025,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational facilities.

Seymour Johnson AFB, N. C., \$6,538,000; airfield pavements, fuel storage, communications, navigational aids, airfield lighting and operational and aircraft maintenance facilities.

► Air Training Command—Chanute AFB, Ill., \$186,000; communications, navigational aids and operational facilities.

Gila Bend Auxiliary Field, Ariz., \$842,000; communications and navigational aids.

Greenville AFB, Miss., \$702,000; airfield pavements, fuel storage, communications and navigational aids.

Luke AFB, Ariz., \$381,000; airfield pavements, communications and navigational aids.

Perrin AFB, Tex., \$432,000; airfield pavements, communications and navigational aids, operational and aircraft maintenance facilities.

Selma Municipal Airport, Ala., \$176,000; airfield pavements.

Tyndall AFB, Fla., \$1,067,000; airfield pavements, communications and navigational aids, aircraft maintenance facilities.

Wichita AFB, Kan., \$2,479,000; airfield pavements, training facilities.

► Air Materiel Command—Hill AFB, Utah, \$8,305,000; airfield pavements, communications, navigational aids, airfield lighting and operational facilities.

Mallory AF Depot, Tenn., \$243,000; aircraft maintenance facilities.

Norton AFB, Calif., \$2,183,000; airfield pavements, communications and navigational aids, aircraft maintenance facilities.

Norwalk No. 1 AF Tank Farm, Calif., \$156,000; fuel storage.

Norwalk No. 2 AF Tank Farm, Calif., \$718,000; fuel storage.

Robbins AFB, Ga., \$10,138,000; airfield pavements, communications, navigational aids, airfield lighting and operational facilities.

Tinker AFB, Okla., \$5,953,000; airfield pavements, fuel storage, communications and navigational aids, operational and aircraft maintenance facilities.

Topeka AF Depot, Kan., \$194,000; utilities.

Various Locations, \$802,000; operational facilities, utilities, storage facilities, and personnel facilities.

► Military Air Transport Service—Charleston AFB, S. C., \$4,315,000; airfield pavements, fuel storage, communications and navigational aids, operation and aircraft maintenance facilities.

Dover AFB, Del., \$1,654,000; airfield pavements, operational and aircraft maintenance facilities.

Hickam AFB, Honolulu, Hawaii, \$2,406,000; airfield pavements, communications, and navigational aids.

► Continental Air Command—Brooks AFB, Tex., \$757,000; communications and navigational aids and aircraft maintenance facilities.

Dobbins AFB, Ga., \$576,000; operational facilities.

Mitchel AFB, N. Y., \$211,000; communications and navigational aids and operational facilities.

► Research and Development Command—

## New Fenwal Overheat Detectors Guard Eastern's New Super-C Constellations



1. WINTER TO SUMMER in three hours and forty-five minutes is a "regularly scheduled" feat of Eastern Air Lines on its New York-Miami run. Its new Super-C Constellation is the last word in luxury travel and dependability. Among its advanced features is a new "right-angle" fire and overheat detector for the utmost in protection on this blue-ribbon transport.



2. EASE OF INSTALLATION is a feature of all Fenwal Overheat Detectors. Shown, is a two-terminal, hermetically sealed unit being installed on Eastern Airlines' latest transport. Many of America's leading aircraft operators have standardized on Fenwal Detectors after exhaustive tests and experience in severe environmental and operational conditions.



3. X-RAY INSPECTION is one of many tests for quality-control and accuracy to which individual THERMOSWITCH units are subjected at Fenwal Incorporated. Precise inspection matches and protects modern mass-production methods which are making Fenwal temperature control and detection devices preferred throughout industry for the dual qualities of absolute dependability and reasonable price.



4. HERE THEY ARE. Fenwal two-terminal Overheat Detectors in two designs—same performance characteristics. The right-angle model was developed for use in confined space. Temperature-sensitive outer shell is the actuating element, causing internal contact to function the instant surrounding air reaches alarm point. They comply fully with C.A.A. and SAE requirements. For complete data write Fenwal Incorporated, 124 Pleasant Street, Ashland, Massachusetts.

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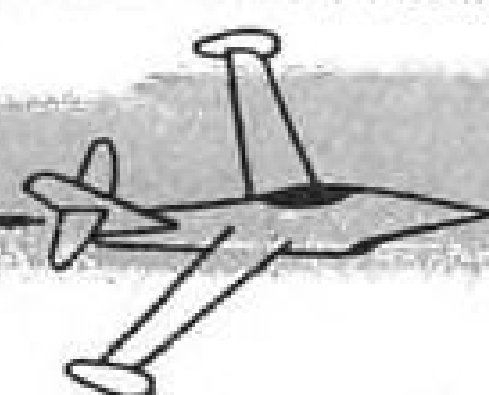


# Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,

Senior Member, Aviation Writers Assn.



The planes get most of the credit — and the men who fly them.

Behind the planes are thousands upon thousands of specialists, scientists, engineers, technicians who, in each new design over the years, have incorporated improvements and refinements to give us the jet aircraft of today with its phenomenal performance.

But man himself hasn't changed physiologically. He's still the same, yet he has been "adapted," in a sense, to this modern air world of terrific speeds and astonishing heights, to pressures and temperatures in wide extreme, to the limits of climatic rigors, to physical hazards that but a few years ago would have claimed his life in almost a finger-snap.

No, "adapted" isn't the word. Rather, the man who flies has been "protected" against these multiple dangers of speed and altitude and range by other men, a comparative few, who have made his welfare a new science — aero medicine.

It's a science that covers vast challenges as operational limits are extended farther and farther by new aircraft designs and greater power.

In the major field of altitude alone, aero medicine has solved innumerable problems and proved what aids man must have to live and function in the thin, cold heights of the stratosphere. If you've ever subjected yourself to hypoxia — oxygen starvation — you know that the best physique and the strongest will are of no avail against its insidious attack.

It's a matter of moments until your hands tremble, your coordination vanishes, your hearing dims. Your mind goes dead, and — stupefied — you approach the brink of unconsciousness. They tell you about it after they've clamped the mask back on your face.

Then there are the demands for pressurization to keep man's environment somewhere near normal while he flies at altitudes where he could not possibly exist otherwise. And with these demands comes the corollary danger of explosive decompression that can rupture the body's vital vessels without the protection of special pressure suits and helmets devised by aero medical research.

There are the G-problems, too, the massive weight of multifold gravity that squashes you down in jet or centrifuge, dragging your features out of shape and draining the blood from your brain for a fast blackout — unless you're protected by the quick, balloon-like grip of the G-suit fashioned by aero medical researchers.

Newest of the major fields in this

modern science is heat, the problems posed by the oncoming thermal "barrier." How much heat can a man stand? What clothing will he need to protect him? How can you safeguard a pilot against the possibility of melting heat and at the same time guard him against the freezing cold of a high altitude bailout or immersion in Arctic waters?

Today's problems are simple compared with the temperatures the aero medical staffs are facing in the future — with the knowledge that they must be ready to meet the challenge of danger to the pilot's mind and body when aircraft inevitably will sustain speeds of Mach 2 or Mach 3 or better.

So sweeping is the new science that it would take volumes to outline it — from the study of human reactions to quick deceleration on streaking rocket sleds to research into pilot fatigue, the effects of tumbling, upward and downward ejections, the physiological aspects of strain and anxiety, protection against cosmic radiation, impact safeguards, cockpit comfort, pilot fascination aloft, the effects of drugs on psychological efficiency, the visual problems of supersonic flight, age vs. efficiency — even research into foods and shelters and personal gear of all types, emergency and otherwise...

To the flight surgeons, to the researchers of the Air Force Aero Medical Laboratory and its Navy counterpart, to the members of the Aero Medical Association, to all the doctors and the inventors and the technicians who have applied their skills to the problems — and to the human "guinea pigs" who have volunteered for rough, dangerous assignments in proving human limitations and testing new developments — all credit for sustaining man in a new environment.

Without you, flight as we know it today would be impossible.

Edwards AFB, Calif., \$16,192,000; airfield pavements, communications and navigational aids, operational and aircraft maintenance facilities, research, development and test facilities.

Griffiss AFB, N. Y., \$1,652,000; airfield pavements, communications, navigational aids and airfield lighting facilities, operational and aircraft maintenance facilities.

Hartford Research Facility, Conn., \$5,750,000; research, development and test facilities, and land acquisition.

Holloman AFB, N. M., \$4,652,000; airfield pavements, lighting and operational facilities.

Kirtland AFB, N. M., \$244,000; airfield pavements.

Laurence G. Hanscom AFB, Mass., \$6,649,000; airfield pavements, communications, navigational aids, lighting operational and maintenance facilities.

Sacramento Peak (Laurence G. Hanscom Auxiliary No. 2), N. M., \$114,000; land acquisition.

Climatic Projects Laboratory, Mt. Washington, N. H., \$858,000; fuel storage.

► Air University—Maxwell AFB, Ala., \$1,392,000; communications and navigational aids and operational facilities.

► Communications and Navigational Aids—Various locations, \$1,040,000; communications and navigational aids, and land acquisition.

► Alaskan Air Command—Adak (Davis Naval Sta.), \$24,000; communications and navigational aids.

Galena Airfield, \$6,312,000; airfield pavements, fuel storage, communications and navigational aids, operational and aircraft maintenance facilities.

Naknek AFB, \$1,087,000; fuel storage, communications and navigational aids, aircraft maintenance facilities.

► Naval Aviation—NAS Alameda, Calif., \$4,463,000; aircraft maintenance and overhaul facilities.

Alice, Tex., \$151,000; operational facilities.

NAS Atlantic City, N. J., \$779,000; operational facilities, and navigational aids.

Marine Corps Auxiliary Air Sta., Beaufort, S. C., \$11,096,000; aircraft maintenance facilities, airfield pavements and fuel storage.

NAS Brunswick, Me., \$632,000; operational facilities, navigational aids.

NAS Cecil Field, Fla., \$1,384,000; operational facilities.

NAS Chase Field, Tex., \$241,000; aircraft maintenance facilities.

Marine Corps Air Sta., Cherry Point, N. C., \$1,609,000; airfield pavements, fuel dispensing facilities and communication facilities.

NAS Corpus Christi, Tex., \$342,000; fuel dispensing facilities and navigational aids.

NAAS Corry Field, Fla., \$2,153,000; airfield pavements and lighting facilities.

Naval Auxiliary Landing Field, Crows Landing, Calif., \$89,000; crash facilities.

NAAS El Centro, Calif., \$225,000; ammunition storage facilities.

Marine Corps Air Sta., El Toro, Calif., \$1,675,000; fuel facilities, navigational aids and utilities.

NAAS Fallon, Nev., \$569,000; operational facilities.

NAS Glenview, Ill., \$70,000; land acquisition.

NAAS Glynnco, Ga., \$6,531,000; fuel and communication facilities.

NAAS Kingsville, Tex., \$666,000; navigational aids, fuel facilities.

Naval Air Facility, Litchfield Park, Ariz., \$1,654,000; operational facilities, airfield pavements and aircraft maintenance facilities.

Naval Auxiliary Air Facility, Mayport, Fla., \$75,000; land acquisition.

NAS Miramar, Calif., \$4,001,000; navigational aids and aircraft maintenance facilities.

NAS Moffett Field, Calif., \$1,336,000; navigational aids and fuel facilities.

Marine Corps Auxiliary Air Station, Mojave, Calif., \$160,000; land acquisition.

Marine Corps Air Facility, New River, N. C., \$972,000; personnel and maintenance facilities.

NAS Norfolk, Va., \$628,000; training facilities.

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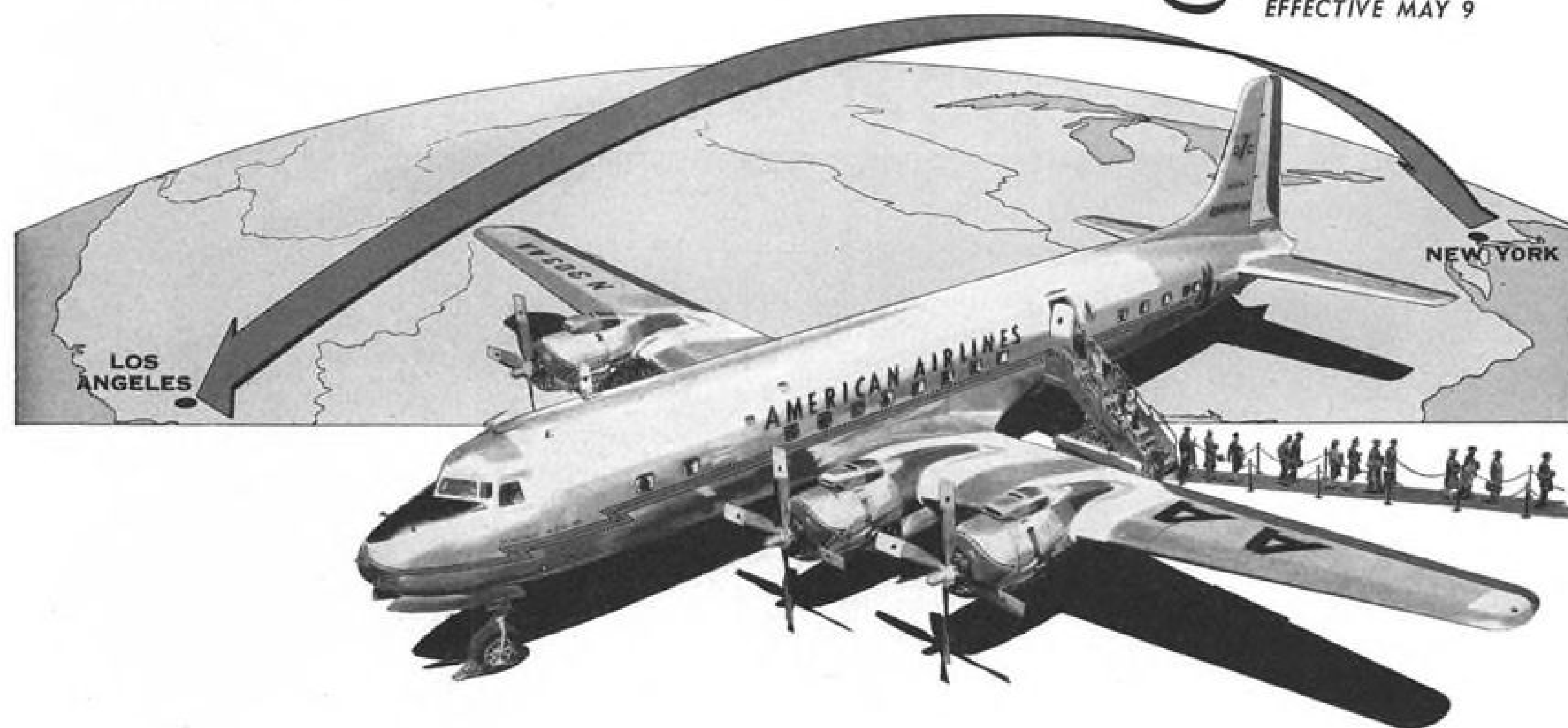
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Ar. LOS ANGELES	4:55 pm PDT	5:55 pm PDT	9:55 pm PDT
Lv. LOS ANGELES	8:00 am PDT	9:00 am PDT	9:00 pm PDT
Ar. NEW YORK	6:15 pm EDT	7:15 pm EDT	7:15 am EDT

*America's Leading Airline* **AMERICAN AIRLINES INC.**

NAS Oceana, Va., \$4,696,000; navigational aids and aircraft maintenance facilities.

NAS Pensacola, Fla., \$1,533,000; navigational aids and construction of outlying field.

Naval Air Missile Test Center (San Nicolas Island), Pt. Mugu, Calif., \$1,132,000; testing, administrative, maintenance and security facilities.

NAS Quonset Point, R. I., \$579,000; navigational aids.

NAS San Diego, Calif., \$1,157,000; operational and aircraft maintenance facilities.

Padre Island, Tex., \$80,000; operational facilities.

Naval Air Turbine Test Sta., Trenton, N. J., \$5,209,000; research and development facilities.

NAS Whidbey Island, Washington, D. C., \$4,245,000; aircraft maintenance facilities, airfield pavements.

Naval Air Facility, Culebra Point, P. R., \$6,085,000; airfreight terminal facilities.

NAS Quantanamo Bay, Cuba, \$230,000; medical facilities.

NAS Iwakuni, Japan, \$2,246,000; airfield pavements, ammunition and fuel storage facilities.

NAS Kodiak, Alaska, \$719,000; community facilities.

Naval Sta., Kwajalein, Marshall Islands, \$990,000; aircraft maintenance facilities.

## Hughes Buys Three Connies for TWA

Hughes Tool Co. will be the middle man in the sale of three Delta-C&S Air Lines Constellations to Trans World Airlines.

Civil Aeronautics Board has approved Delta's sale of the Lockheed transports to TWA via Hughes. Delta is in the midst of a re-equipment program to replace its Connies with Douglas DC-7s.

Hughes Tool will buy the aircraft and sell them to TWA on the installment plan. Hughes controls TWA. Delta requested an exemption to make the transaction as did Hughes, because the manufacturing firm is permitted only financial control of TWA. The Board determined that the aircraft sale did not indicate a merger, consolidation or any administrative control of TWA.

## Grumman Salaries Total \$256,750

Grumman Aircraft Engineering Corp. paid its board chairman, L. R. Grumman, a \$55,200 salary in 1953, a Securities & Exchange Commission report reveals.

Other salaries: L. A. Swirbul, president, \$66,250; William T. Schwendler, executive vice president, \$55,250, and E. Clinton Towl, vice president, \$35,450. All officers received a total of \$256,750 in salary.

## Bendix Pays Officers \$813,779 in '53

Bendix Aviation Corp. paid its president, M. P. Ferguson, \$84,233 in fees and salaries during fiscal 1953, the firm

reports to Securities & Exchange Commission.

Ferguson also received \$39,500 in bonuses.

Other officers' salaries: Charles Marcus, vice president, \$60,400 salary and \$29,250 bonus; R. P. Lansing, vice president, \$51,300 salary and \$28,125 bonus; W. H. Houghton, vice president and treasurer, \$44,699 salary and \$28,125 bonus; G. E. Stoll, vice president, \$40,000 salary and \$22,750 bonus; and D. O. Thomas, director, \$27,258 salary and \$40,000 bonus.

All officers and directors received a total of \$519,779 in salaries and \$294,000 in bonuses.

## Boeing Pays Allen \$101,600 in Salary

Boeing Airplane Co. paid its president, William M. Allen, \$101,605 in salary in 1953, the firm reports to Securities & Exchange Commission.

Other salaries reported: Wellwood E. Beall, senior vice president, \$72,950; Fred P. Paudan, vice president-manufacturing, \$46,840; J. E. Schaefer, vice president-general manager of the Wichita Division, \$46,860; Edward C. Wells, vice president-engineering, \$58,380; and J. O. Yeasting, vice president-finance, \$41,880. All salaries totaled \$624,030.



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in the tradition of the  
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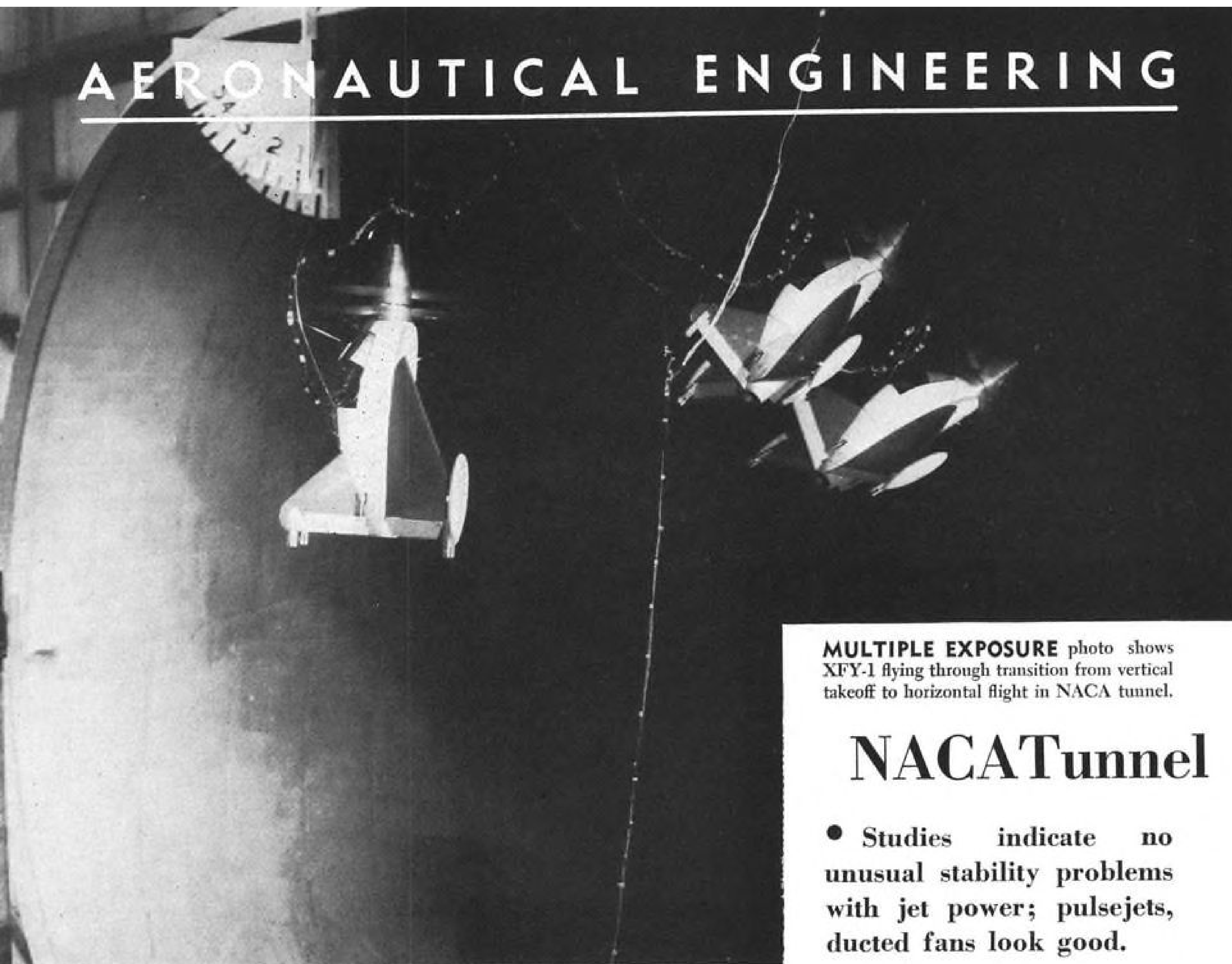
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**MULTIPLE EXPOSURE** photo shows XFV-1 flying through transition from vertical takeoff to horizontal flight in NACA tunnel.

## NACATunnel

• Studies indicate no unusual stability problems with jet power; pulsejets, ducted fans look good.

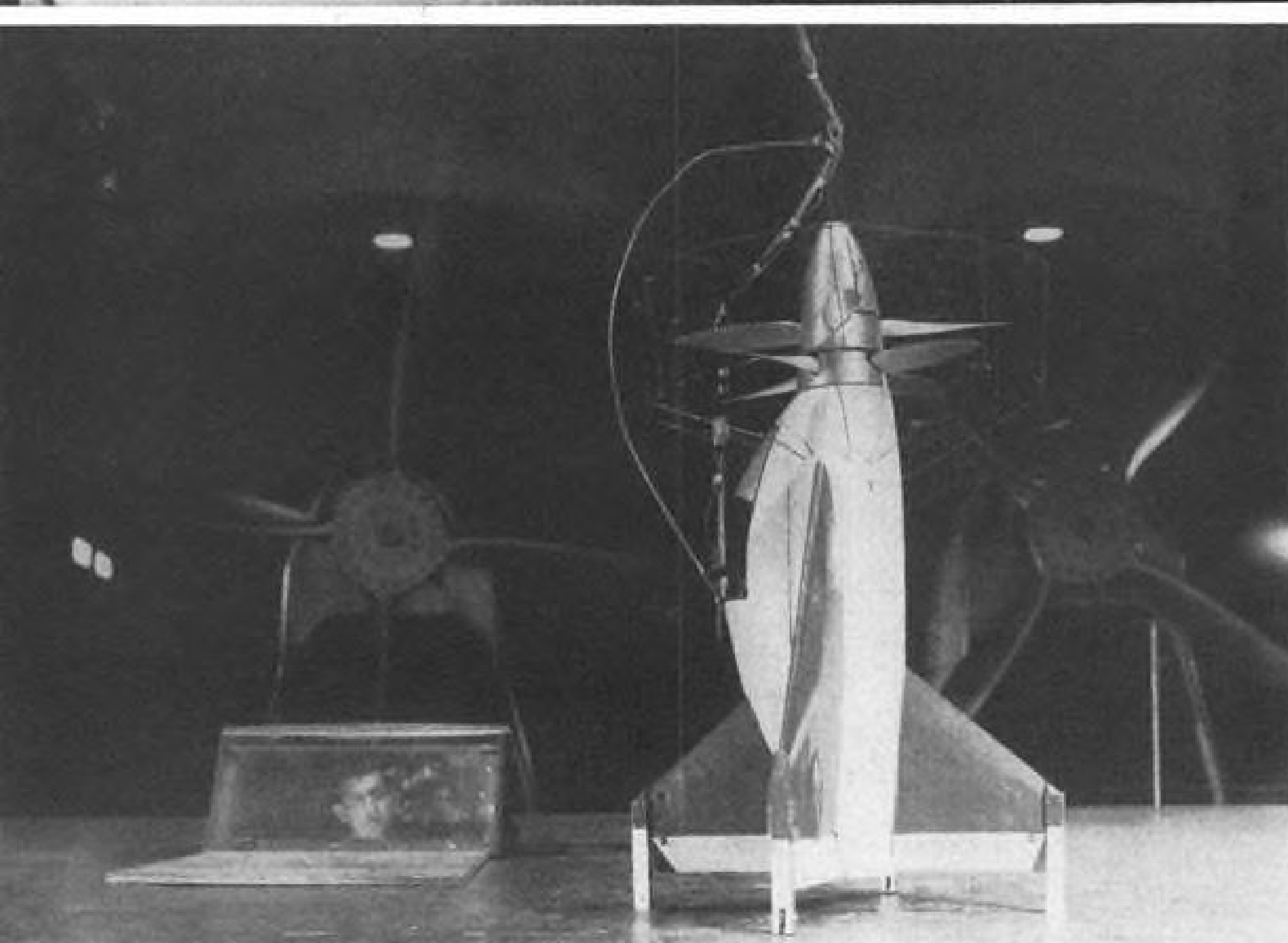
By Robert Hotz

New approaches to the problems of developing vertical-rising aircraft are being explored by the National Advisory Committee for Aeronautics. These approaches include the use of ducted fans and pulsejet power and cascade-type wings.

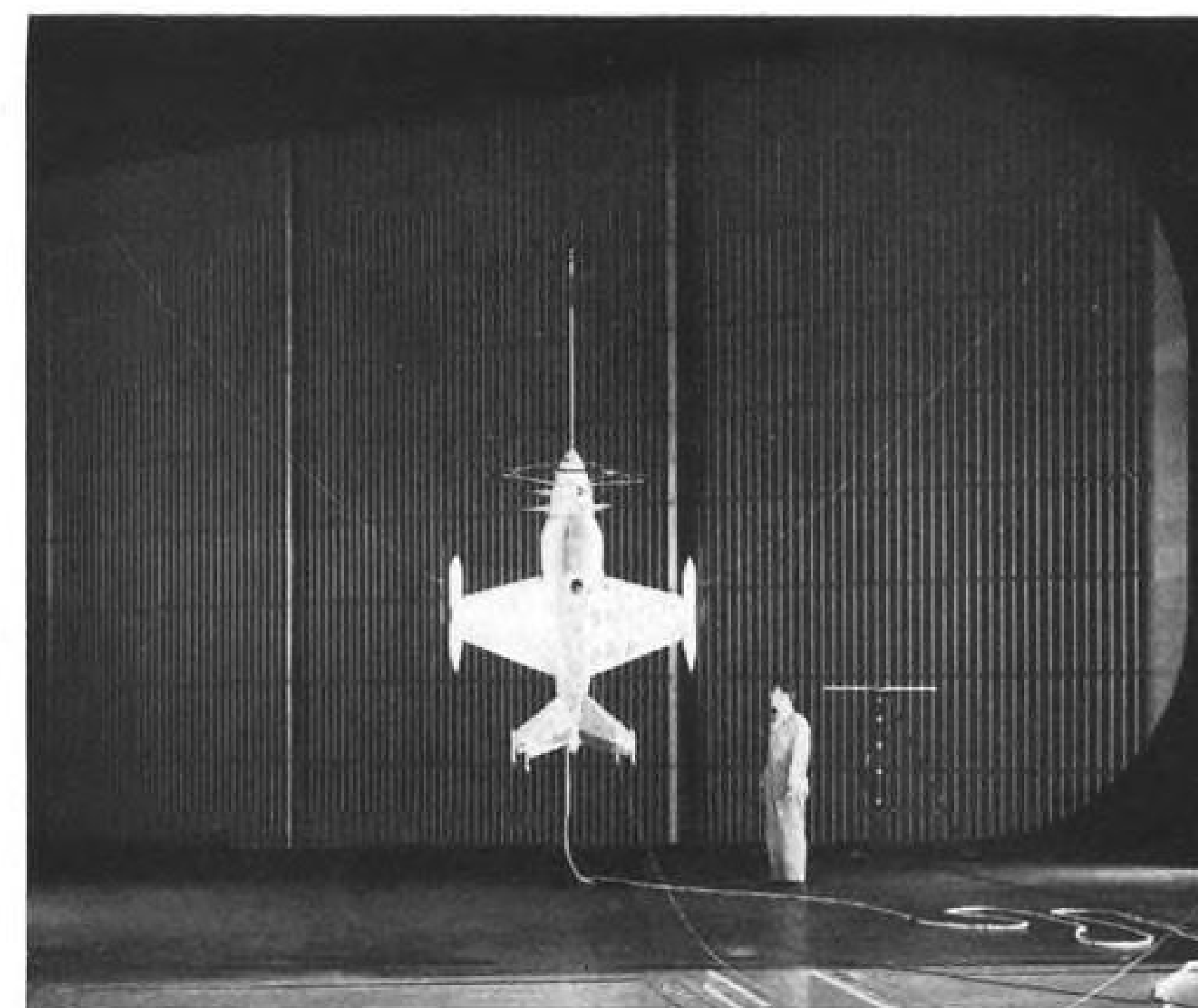
NACA has been doing basic research in the VTO field for more than a decade and laid the foundation for the development by Lockheed and Convair of the VTO prototypes powered by Allison turboprops that now are being readied for initial flight tests (AVIATION WEEK Feb. 15, p. 15; Mar. 22, p. 14; Mar. 29, p. 16).

► **VTO Pioneer**—Development work on the Lockheed XFV-1 was done at Ames Laboratory in California but most of NACA's research work on VTO has been done at the Langley Laboratory where development work was also accomplished on the Convair XFY-1.

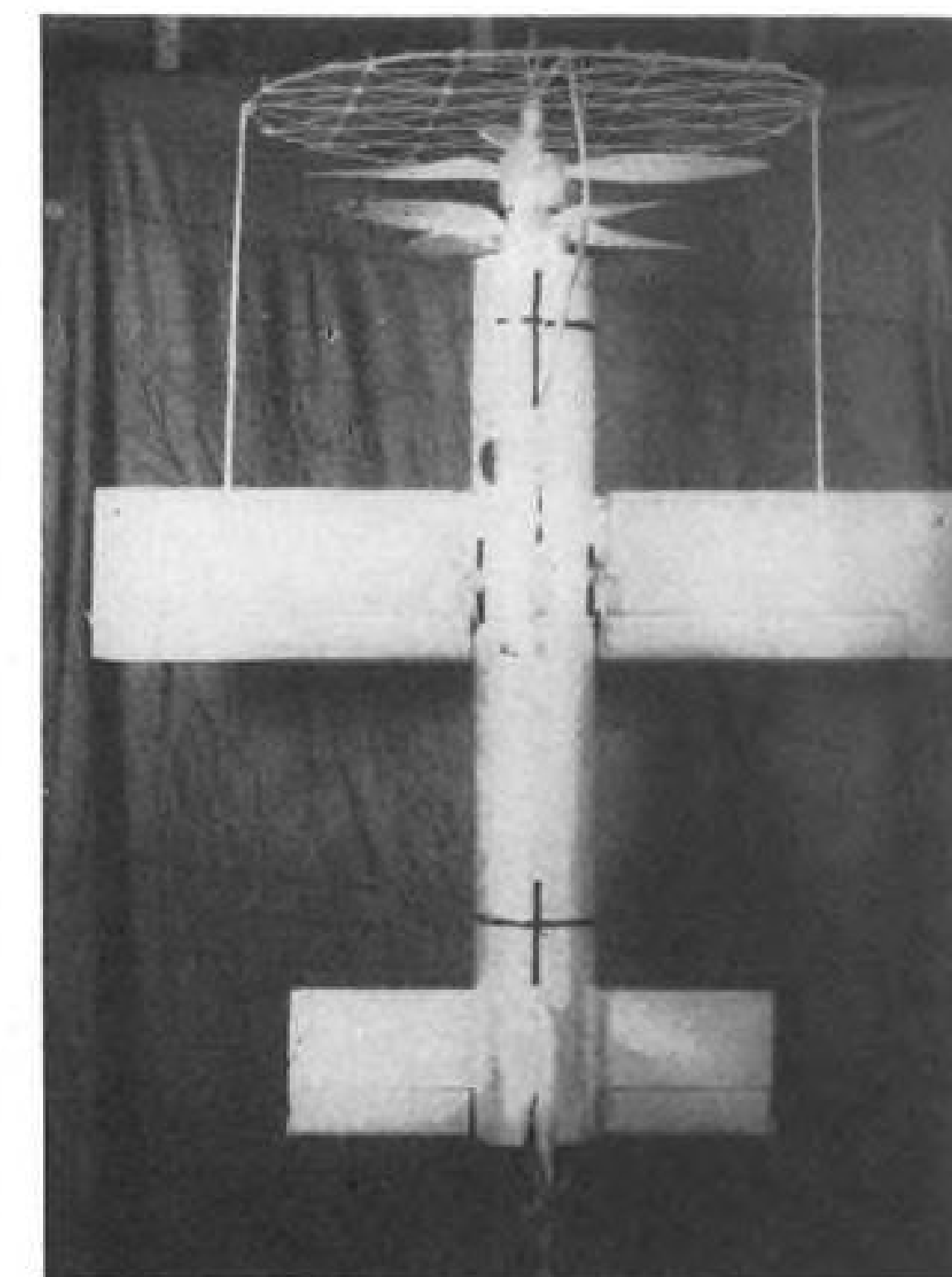
NACA's VTO research team is headed by Charles H. Zimmerman, assistant chief of Stability Research Division at Langley, working with John P.



**SCALE MODEL** of Convair XFY-1 VTO prototype is readied for free flight in full-scale windtunnel at NACA Langley Laboratory. Tunnel drive fans are visible in background. Remote control pilot operates behind screen in foreground.



**QUARTER-SCALE MODEL** of Lockheed XFV-1 being readied for free flight in world's largest windtunnel at NACA Ames Lab, California. Most of the committee's VTO research work has been done at Langley.



**STRAIGHT-WING VTO** research model used by NACA to establish basic stability characteristics during transitional flight.

## Tests Give Answers to VTO Problems

Campbell, chief of the Langley free-flight tunnel, and his assistant, Marion O. McKinney. Zimmerman is a pioneer in the VTO field who worked with NACA prior to 1937 and then spent 11 years with the Chance Vought Division of United Aircraft where he designed the XF5U-1, a Navy carrier-based fighter prototype, approaching VTO characteristics. Zimmerman returned to NACA in 1948 after the XF5U-1 project was abandoned by the Navy.

A simple ducted fan, known at Langley as the "Flying Barrel," has been used successfully for initial exploration of stability and control problems of a jet-powered vertical riser. The test device consists of a barrel-type structure 18 in. in diameter with a set of dual-rotating propellers driven by an electric motor

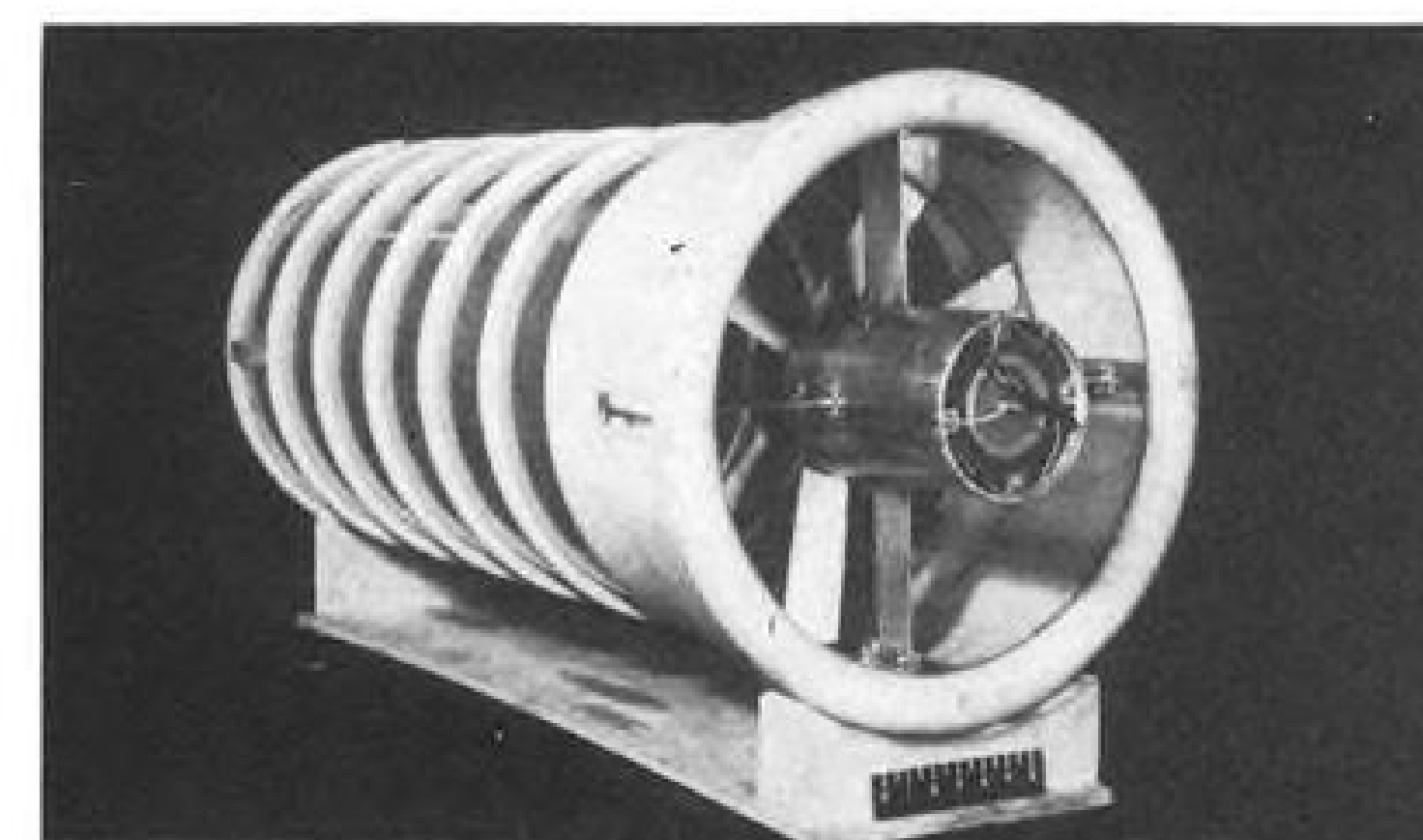
mounted in the nose and a set of cruciform controls mounted in the tail where they are in the jet blast.

► **Jet Power Promising**—Experiments with the Flying Barrel have indicated that no unusual stability problems should be encountered in vertical takeoff or hovering flight with jet-powered types. Further experiments are now in progress with various types of wing and tails added to the ducted-fan powerplant. Other models will be tested, powered by a 90-lb.-thrust pulsejet developed by American Helicopter Co. for rotor-tip power.

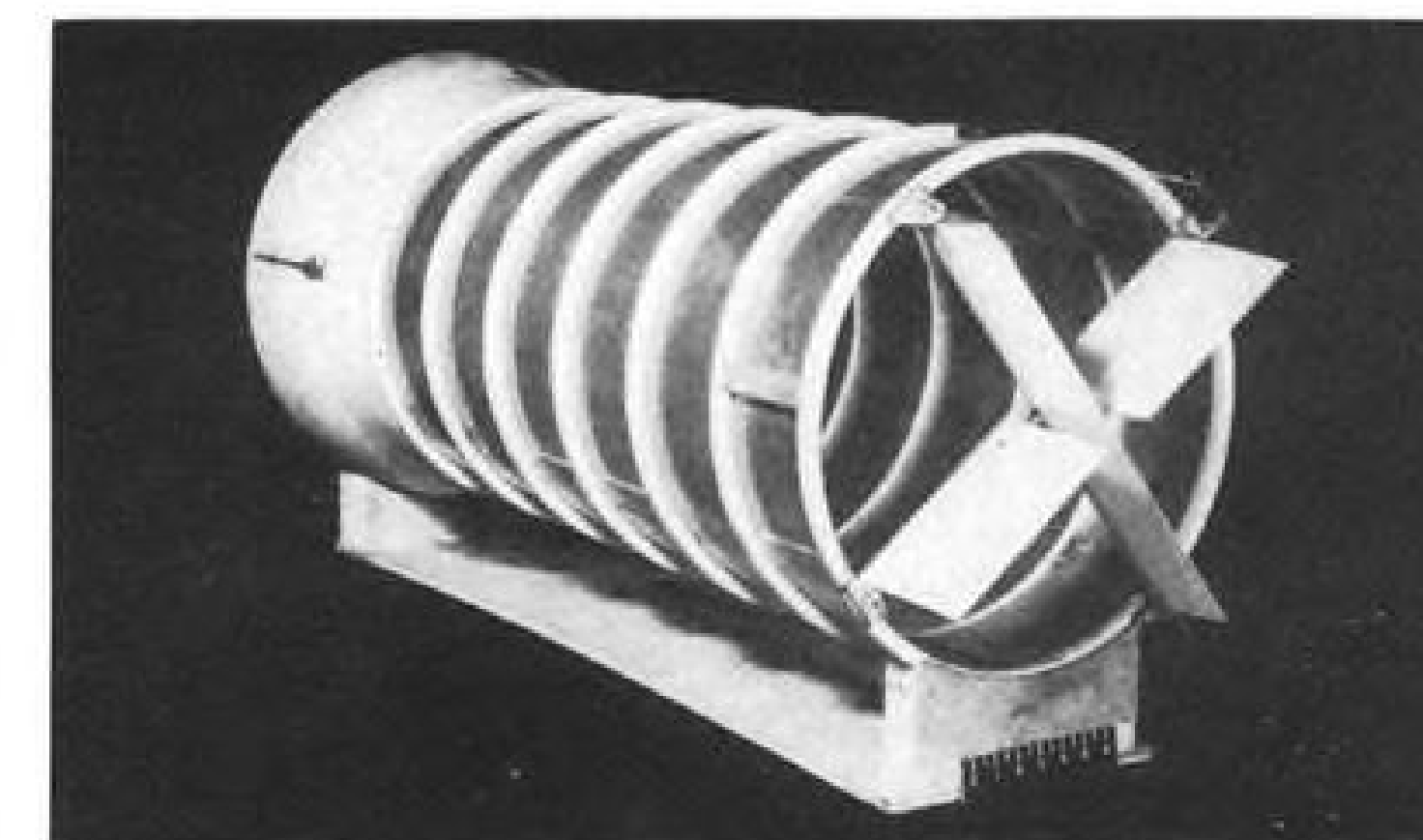
The ducted fan and jet-powered approach to VTO appears more promising than the turboprop-powered prototypes now in existence, because of the ultimate higher performance in level flight.

It is generally accepted that the turboprop VTOs will never be better than second-line fighters in the military stable. With jet power, VTO types with a level flight capability of Mach 2 are not deemed impossible.

► **Transport Use Possible**—Another approach being explored by NACA is the cascade-type wing which aims at avoiding the problems of upright engine and propeller installations by turning air 90 deg. over the wing to provide vertical lift. NACA has been exploring stability and control problems of this type VTO for some time (AVIATION WEEK May 18, 1953, p. 16). Some people familiar with these experiments feel they may eventually have considerable commercial application to transport aircraft when routine transport cruising speeds



**FRONT** of Flying Barrel shows ducted fan using dual props.



**REAR** shows cruciform controls mounted in jet stream.





## Giannini LOW PRESSURE TRANSMITTERS

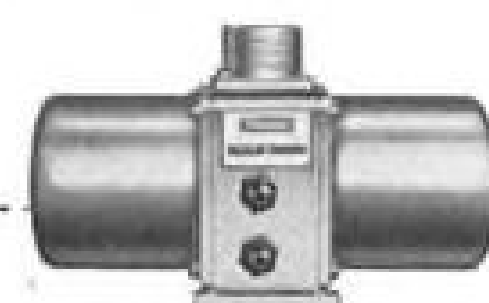
Giannini low pressure transmitters utilize a precision potentiometer element to translate pressure signals into proportional electrical signals (20-50 volts), requiring little or no amplification.



MODEL 45176

Models are available with single or multiple outputs, and can be linear with airspeed, altitude, pressure, or to natural or empirical functions.

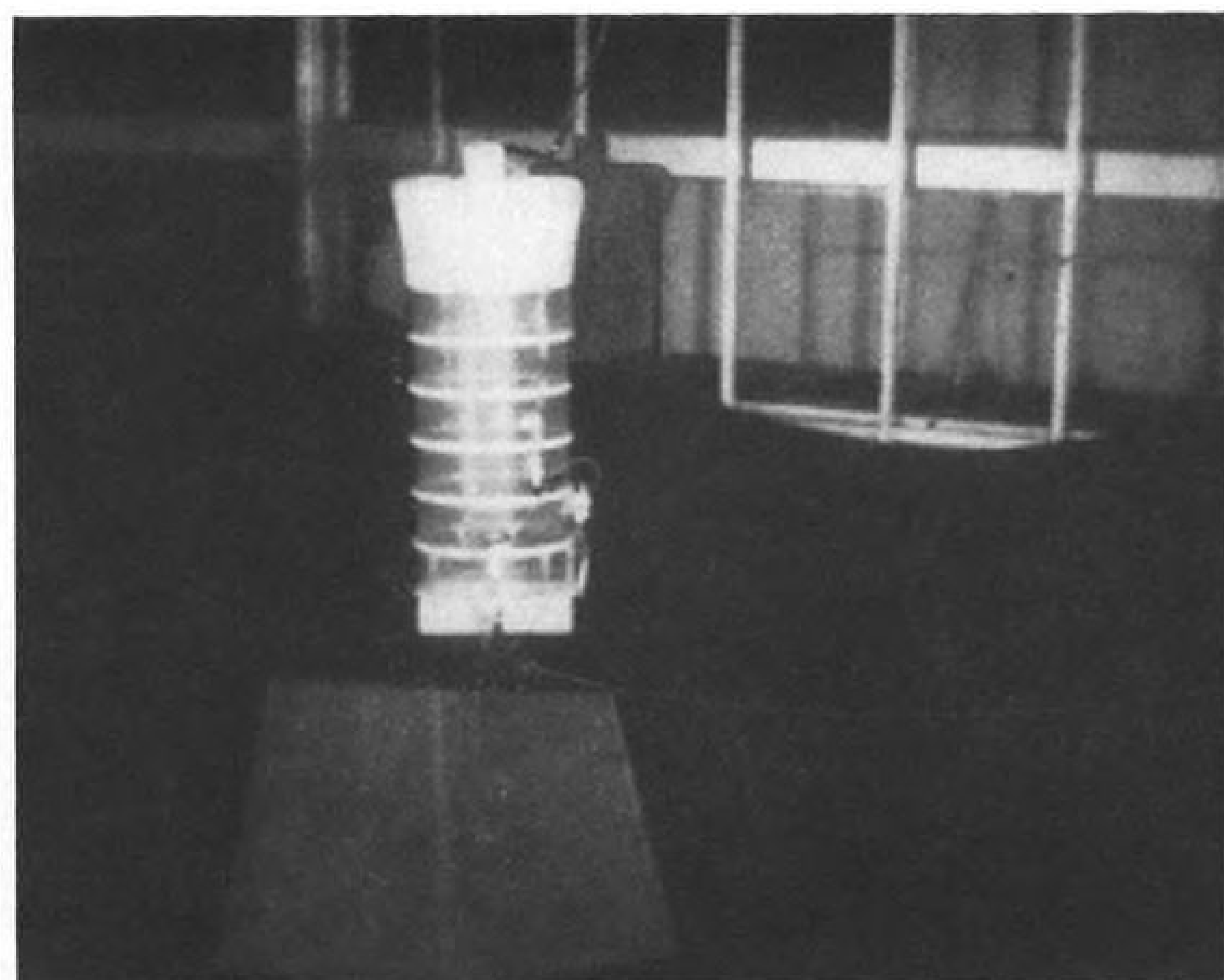
Ranges from  $\pm 0.5$  psi., diff. to 0-150 psi., (abs., diff., gage), under normal environmental conditions, or extreme conditions of high acceleration, severe shock or vibration. Write for complete engineering information.



MODEL 45177

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**Giannini**



FLYING BARREL really flies, this photo taken during Langley experiment shows.

exceed the 400-mph. speed mark.

Basic research on the feasibility of turboprop-powered VTOs was done by NACA at Langley during 1948-49 with a simple straight-winged model using cruciform tail surfaces. These experiments proved that it would be possible to control propeller-driven VTOs in hovering and transitional flight without an automatic stability device. The instability encountered in both hovering and transitional flight could be handled with normal controls.

Indications were that a rate-sensitive gyro would be helpful for these control problems but a fully automatic device was not necessary. When control surfaces were close to the ground during the initial climb and the end of the landing sequence there was some diminishing of control effectiveness but again it proved to be a minor problem.

►“Zoom” Abandoned—NACA conducted further research on another straightwing VTO model that resembled the eventual configuration of the Lockheed XFV-1, and later tested a sweptwing model and a delta-wing configuration scale model of the Convair XFY-1.

Tests on transitional flight with these models indicated that it was feasible to abandon the “zoom” technique for changing from vertical to horizontal flight and use instead a more gradual “flying-through” technique. The zoom technique was particularly bad for landing since it limited operations to weather having the 3,000-ft. ceiling necessary for the zoom to vertical landing descent. With the flying-through technique, landings can be made under 500-ft. ceilings. Region of greatest in-

stability during transition flight occurs when the angle of attack is between 40 and 50 deg.

►Pilots Study Tests—In addition to test of the Convair scale model at Langley, the Lockheed model was tested at Ames, both in the free-flight tunnel and in the 12-ft. pressure tunnel, where level flight characteristics, highspeed stability, control effectiveness and propeller effects were studied in the range of Mach 0.5 to 0.92.

Lockheed test pilot Herman (Fish) Salmon and Convair pilot Joe Coleman studied the NACA free-flight model tests to get a better grasp of their problems in flight testing the full-scale prototypes.

## Salaries Still Rising For New Engineers

Starting salaries for its engineering graduates reached an all-time high in January, with an average figure of \$373 monthly, Illinois Institute of Technology reports.

Top salaries went to chemical engineers (\$394), with civil, mechanical, electrical and industrial following in that order.

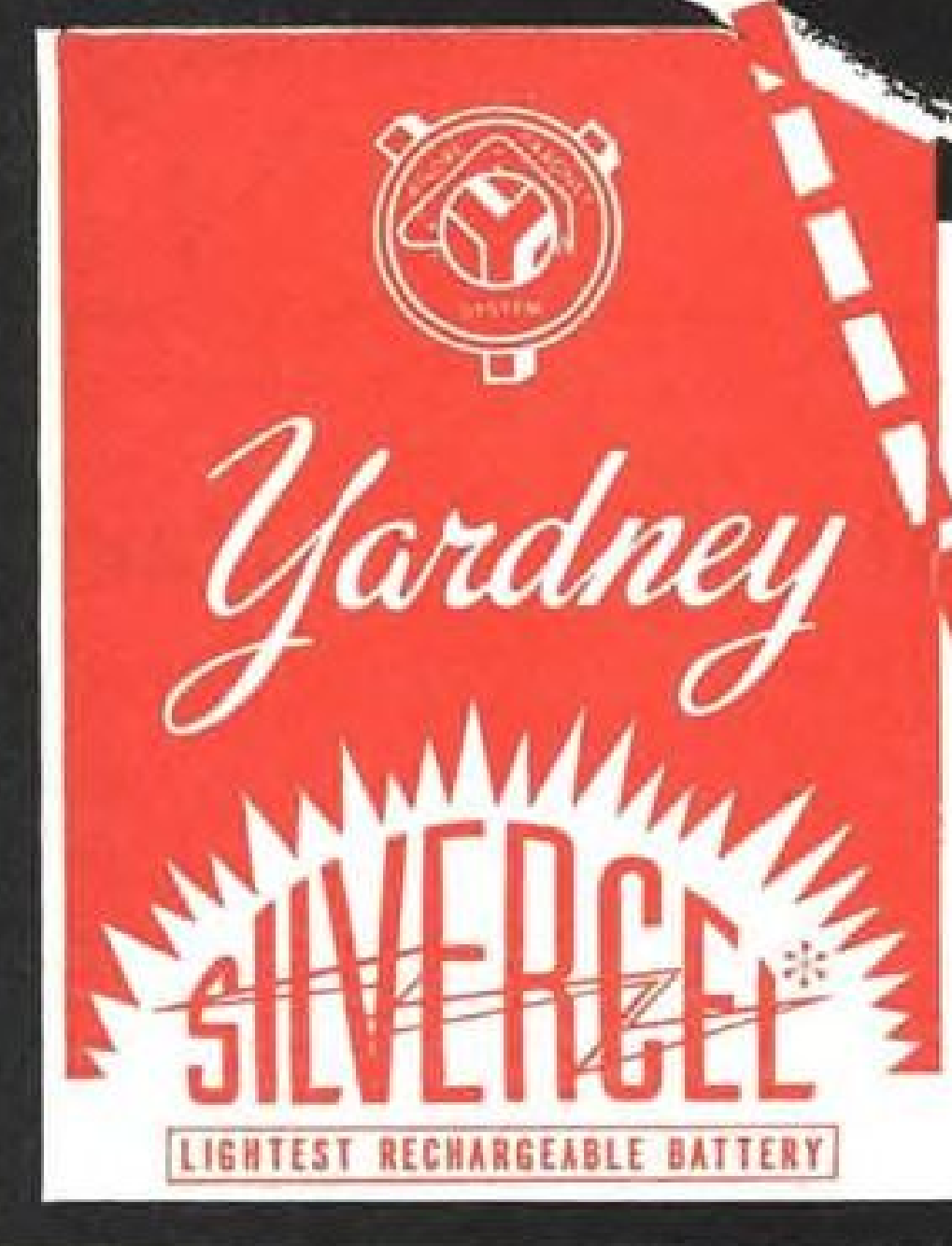
Figures apply to graduates with a bachelor's degree and for a work week of 40 hr.

Average starting salaries were up 9.3% over a year ago; all the graduates who filed for placement left school with jobs, after an average of 7.5 interviews per man.

Salary rates since 1949 show a continuing increase from \$282 monthly to the current level.

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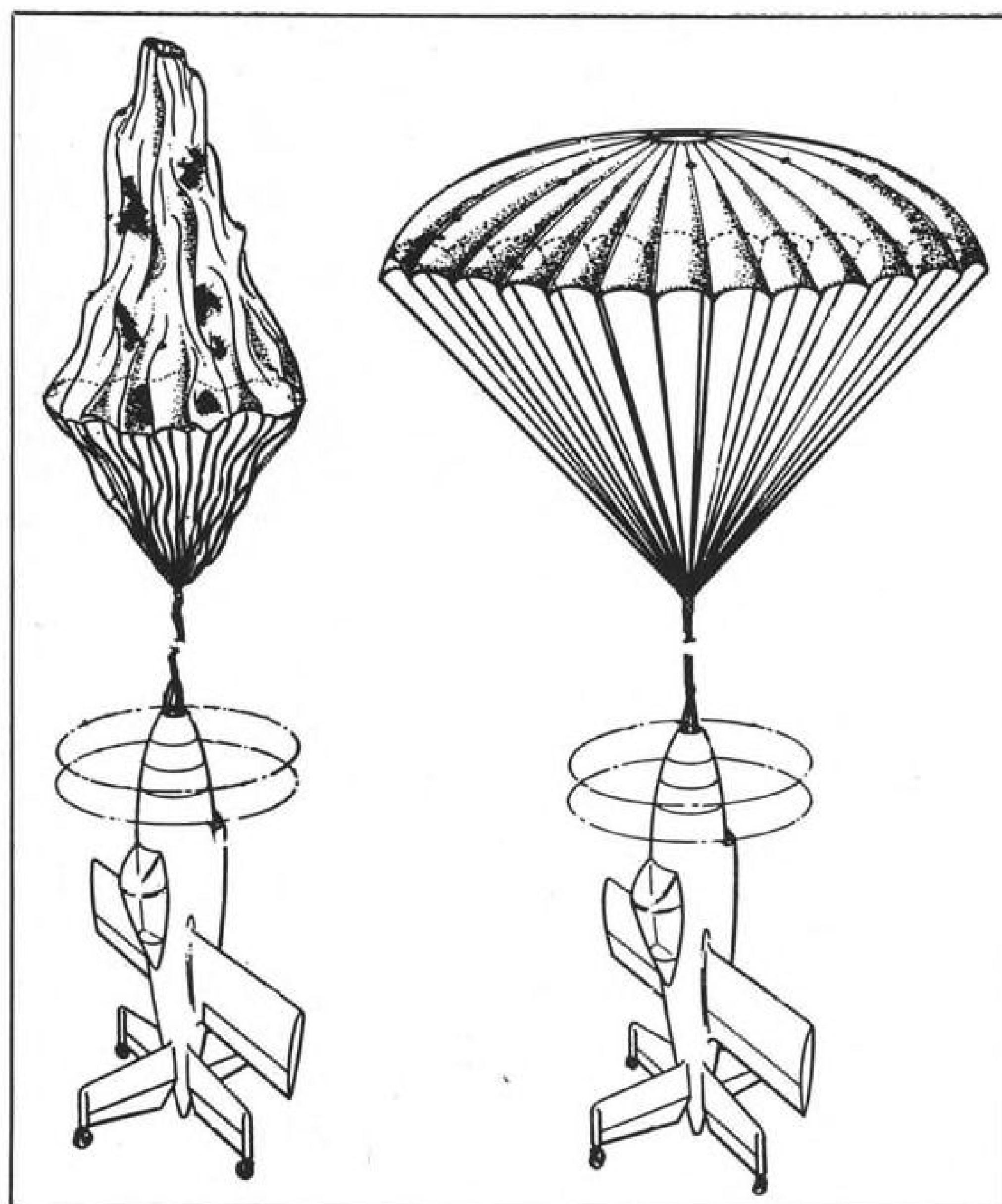
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SAFE LANDING for Lockheed VTO in case power fails is purpose of patented chute.

## Lockheed Patents VTO Parachute

A parachute for landing Lockheed Aircraft Corp.'s vertical takeoff interceptor (AVIATION WEEK Mar. 22, p. 14) in the event of engine failure has been patented.

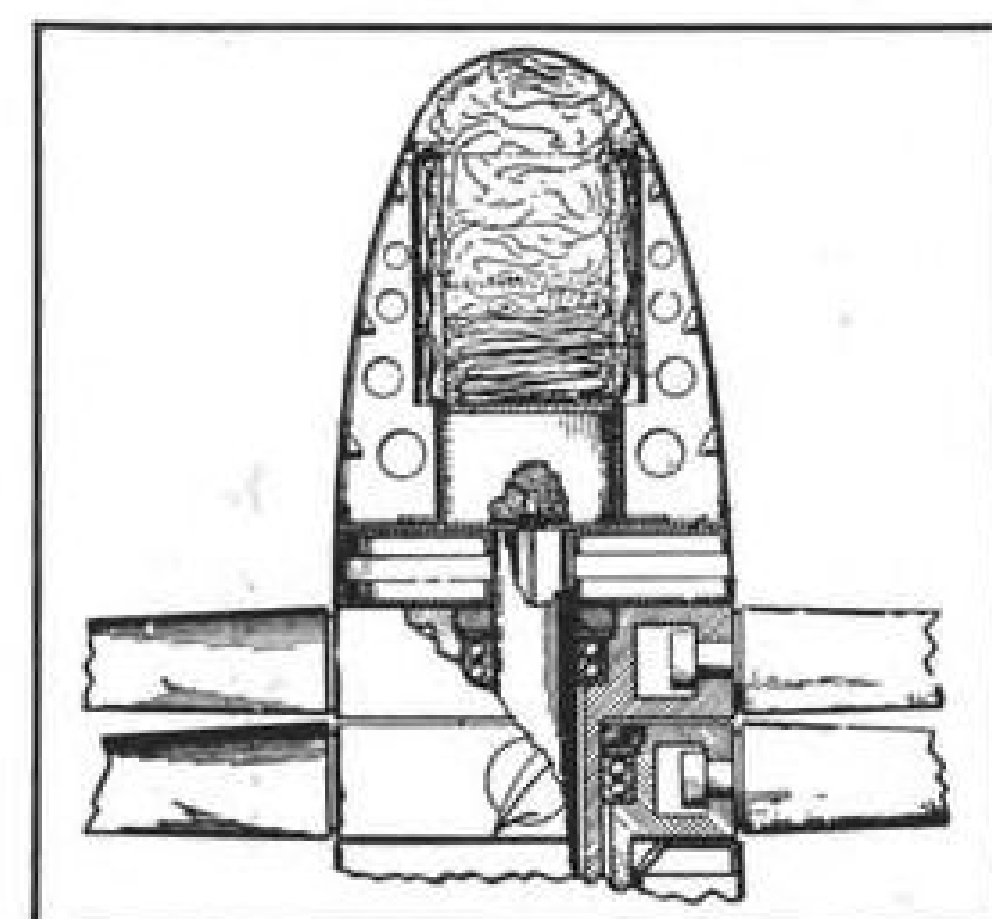
The parachute is housed in the fighter's spinner and is ejected upwards by an explosive charge. A detachable, domelike cap on the spinner allows the chute to be expelled. Resilient metal strips around the hem of the parachute canopy provide a partial opening when the chute is shot out of the confines of the spinner.

Weights are attached to the chute to assist in carrying the canopy clear of the downflow of air through the propellers. These features permit a rapid inflation of the chute.

► **Eliminates Hazard**—In a patented description, inventor Eugene C. Frost, Burbank, Calif., states: "... In preparing for a landing, the airplane is maneuvered from a normal flight attitude to the vertical taildown attitude and is then caused to sink or move

downwardly in this vertical attitude to land on its tail.

"There is some hazard in operating the aircraft in this manner because engine failure or malfunctioning while in this vertical attitude shortly after the takeoff or preparatory to landing may occur at an altitude insufficient to permit the pilot to maneuver the



DETAILS of chute housing in VTO nose.

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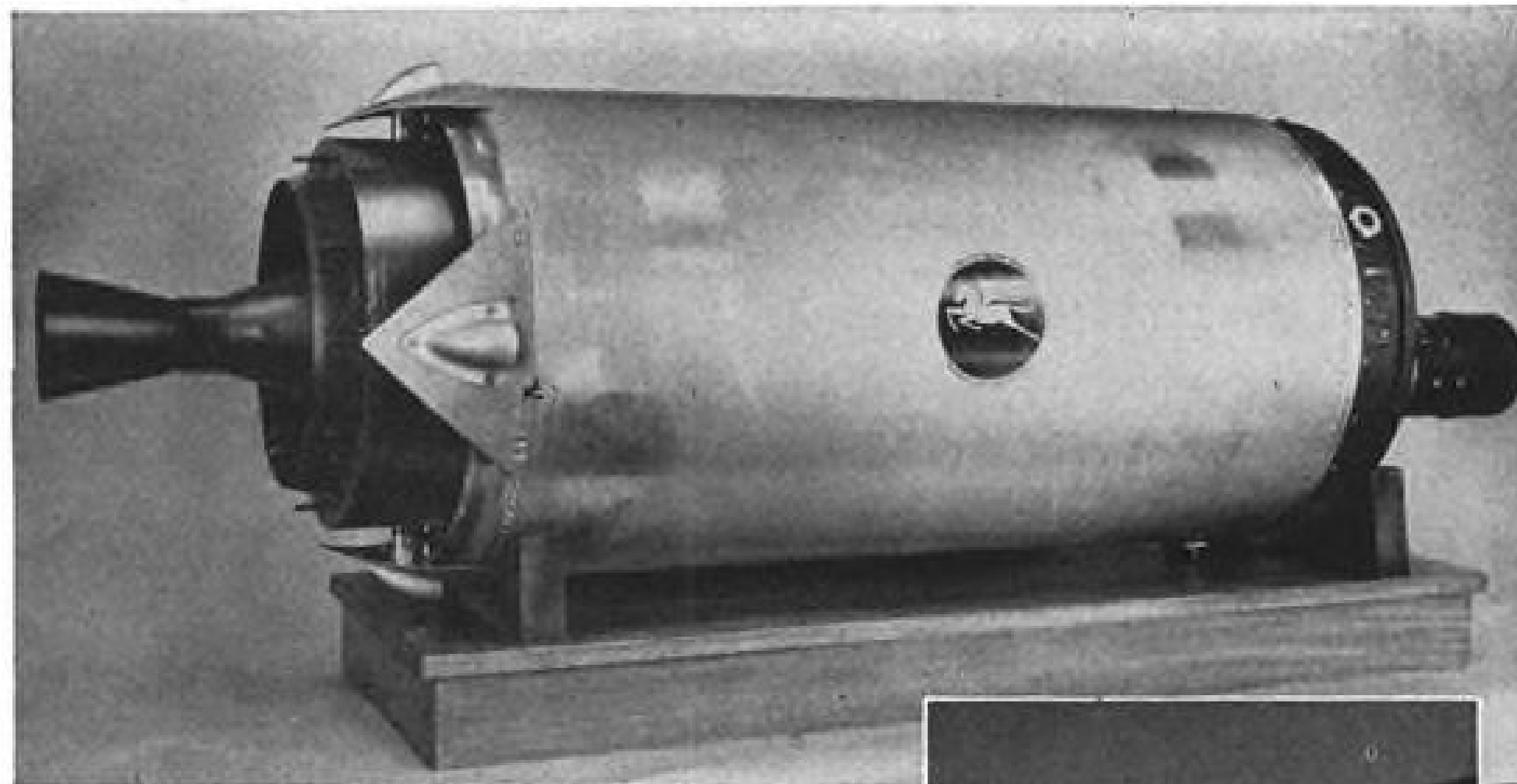
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Design of the Fairchild J44 jet engine for pilotless aircraft placed a tremendous responsibility on two bolted joints. A sheet metal cowl forming the pressure chamber also serves as the load-carrying frame. Two end pieces bolted to the cowl support the main bearings . . . and these bolted joints hold the entire monocoque structure together. They must withstand the severe shock of parachute recovery as well as the normal stresses of flight.

ELASTIC STOP® nuts were called out by Fairchild for both joints. At the high temperature end, ESNA's all-metal, high-temperature, beam-type nuts are used. The joint at the compressor intake end is held by ELASTIC STOP nuts with the familiar red insert locking collar. All are vibration-proof and self-locking. Assembly is a quick, one-piece operation.



In all testing and field experience with the J44, Fairchild has not experienced a single failure due to the loosening of an ELASTIC STOP nut.

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craft into a safe glide or otherwise bring the airplane down safely."

► **Quick Inflation**—" . . . The parachute is capable of inflation almost immediately upon ejection from the airplane and is adapted to lower the airplane at a sufficiently low sinking speed to prevent serious injury to the airplane and pilot under most conditions of operation."

Patent was filed May 22, 1951, when development of a VTO was first undertaken by Lockheed. Patent rights have been assigned to the aircraft company by the inventor.

### No Harm in Pressure Loss, Doctor Says

Physical discomfort caused by sudden loss of pressurization at 25,000 ft. is "comparatively innocuous," Dr. Charles Barron, Lockheed Aircraft Corp. flight surgeon, told the Aero Medical Assn. recently.

He also reported that as a result of instantaneous decompression experiments conducted thus far at Lockheed, a major step has been taken in future tests to check problems encountered in fighters and bombers flying at 40,000 ft. and upwards.

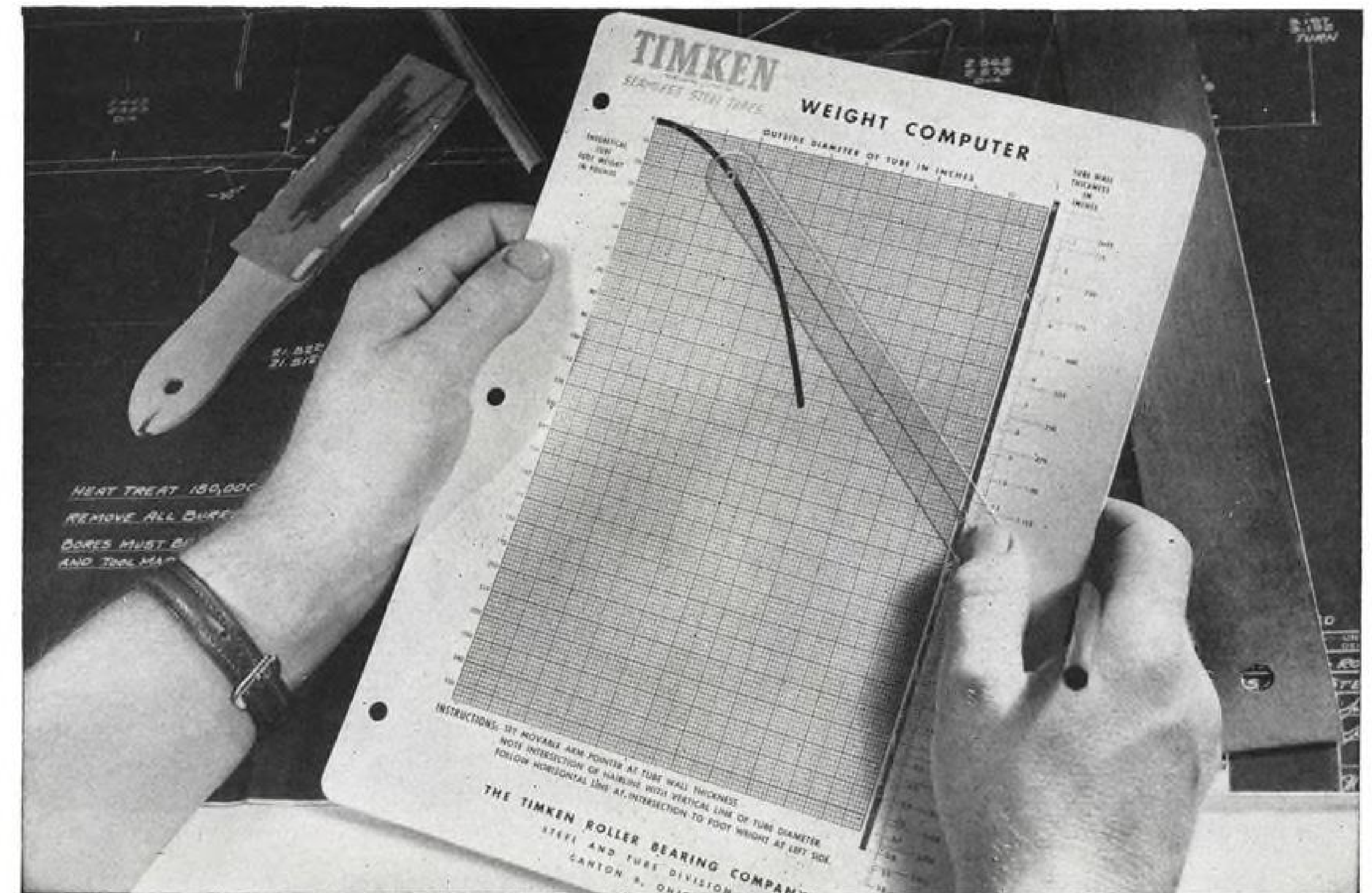
► **Altitude Tests**—Explosive decompression tests to 25,000-ft. simulated altitude have been conducted at Lockheed since January 1952. They involved 381 employees ranging from 20 to 55 years of age, who underwent the experiments under carefully controlled conditions while sitting in an "altitude" chamber.

While the subjects were in the chamber at a simulated 8,000-ft. altitude, a diaphragm was shattered and air escaped into a partial vacuum in an adjoining chamber, causing a rapid change to rarefied conditions found at 20,000-25,000 ft. The switch in pressure was accompanied by a thunderous clap of noise, Barron said, and split-second blast of wind and fog.

Other highlights of the experiments: • **Majority of personnel tested** were in their 30s, but total results indicate that controlled explosive decompression can be taken safely by persons up to at least 55.

• **About 20% of the participants** had a physical defect, such as varicose veins, hypertension, overweight, reduced hemoglobin, sinus trouble, hernia or hay fever. Several had multiple defects but reacted similarly to those without defects.

• **Complaints about the lungs** were negligible; sinus cases were helped appreciably; temporary ear complaints in two cases were the most severe reactions noted; gastro-intestinal tract complaints were relatively few and only two persons noted any dental pain.



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WITH this handy little computer, you can quickly figure the weight of steel tubing. You set the slide at tube-wall thickness and O.D. and simply read off the tube weight per foot. Write us and we'll send you one. There's no obligation, of course.

This computer is a small example of the helpful service the Timken Company offers manufacturers of hollow steel parts. Even more important: our engineers will be glad to study your problem and recommend the most economical tube size, *guaranteed* to clean up to your dimensions.

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their hollow parts are making significant savings because they switched to Timken® seamless tubing. In addition to the big reduction in scrap loss, they save a great deal of machining time. Frequently, finish boring is the first production step. Machine tools are released for other jobs.

Timken seamless tubing has fine forged quality because it is made by a piercing process which is basically a forging operation. Write us now on your company letterhead for the handy tube weight computer. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



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**Fine Alloy**  
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SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



# PRODUCTION



HEAT-RESISTANCE to jet engine blasts (F3D, left) and 5,000F temperatures reached in rockets (right) may soon be improved as . . .

## Ryan Develops Ceramic-Liner Techniques

• New ways to apply and work with coatings point to solution of some high-heat powerplant problems.

The role of ceramics and now of cermets—a combination of ceramic and metallic powders—grows increasingly important in the development of more efficient components for the hot end of jet and rocket engines.

Therefore it is natural that these materials should pay a big part in the research and production activities of Ryan Aeronautical Co., a pioneer in afterburner work. Recent Ryan disclosures tell of company developments in this field. They involve:

- Flame-spraying of cermet on metal.
- Ceramic coating of large, thin-walled jet engine components.
- Welding through ceramic coatings.
- **Flame-Spray Process**—Flame-spraying is still in the research category. In this operation, a powdered refractory is momentarily liquefied, then sprayed on a metal surface. Ryan uses a gun that was designed for metal spray-welding work but converted for the application of cermets.

As coatings for afterburner liners, rocket parts, and other high-heat components, flame-sprayed cermets offer interesting possibilities. These parts must

withstand high-velocity, high-temperature corrosive gases, but are not required to possess high structural strength. Service life of these parts may be extended appreciably with cermet coatings successfully applied.

► **Nickel-Magnesia Cermet**—Nickel-magnesia, a promising cermet, has been flame-sprayed successfully at Ryan on stainless steel, Inconel and other high-temperature alloys. As a coating, nickel-magnesia will withstand temperatures as high as 3,500F for limited periods.

The material is made from nickel

and magnesium oxide which have been combined, sintered and ground to a powder. It has a very high fusing temperature and cannot be applied to metal structures by ordinary furnace fusing methods, Ryan reports. Ordinary furnaces will not provide temperatures above 2,100F. Specially insulated furnaces are expensive, difficult to design and operate for handling sizable parts.

Another difficulty is that jet engine alloys cannot take the necessary fusing temperatures without losing strength

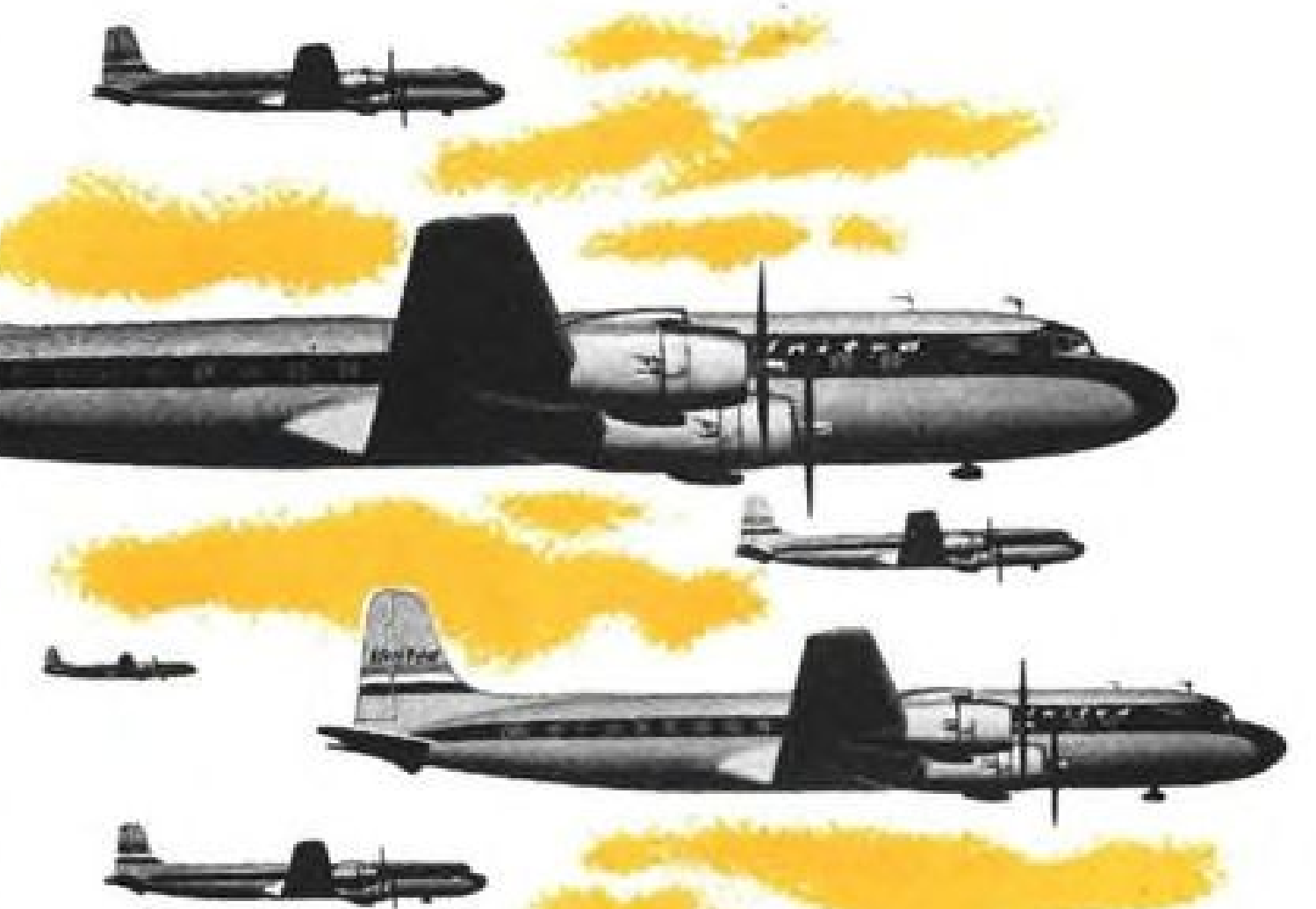
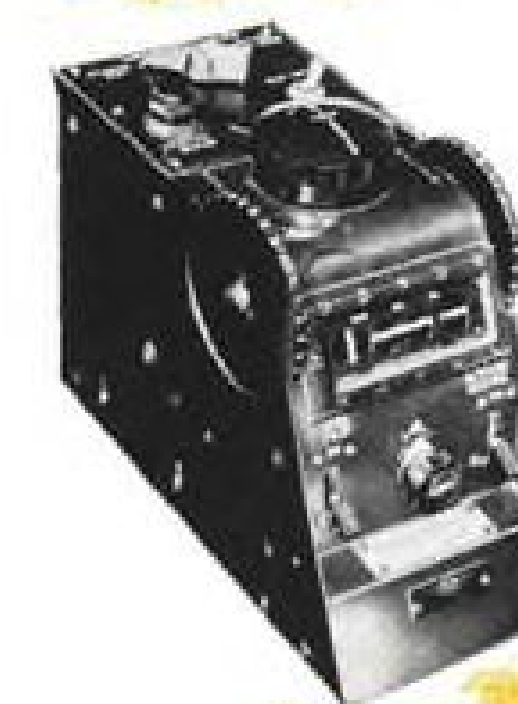


RYAN AFTERBURNERS, like these for the J47, generate temperatures to 3,500F.

FOR ACCURACY EN ROUTE  
AND PRECISION IN LANDING



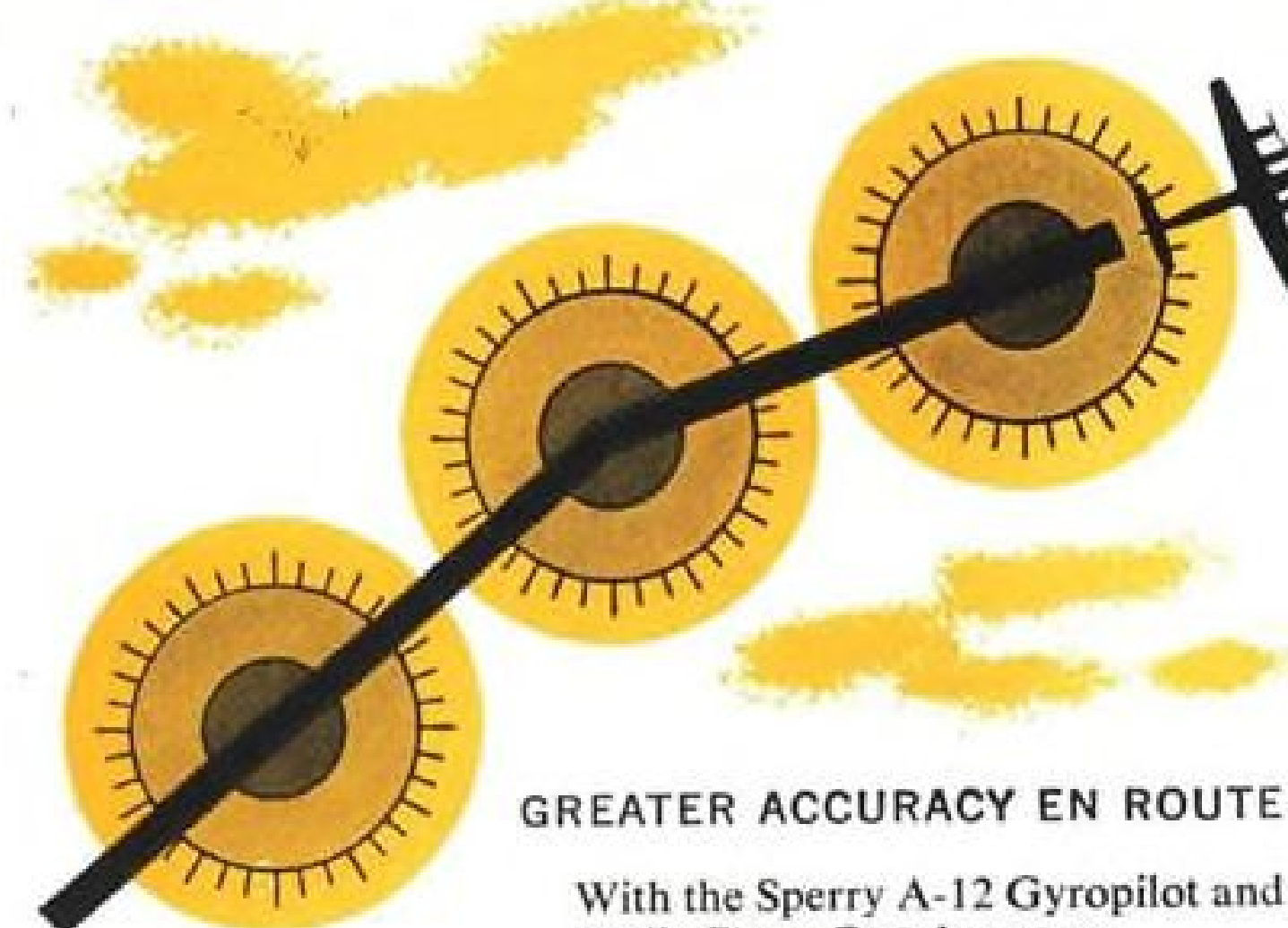
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Gyropilot  
with New  
Radio Beam  
Coupler**



ENTIRE FLEET OF DC-7s TO HAVE  
NEWEST FEATURES OF AUTOMATIC FLIGHT

Seven years ago, United Air Lines pioneered routine airline instrument approaches by installing the Sperry A-12 Gyropilot® Flight Control and approach coupler on its fleet of DC-4s. It was, in the words of United Air Lines' President, W. A. Patterson, "... a definite start in eliminating weather as an obstacle to airline operations." Today, United Air Lines is still leading the way. With its entire fleet of DC-7s equipped with Sperry A-12 Gyropilots and new Radio Beam Couplers—United Air Lines plans to make routine automatic flight on the Victor Airways using the omni range.

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With the Sperry A-12 Gyropilot and Radio Beam Coupler, cross country flying is extremely accurate and greatly simplified. Compensation for cross winds is made automatically and the pilot gets a continuous indication of drift angle. It provides a smooth flight over each omni range station. Upon entering this zone, the Coupler automatically disengages itself and the precise compass heading is maintained. Once passed the area where the radio beams are ineffective, the Coupler automatically re-engages itself and the aircraft continues on the beam.

**SPERRY**

GREATER PRECISION ON APPROACHES

With the Gyropilot and Radio Beam Coupler, there is a greater degree of stability on coupling of glide slope and localizer even under turbulent conditions. Once tuned to ILS, the aircraft seeks and follows the localizer beam until the Coupler automatically engages the glide slope at its intersection. Pitch signal integration greatly simplifies operating procedures on approaches. Lowering landing gear and changes in airspeed require no manual manipulation of pitch knob.

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The A-12 Gyropilot with the new Radio Beam Coupler feature does far more than relieve the pilot of unnecessary fatigue. Straighter, more accurate courses mean time saved and less fuel consumption. More precise approaches mean fewer cancellations because of weather. This improved Coupler is now in production and the A-12 Gyropilot can be procured with this new feature. It can also be added to existing A-12 installations. Our nearest district office will be happy to give you complete details.

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"When You Order Bolts, Specify **ABC**"



THIN-WALLED structures get high-temperature coatings without warping.

and incurring other physical changes. Flame-spraying gets around these obstacles, Ryan says. It heats the cermet to the fusing point without bringing the base metal, to which it is applied, close to harmful high temperatures. Expensive furnace equipment also is eliminated.

The nickel-magnesia powder is placed in a metal container attached to the flame-spraying gun. The powder is forced through a tube into the hot torch nozzle by nitrogen gas. Oxygen and acetylene also are piped to the nozzle, where they burn at a temperature of 5,500F. The cermet liquefies as it flows through the hot flame and is sprayed on the metal surface. Impinging on the cooler metal, the temperature of the cermet drops, the material solidifies and adheres in a coating which can be applied to a required thickness.

Ryan has put on the coating in thicknesses ranging from less than .001 in. up to .020 in. The base metal is not brought to a temperature which could cause it to warp or buckle.

The spray gun is light and dependable, Ryan says. Four valves control the flow of oxygen, acetylene, nitrogen and the cermet powder.

► **Afterburner Liners**—Ryan, in conjunction with California Metal Enameling Co., is producing large General Electric afterburner liners. These stainless steel, thin-gage structures shield the afterburner walls from the flaming jet stream. If they were not coated on both sides with a ceramic shell, they could not stand up in service. Louvers and corrugations afford extra strength and insulation.

In service, the liners extend afterburner life by maintaining a relatively cool boundary layer of gas along the afterburner walls.

The A-418 ceramic coating, the most recent National Bureau of Standards

Nothing Missing  
in the  
**LINK!**

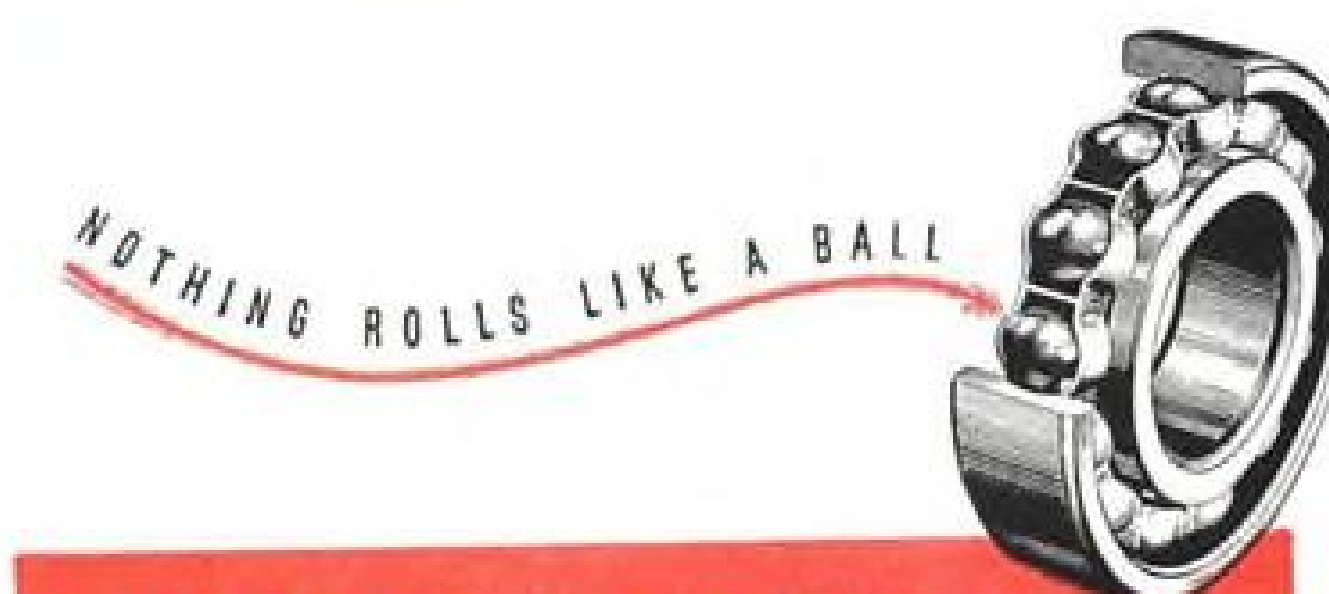


Link Hi-Precision Gear Box, one of many in the Flight Simulator, shows the New Departure ball bearings that maintain accurate gear pitch-line contact . . . almost entirely eliminate backlash and friction.

Take off . . . rough weather . . . enemy aircraft . . . Link's F-89D Jet Flight Simulator provides nearly every flight situation without getting off the ground. Extensive use of New Departure ball bearings throughout assures the same operational characteristics, the same smoothness and accuracy, so essential in actual aircraft equipment.

These high-precision ball bearings provide low starting torque, very low running friction and exact location of vital parts, irrespective of operating position.

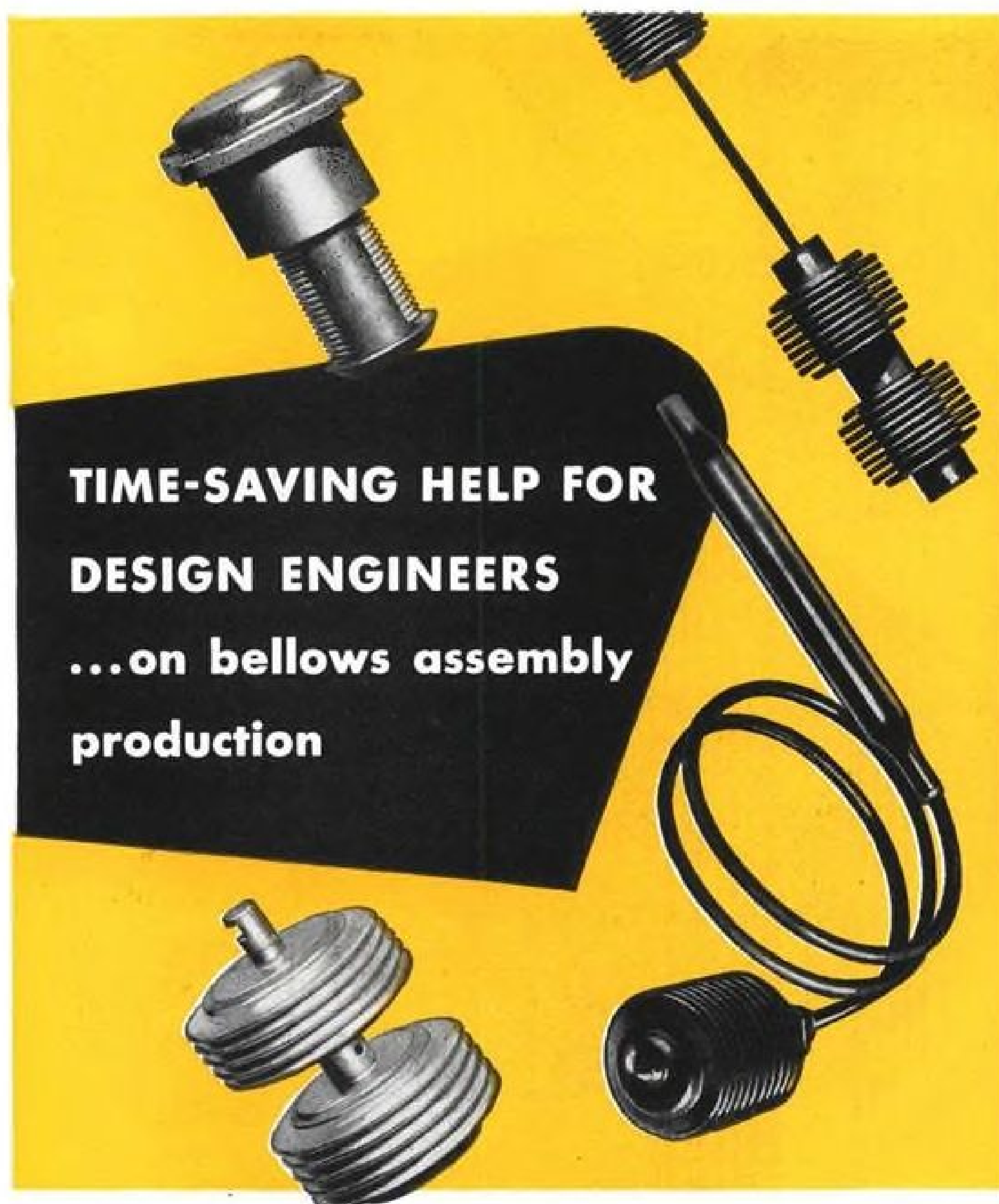
If you design for aircraft equipment, it will pay you to talk to your New Departure engineer.



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CERMETS are sprayed like paint on stainless steel parts with 5,500F gun.

type, protects the liner from the rapid oxidation to which it normally would be subjected.

Ryan says that exceptional methods had to be developed to obtain uniform coatings on the corrugated surfaces. Special cleaning methods also had to be developed, since standard sandblasting procedures could not be used because of the thin gage material involved. Techniques were evolved to prevent warpage of the thin section during the furnace fusing process.

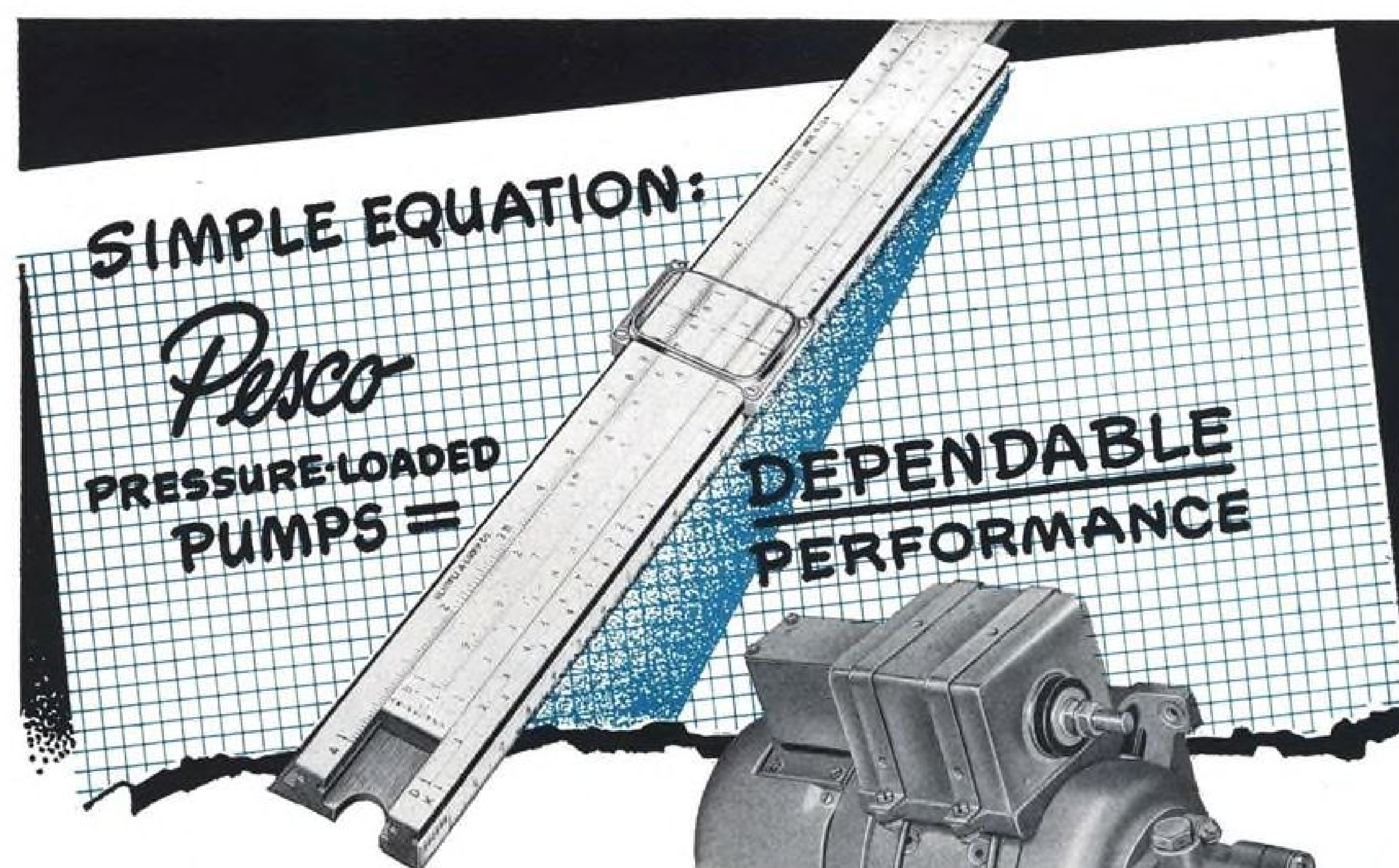
► **Welding Through Ceramics**—Ryan reveals that because the A-418 ceramic coatings are flux-like in character, it is possible to arc-weld through them with good results. In Ryan's production plan, the large structures involved are built in small component parts, then welded after they have been ceramic-coated. This simplifies the coating process, Ryan says, and affords savings, since the parts are more accessible.

The ceramic coating melts, floats on the weld metal and combines with the welding flux. Along the weld zones, the adjacent ceramic material smoothly blends into the weld without spalling, Ryan says, because of the good thermal shock-resistance of the coating.

► **Test Setup**—Ryan's development laboratory continually evaluates ceramic material. The test setup uses an arrangement burning high-octane fuel in test headers coated with the ceramic under test. Flame temperature is 2,200F and the ceramic is heated to a 1,700F skin temperature for 25 hr.

In comparative tests, the A-418 ceramic coatings have displayed less physical change due to temperature than any other tested, Ryan says.

Another function of the Ryan laboratory is to aid production by determining the proper thickness for coating parts, and to ascertain, for example, how many firings are desirable.



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First there is Pesco experience. Since 1933 Pesco has concentrated its full facilities on the continuous development of aircraft pumps, motors, and accessory equipment. The successful solution of thousands of pumping problems has provided Pesco with unmatched "know-how" in pump design, characteristics, and application.

Then there are Pesco engineering and research—continuous and complete services using advanced technology in both design and materials to provide improved products and solutions to pumping problems.

And finally there are Pesco production facilities—geared to produce precision units in volume. High-precision machines and advanced production and testing techniques are reflected in the consistently high quality of all Pesco products.

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Pesco Model No. 111530 Electric Motor-Driven Hydraulic Pump with 0.056 cubic inch displacement, 1.3 gpm @ 3000 psig, 26 Volts. Weight 28 lbs.

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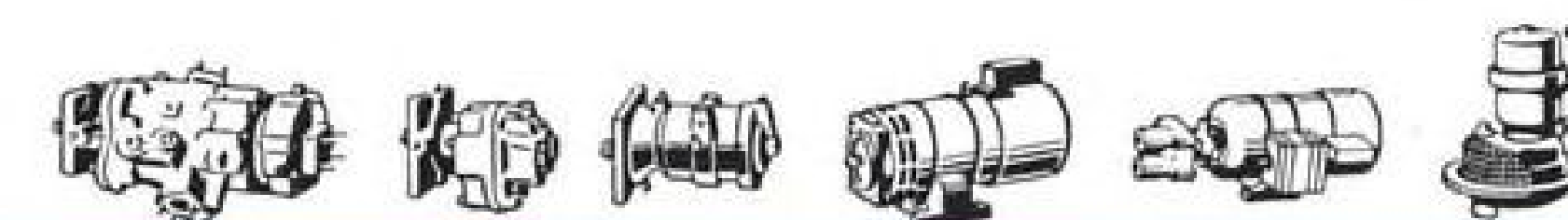
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**PRODUCTS DIVISION**



**BORG-WARNER CORPORATION**  
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## Destination Freedom

On March 5th, the entire 22nd Bombardment Wing left London, England. Just twelve hours and 6,000 miles later it landed at March Air Force Base, California. By this *nonstop* mass B-47 flight the Strategic Air Command has underscored global air power.

Congratulations to the United States Air Force! Your triumph over time and space gives new security to the free world.

With global air power an actuality, logistic and operational difficulties will become a major issue. The Fletcher Aviation Corporation report, *Maximum Tactical Utility Through Standardization of External Fuel Cells and Suspension In-Flight Refueling*, outlines a workable solution to this phase of the issue.

*Behind our global air power is an army of scientists and inventors...all spurred by a common incentive...the American Patent System.*

*Like freedom of speech, the American Patent System is a source of strength the enemy would like to destroy. We must all be vigilant to preserve it.*

## FLETCHER

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Colonel John B. Henry, pilot of lead aircraft in the record-smashing flight, is shown flanked by Major General Walter C. Sweeney, Jr., Fifteenth Air Force Commander (right), and Major General Robert H. Terrill (left), Fifteenth's Deputy Commander. This was the longest such flight ever made.

## Parker Develops New Flight Fueling Unit

Parker Aircraft Co., Los Angeles, has completed preliminary design work on a new probe-and-drogue inflight refueling system.

Parker's system has a new type of coupling to permit high flow rates, and a new type of hose tension-control mechanism employing stored hydraulic energy. As the hose unreels because of slipstream drag on the cone-shaped drogue, energy generated by this action is stored in an accumulator. The energy is released as needed to tension the hose.

The company points out that its tension-control system makes no demand on the plane's electrical system. This is an especial advantage when fuel is being pumped at a high rate and there is a high power demand on the electrical system.

## Military Sets Specs For Titanium Bolts

First proposed military specification for titanium alloy aircraft shear bolts is being circulated to industry by Navy Bureau of Aeronautics.

Strength requirements are identical to the requirements called for in National Aircraft Standard 464 for steel bolts. Chemical composition is the same as RC-130B. The proposed specification has been approved by Air Force and Army.

► **Research Contracts**—Issuance of the specification is a major step in BuAer's titanium fastener program that started in early 1951 with the awarding of two research contracts—one to Russel, Burdall & Ward Bolt and Nut Co., Port Chester, N. Y., to investigate cold heading techniques, and the other to H. M. Harper Co., Morton Grove, Ill., to check hot heading techniques.

Results of the investigations were distributed to bolt firms to speed development of the fastener program.

Harry S. Brenner, a standards engineer in the BuAer's Airborne Equipment Division, says the aircraft industry is interested in utilizing titanium fasteners.

► **New Alloys Coming**—"We estimate that about 3% of an airframe's dead weight is made up of fasteners—bolts, screws, rivets and washers," Brenner says. "Titanium will produce about a 40% weight savings in fasteners alone. In a 20,000-lb. aircraft that means a savings of 240 lb."

The titanium fastener problem has been approached by BuAer in three segments:

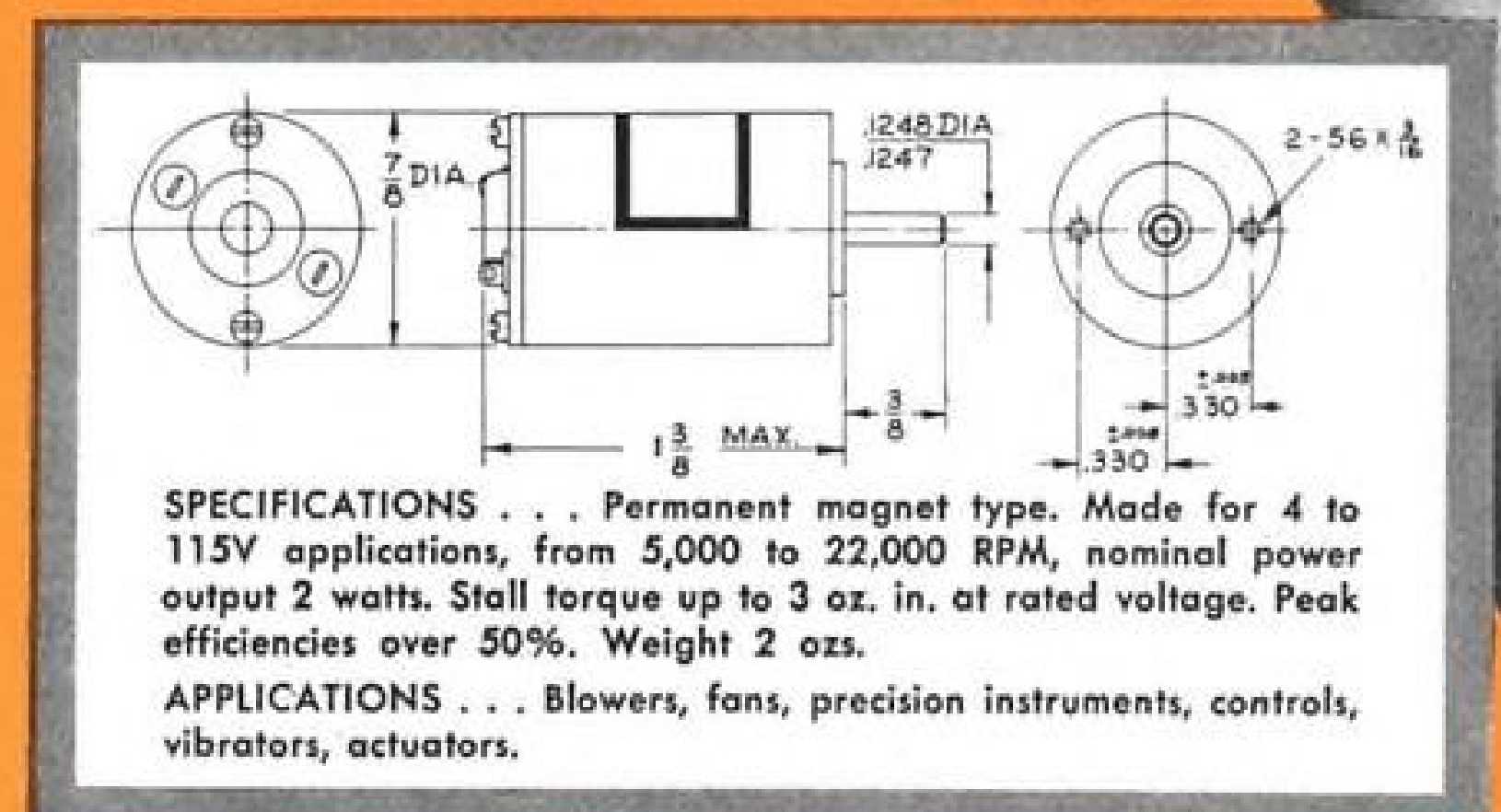
• First is the tension-fatigue fastener such as internal wrenching bolts. Com-

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prehensive fatigue tests now are well along at the Naval Air Experimental Station in Philadelphia.

• Second segment is the shear fasteners. This portion has reached the stage of the proposed specification.

• Third segment is permanent fasteners such as rivets and lock bolts. Initial testing of this phase of the program has started at NAES.

First two segments concern threaded bolts.

Entire investigation is guided by the principle of adapting the fastener to the material, Brenner says.

The National Aircraft Standards Committee is following the program.

NASC will schedule a titanium fastener forum June 14 in New York, just prior to the national NASC meeting.

## Navy Contracts

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

Adel Div., General Metals Corp., 10777 Van Owen St., Burbank, Calif., valve assys., \$111,573.  
 AiResearch Mfg. Co., 9851-9951 Sepulveda Blvd., Los Angeles 45, Calif., actuator assys. and spare parts, \$102,486.  
 Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., carburetor, 73 ea., \$100,463; poppet valves and diaphragms, \$38,345.  
 Cook Paint & Varnish Co., 3301 Bourke

Ave., Detroit 21, Mich., lacquer, cellulose nitrate, 300,000 qt., \$207,000.

Dynamic Air Engineering, Inc., 7412 Male Ave., Los Angeles 1, Calif., blower, motor, \$36,149.

Benjamin Franklin Paint & Varnish Co., 4820 Langdon St., Philadelphia 24, Pa., enamel, camouflage, 26,938 gal., \$49,221.

General Electric Co., 1405 Locust St., Philadelphia 2, Pa., overhaul of turbo-superchargers (govt.-owned), \$66,500.

General Electric Co., Lamp Div., 3201 Walnut St., Philadelphia, Pa., incandescent electric lamps, \$46,771.

General Motors Corp., Delco Products Div., 329 E. First St., Dayton 1, Ohio, 13 items for use on general aircraft, \$27,030.

Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Blvd., Chicago 11, Ill., aluminum alloy for maintenance of aircraft, \$39,535.

Adel Div., General Metals Corp., 10777 Van Owen St., Burbank, Calif., items and spare parts for valves, 409 ea., \$78,614.

Aero-Coustic Div., Glass Fibers, Inc., 3116 Van Owen Blvd., Burbank, Calif., insulating material, 132,700 sq. ft., \$26,280.

Aero Supply Co., Inc., 611 W. Main St., Corry, Pa., valve assy., fuel, and spare parts, \$181,196.

Aeroproducts Operations, Allison Div., General Motors Corp., Municipal Airport, Dayton, 1, O., bearing, cover for actuators, \$124,734.

Air Cruisers Co., P. O. Box 180, Belmar, N. J., life raft, 125 ea., \$51,250.

AiResearch Mfg. Co., 9851-9951 Sepulveda Blvd., Los Angeles 45, Calif., tubes used on oil coolers, \$38,495.

Ampruf Paint Co., Inc., 10925 Schmidt Rd., P. O. Box 508, El Monte, Calif., enamel, 15,500 gal., \$32,385.

Atlas Paint & Varnish Co., 32-50 Buffington Ave., Irvington 11, N. J., enamel, 17,500 gal., \$34,065.

Aviation Engineering Div., Avien-Knickerbocker, Inc., 5815 Northern Blvd., Woodside, N. Y., indicators, fuel quantity, \$25,255.

Bendix Products Div., Bendix Aviation Corp., 401 Bendix Drive, South Bend, Ind., fuel pump, piston and four items of parts for overhaul of pumps, \$119,109; pump parts for J42 engines, \$284,631.

Champion Spark Plug Co., 900 Upton Ave., Toledo 1, Ohio, spark plug used on R2800-83MA aircraft, 30,840 ea., \$41,326; spark plugs, 20,000 ea., \$26,800.

Chandler-Evans Div., Niles-Bement-Pond Co., Charter Oak Blvd., West Hartford, Conn., maintenance parts for use on various aircraft, \$30,107; maintenance parts for various carburetors for P2V-6 aircraft, \$39,836.

Cleveland Pneumatic Tool Co., 3781 E. 77th St., Cleveland 5, O., maintenance parts for HSL-1 aircraft, \$78,463.

Eagle-Picher Sales Co., American Building, Cincinnati 1, O., pigment, zinc oxide, 360,000 lb., \$48,096.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., controller, autopilot, \$32,361; starter for use on various aircraft engines, 510 ea., \$221,146; servo, autopilot, \$77,361.

Thomas A. Edison, Inc., Instrument Div., 51 Lakeside Ave., West Orange, N. J., control for use on various aircraft, 728 ea., \$52,316.

Garod Radio Corp., 70 Washington St., Brooklyn 1, N. Y., radar test set, 50 ea., \$60,962.

Garwin, Inc., 918 Dooley St., Wichita, Kan., services and material to overhaul turn and bank indicators, \$30,000.

General Electric Co., 1405 Locust St., Philadelphia 2, Pa., indicators, filters, \$195,189.

General Laboratory Associates, Inc., 17 E. Railroad St., Norwich, N. Y., ignition components for J48-P5 engines, \$134,486.

Glidden Co., 3rd and Bern St., Reading, Pa., enamel, aircraft, gloss, \$90,291; enamel, 20,000 gal., \$52,800; enamel, aircraft, gloss, \$20,214.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, O., lining, brake, 23,292 ea., \$56,460.

Haloid Co., 2-20 Haloid St., Rochester 3, N. Y., paper, photographic, \$57,623.

Hiller Helicopters, 1350 Willow Rd., Palo Alto, Calif., clutch assy., boom assy.,

and transmission, \$5,439,528.

Hub Paint & Varnish Co., Inc., 47-38 Fifth St., Long Island City 1, N. Y., paint, exterior, camouflage, 15,000 gal., \$28,420.

Instruments Corp., 4 North Central Ave., Baltimore 2, Md., wind measuring set, 230 ea., \$52,159.

Jack & Heintz, Inc., 17600 Broadway, Cleveland 1, O., generator, tachometer, 1,079 ea., \$33,398; tachometer generator, 1,497 ea., \$54,401.

Mine Safety Appliances Co., 201 N. Brad-dock Ave., Pittsburgh, Pa., mask, oxygen, 3,835 ea., \$69,662.

## Fast Writeoffs

Accelerated tax amortization for manufacturers expanding their defense facilities is granted by the government in the form of certificates of necessity.

In the following list of recent certificates, company name is given, followed by product or service, cost of construction deemed necessary for defense expansion, and the percentage of the expansion cost allowed for fast write-off. Fast writeoff permits property to be depreciated in five years.

- Circle Weld Co., Inc., Sun Valley, Calif., aircraft parts, \$43,690, 40%.
- Lord Manufacturing Co., Erie, Pa., aircraft parts, \$98,013, 70%.
- Valno A. Hoover, Hoover Electric Co., Los Angeles, aircraft parts, \$137,009, 55%.
- Robertshaw-Fulton Controls Co., Anaheim, Calif., aircraft parts, \$379,861, 40%.
- Wm. R. Whittaker Co., Ltd., Los Angeles, aircraft components, \$1,000,000, 50%.
- Lockheed Aircraft Corp., Burbank, Calif., military aircraft, \$82,891, 65%; \$62,962, 60%; \$69,761, 65%.
- Douglas Aircraft Co., Inc., Santa Monica, Calif., military aircraft, \$177,133, 65%.
- United Aircraft Corp., Windsor Locks, Conn., aircraft parts, \$586,173, 65%.
- Ex-Cello-O Corp., Highland Park, Mich., aircraft engine parts, \$59,299, 65%; \$353,070, 65%.
- Goodyear Tire & Rubber Co., Suffield, Ohio, testing facilities for aircraft parts, \$226,721, 70%.
- United States Rubber Co., Mishawaka, Ind., aircraft parts, \$22,314, 60%.
- Stewart-Warner Corp., South Wind Div., Indianapolis, aircraft components, \$125,420, 65%.
- Goodyear Aircraft Corp., Litchfield Park, Ariz., aircraft parts, \$23,573, 65%.
- Goodyear Aircraft Corp., Akron, Ohio, aircraft parts, \$422,406, 65%.
- Fairchild Engine and Airplane Corp., Stratos Div., Bay Shore, L. I., N. Y., aircraft parts, \$51,861, 65%.
- American Non-Gran Bronze Co., Berwyn, Pa., aircraft parts, \$35,584, 70%.
- Aluminum Company of America, Vernon, Calif., aluminum forgings for aircraft, \$54,000, 65%.
- Aircraft Products Co., Bridgeport, Pa., aircraft parts, \$22,147, 70%.

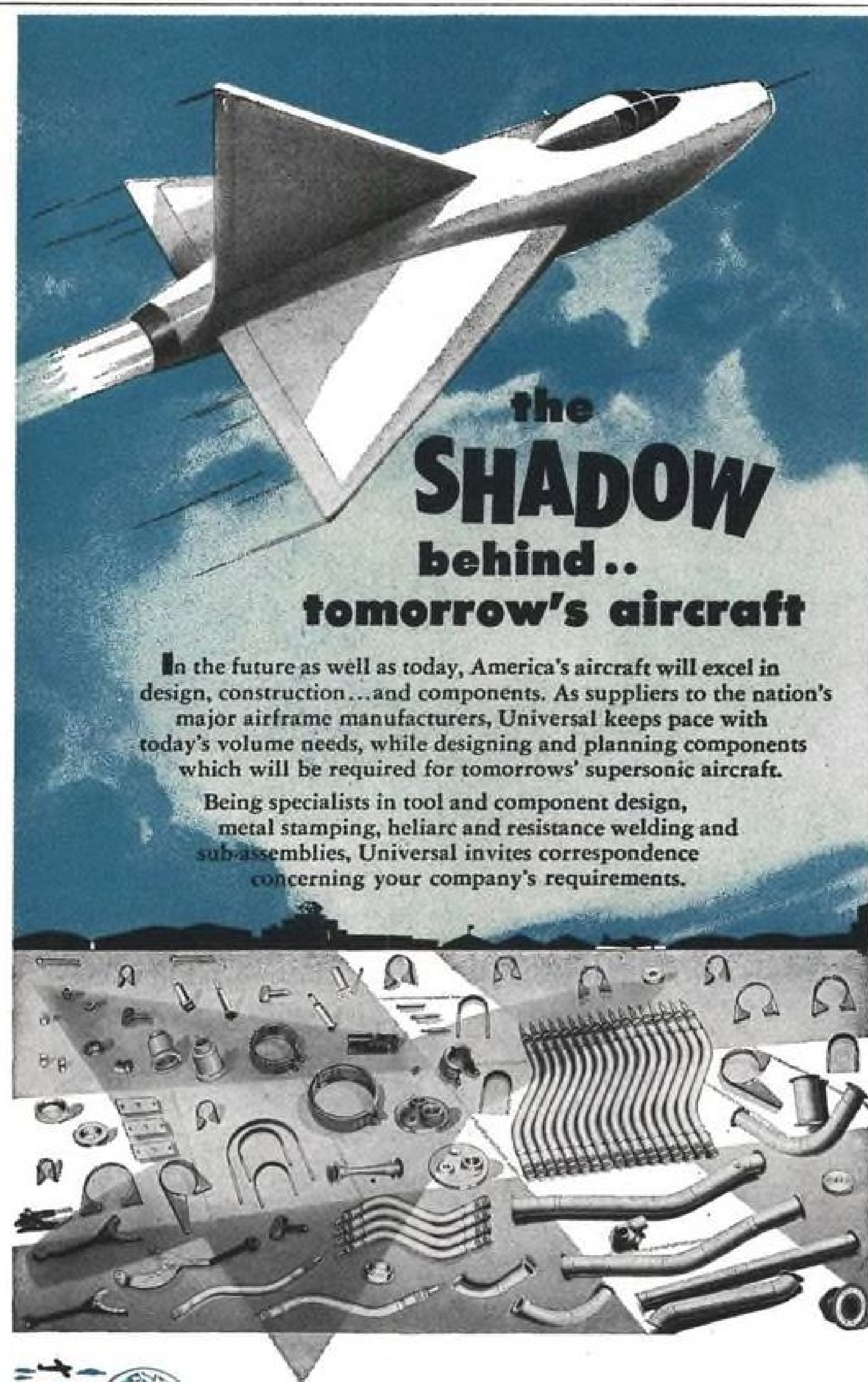
## USAF Contracts

Following is a list of recent USAF contracts announced by Air Materiel Command.

Gordon Enterprises, 5362 Cahuenga Blvd., North Hollywood, Calif., special parts for aerial photographic cameras, \$28,746.

Kearfott Co., Inc., 1150 McBride Ave., Little Falls, N. J., master indicator, 1,687 ea., directional gyros, 1,932 ea., slaving controls, 1,913 ea., \$8,863,576; master indicator, 344 ea., directional gyros, 344 ea., slaving controls, 344 ea., \$1,729,361.

Lewis Engr. Co., 339 Church St., Naugatuck, Conn., temperature indicator, 574 ea., resistance bulb, 790 ea., resistance bulb spares, 790 ea., \$27,280.



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## WHAT'S NEW

### New Publications

Panorama of Flight—Aviation History in Paintings is an attractive slick-paper brochure containing black-and-white reproductions of 191 airplane portraits by Charles H. Hubbell that have appeared in Thompson Products' calendars since 1939. Thompson Products, Inc., Advertising Dept., 2209 Ashland Rd., Cleveland 3, Ohio.

Kentucky's Dept. of Aeronautics has put out a 1954 Aeronautical Chart showing the state's facilities. Map is available free from Dept. of Aeronautics, 922 State Office Bldg., Frankfort, Ky.

Design Considerations of a Saturating Servomechanism is 16-page publication describing applications of the general principles underlying multiple-mode control of servomechanisms. P. E. Kendall and J. F. Marquardt are the authors. The booklet is free. Ask Cook Research Laboratories, 8100 Monticello Ave., Skokie, Ill., for Bulletin R-13.

New 24-page brochure describes activities of the Institute of Environmental Equipment Manufacturers. Send requests to Dr. George D. Wilkinson, General Manager, Institute of Environmental Equipment Manufacturers, 30 Church St., New York 7, N. Y.

Dynamic Measurement is 30-min. 16-mm. sound motion picture in color that tells the story of "electronic yardsticks" in science, industry and medicine. It is available for showing to engineering, industrial and scientific groups. Contact Public Relations Dept., Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 15, Calif.

### Telling the Market

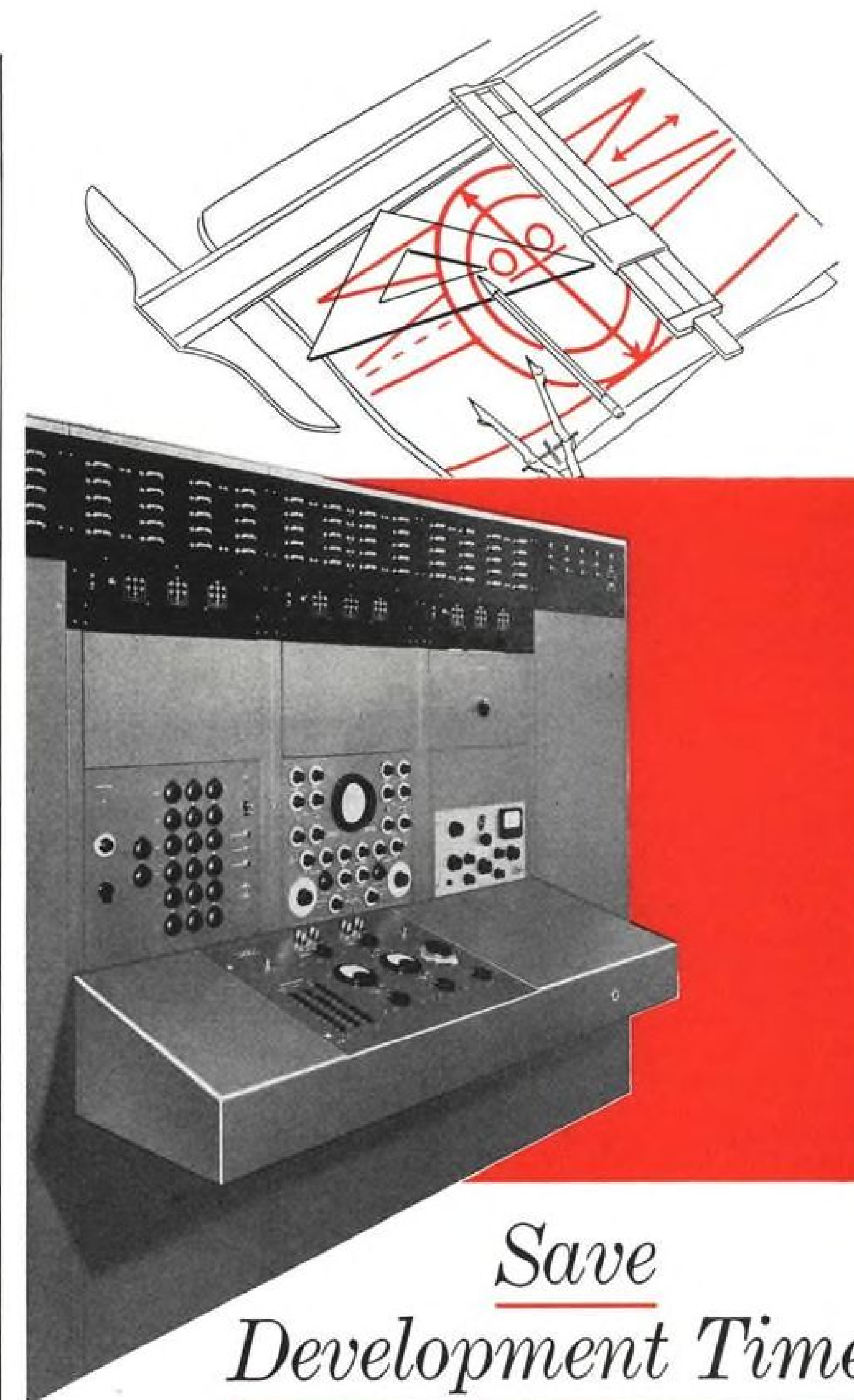
Catalog and engineering manual (58 pp.) on Paneloc fasteners for overlapping metal sheets is available from Scovill Mfg. Co.'s Aircraft Fastener Div., 99 Mill St., Waterbury 20, Conn. . . . Niagara Machine & Tool Works has put out a 20-page bulletin, No. 57A, on its Series AA Open Back Inclined Presses. Address: 683 Northland Ave., Buffalo 11, N. Y. . . . New automatic turret lathe, Model 4-U, is described in Potter & Johnson's four-page Bulletin 153. Company's address is Pawtucket, R. I. . . . Foam Fire Protection describes in question-and-answer form basic information about mechanical and chemical foam installations

made by National Foam System, Inc., West Chester, Pa. . . . Formulations and properties of Bakelite polyester resins and their use in manufacture of reinforced plastic structures are described in 18-page booklet issued by Bakelite Co., 260 Madison Ave., New York 16, N. Y. . . . Manning, Maxwell & Moore's new 124-page Ashcroft Gage Catalog is said by the company to be the most comprehensive catalog ever issued on pressure gages, accessories and engineering information; available from the company's distributors or its plant in Stratford, Conn.

Design engineers' bulletin on stretch-forming methods is first of a series to be put out by Metal Form Div., Cyril Bath Co., 32278 Aurora Rd., Solon, Ohio. . . . Technical booklet on engineering properties of S Monel casting alloy is available from Technical Service Section, International Nickel Co.'s Development and Research Div., 67 Wall St., New York 5, N. Y. . . . Rogers Machine Works, Bulletin 653 is about the company's Perfect 36 vertical turret mills. Address: 1400 Seneca St., Buffalo 10, N. Y. . . . Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh, Pa., is offering the trade its 24-page catalog, Let's Look at the Herman Line of Molding Machines. . . . Complete line of equipment for mechanization of ferrous and non-ferrous foundries is detailed in 40-page book put out by Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill.

### Publications Received

- History of American Industrial Science—by Courtney R. Hall—pub. by Library Publishers, 8 W. 40th St., New York 18, N. Y.; \$4.95; 453 pp. Study of American industry, including aviation, in terms of our national defense and the possibilities of future social and political developments.
- Tables of Circular and Hyperbolic Sines and Cosines for Radian Arguments—National Bureau of Standards Applied Mathematics Series 36 (reissue of Mathematical Table 3)—Order from Government Printing Office, Washington 25.—407 pp., \$3.
- The Firestone Story—by Alfred Lief—published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. \$4.50; 437 pages. Memoirs of a modern industrial enterprise as it evolved through 50 years of American history.
- Aircraft Year Book for 1953—published by Lincoln Press, Inc., Washington, \$6.
- Rocket Propulsion—by Eric Burgess—published by Chapman & Hall, Ltd., 37 Essex St. W.C. 2, London, Eng.—distributed by Macmillan Co., 60 5th Ave., New York 11, N. Y. \$4.50; 235 pages. Second edition. Principles of rocket propulsion.
- Jet Aircraft Simplified—by Charles Edward Chapel—published by Aero Publishers, Inc., Los Angeles, Calif. \$3.75 (hard cover) and \$2.75 (paper covered), 176 pages. Basic principles, practical applications and development of jet propulsion for aircraft.



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## AVIONICS

# Navarho: 50 Stations Can Cover Globe

• Long-range nav system gives bearing and distance instantly; may become international standard

By Philip Klass

Attention is focused on the new Navarho long-distance navigation system, which provides VOR-type bearing and DME-type distance information instantly and automatically at distances up to 2,600 nautical miles. Despite its operation in the low-frequency (90-110 kc.) region, Navarho is relatively unaffected by static and thunderstorm interference.

Interest here and abroad stems from a recent official U.S. policy statement by the Air Coordinating Committee recommending further development and evaluation of Navarho as a possible future international standard (AVIATION WEEK Apr. 5, p. 29).

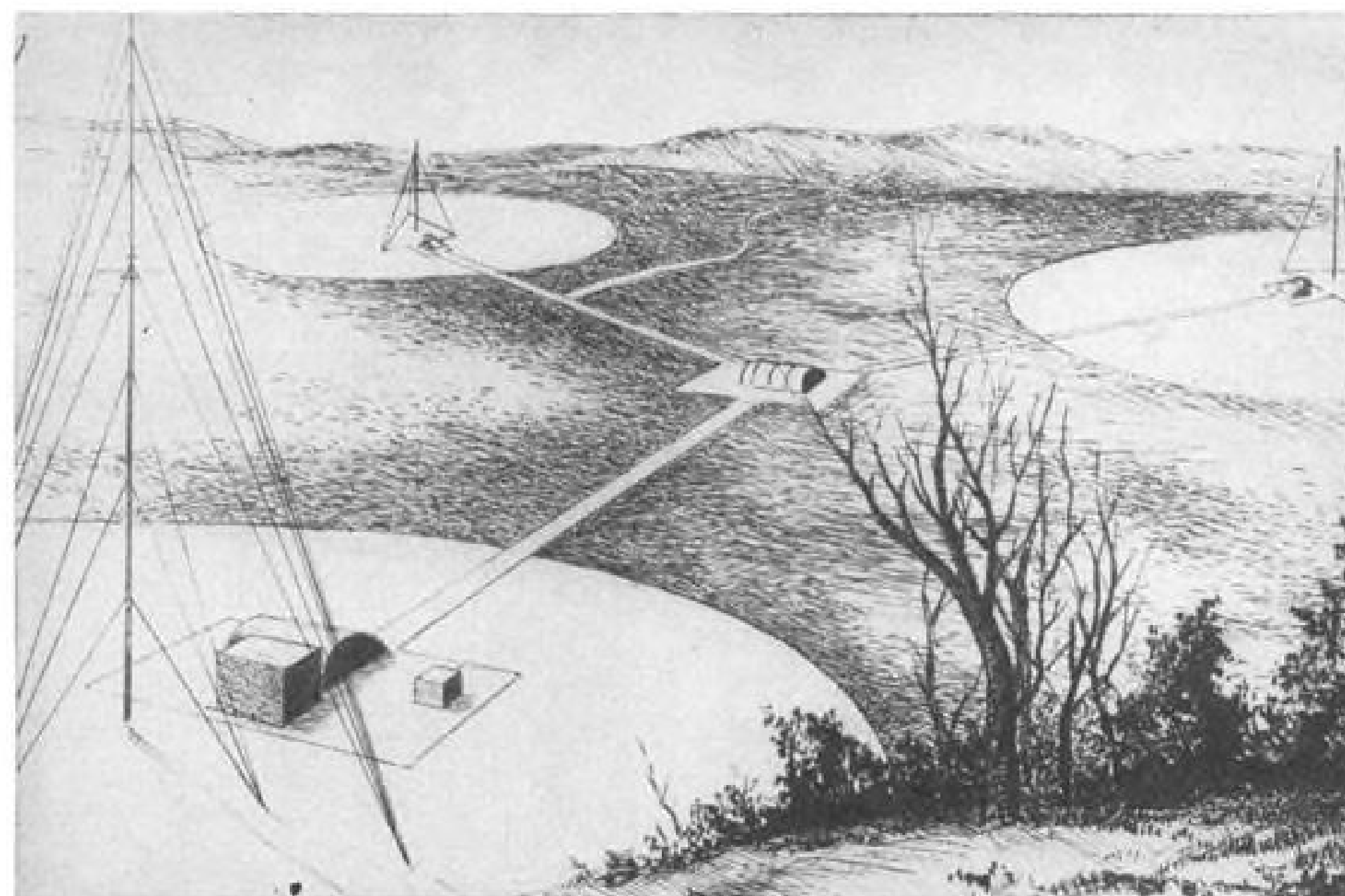
A Navarho station, located at a single site, can serve an area of 12-20 million square miles, and 50 such stations could more than blanket the earth. (By contrast, 450 short-range VORs are needed to cover the U.S.)

► **Navaglobe Plus Rho**—Heart of the USAF-sponsored Navarho development is a system called Navaglobe, which provides bearing information only (AVIATION WEEK Aug. 17, 1953, p. 296). It was conceived and developed, beginning in 1946, by Federal Telecommunications Labs, a division of International Telephone & Telegraph Corp. Later the idea of combining a novel type of distance-measuring equipment (Rho) with Navaglobe was conceived and tried experimentally.

First official wedding of Navaglobe and the Rho portions into a working Navarho system will probably take place late next year or early in 1956 at a site near the Rome Air Development Center (Rome, N. Y.). RADC has an experimental Navaglobe installation at Adamston, N. J., and one at Forestport, N. Y.

► **Navarho Performance**—Based on the strength of flight and lab tests to date, ACC's Air Traffic Control and Navigation Panel says it expects to achieve the following from the new system:

- Operating range: 2,000 nautical miles over land, probably 2,600 n. mi. over water.
- Bearing error:  $\frac{1}{2}$  to 1 degree, at 2,000 n. mi.



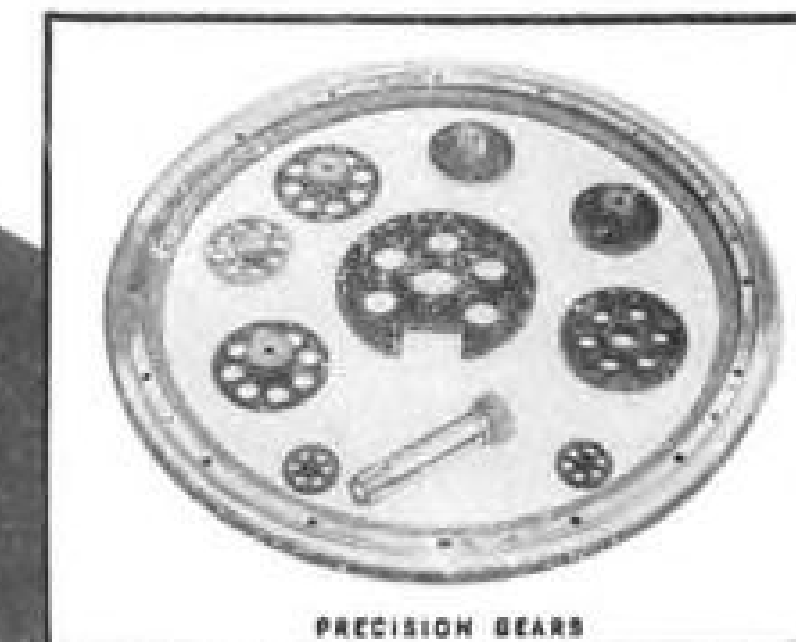
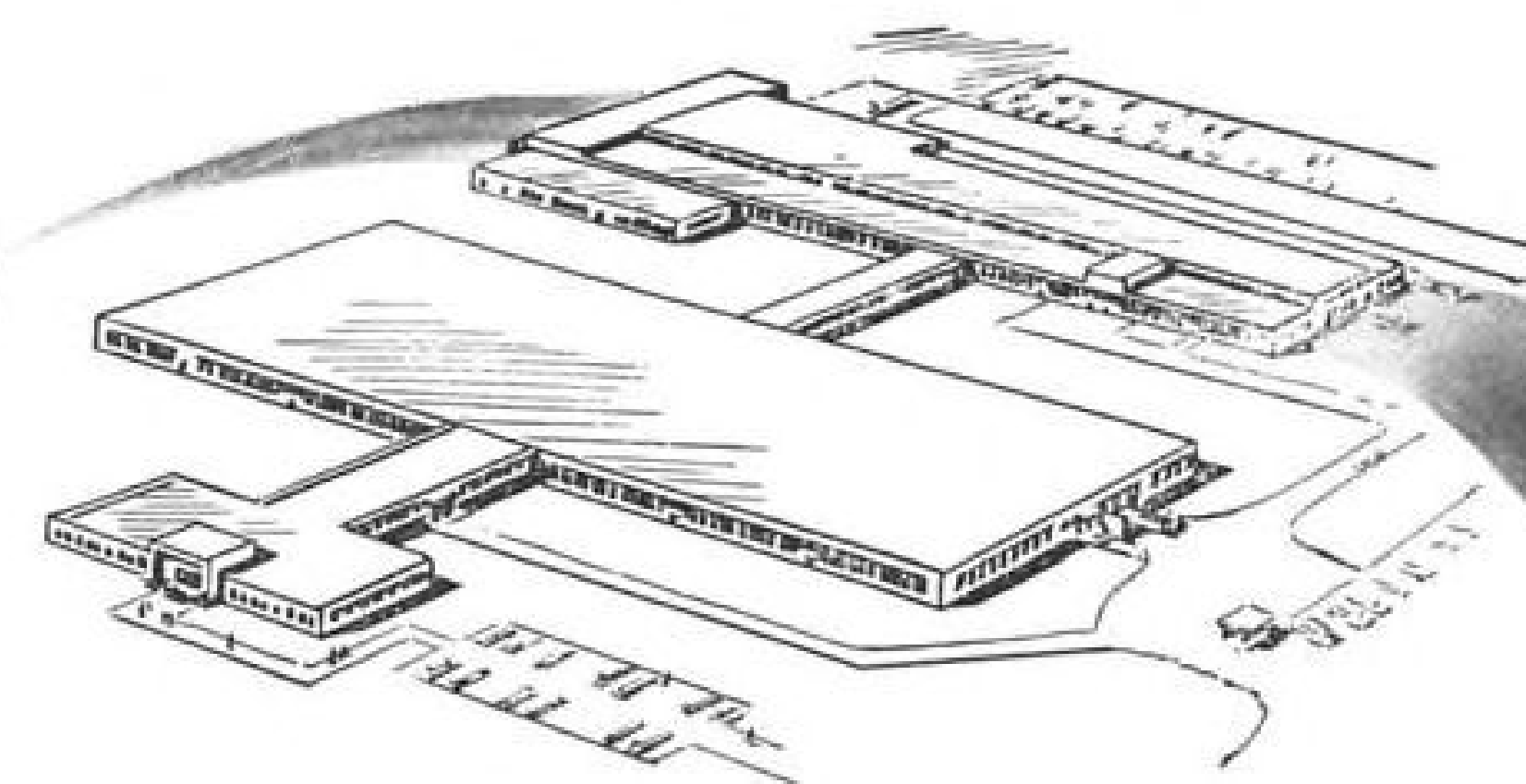
NAVARHO STATION SITE consists of three antennas located at apexes of a triangle, approximately 4,000 ft. apart. System provides both VOR-type bearing and DME-type distance information at ranges up to 2,600 nautical miles.



ORIGINAL NAVAGLOBE system, heart of the new Navarho, was tested at Adamston, N. J.

- Distance error: 1% of distance to station.
- Airborne equipment weight: 50 lb. for a set providing VOR-DME type indications; 70 lb. with computer which provides pilot with continuous indication of his present latitude and longitude.
- Airborne equipment size:  $\frac{3}{4}$  cu. ft.; 1 cu. ft. with computer.

- Airborne equipment price: \$3,500 for basic set; \$4,500 with computer.
- The estimated weight, size, and price are lower than corresponding figures for an airborne VOR and DME.
- **No Threat to VOR-DME**—At first glance, a comparison of Navarho and VOR-DME performance (bearing:  $\frac{1}{2}$ -1 deg. vs.  $3\frac{1}{2}$  deg.; distance: 1% vs.  $2\frac{1}{2}$ %) might imply that the new system is a



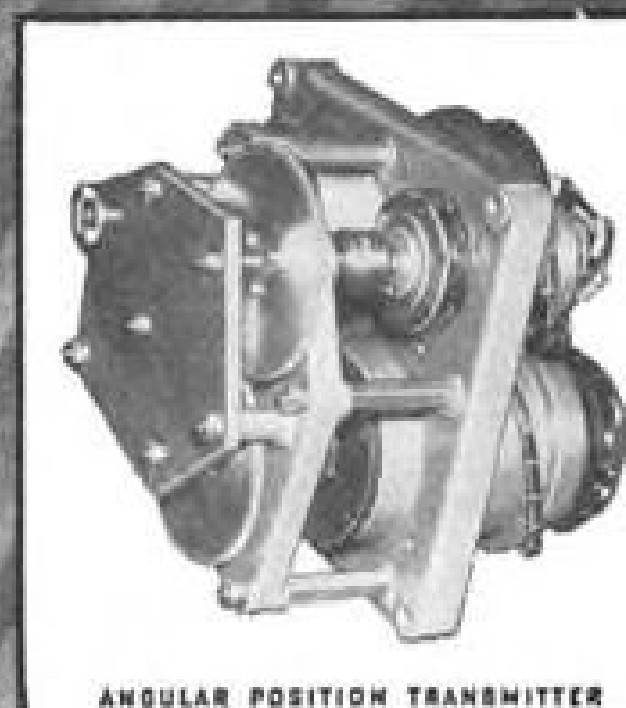
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SIMULATED Navaglobe pulses, four per cycle, are repeated once a second.

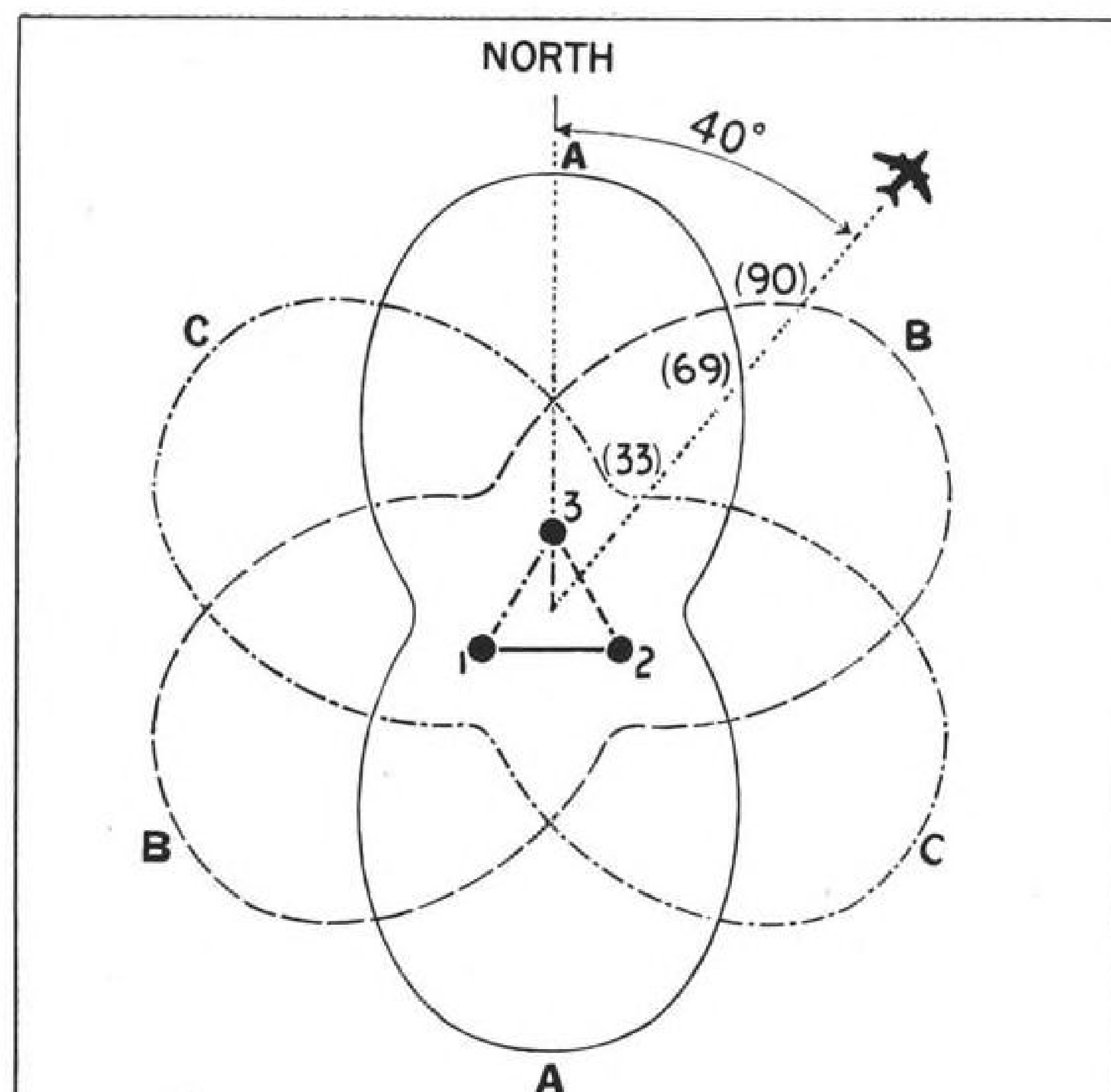
threat to existing short-range nav-aids. However, when the angular bearing and percentage distance errors are translated into an actual position fix for an airplane operating 1,000 miles from a Navarho station, the apparent performance threat disappears. Position errors at this distance could run 18-23 n. mi.

It should be recognized that accuracy comparisons are necessarily based on Navarho performance with experimental equipment versus VOR-DME performance in actual service use. Experience indicates that performance is frequently degraded in the transition from lab model to field use, because of practical manufacturing and installation compromises. The same note of caution applies to estimates of Navarho size, weight, and price.

► **Lesson Learned**—The military, profiting from the bitter Tacan-DME controversy which resulted from unilateral civil and military developments, have moved to get civil aviation participation in Navarho's development and evaluation. Delegates to the International Civil Aviation Organization's Fifth Communications Div. meeting recently journeyed from Montreal to Nutley, N. J., for a technical briefing on Navarho by FTL. U.S. and foreign air carriers are expected to participate in the evaluation when it gets under way.

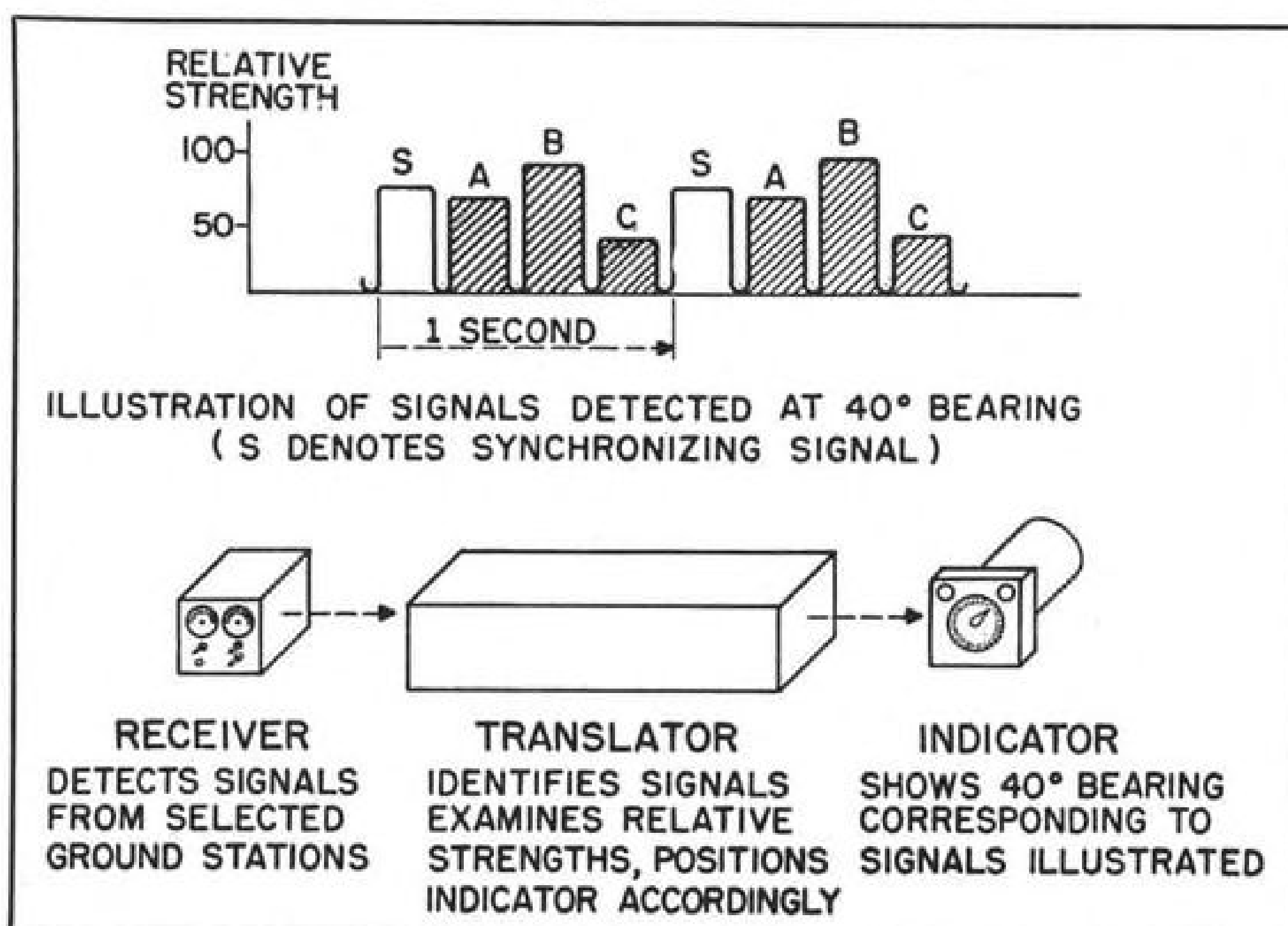
The first Navarho installation near RADC will be USAF-financed, because budgetary provisions had already been made. However the second evaluation installation on the West Coast will probably be sponsored by the Air Navigation Development Board with the Civil Aeronautics Administration. The two sites are expected to blanket the North American continent and much of the North Atlantic and Pacific. The West Coast installation will permit tests of the effect of nearby mountains on Navarho's propagation characteristics.

► **How It Works**—Despite the similarity in services provided by VOR-DME and Navarho, there is a sharp difference in their principles of operation. A



NUMBERS IN ( ) INDICATE RELATIVE STRENGTHS OF A, B AND C SIGNAL AT 40° BEARING

AIRCRAFT BEARING is determined from relative magnitudes of signals received in three pulses, each generated by alternate pairs of the three antennas.



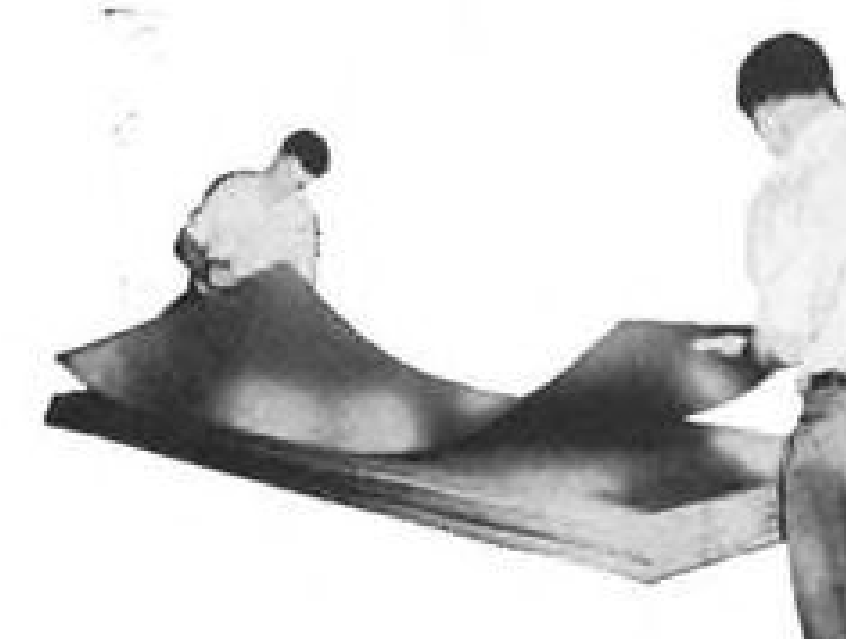
COMPARISON of amplitude of A, B and C in airborne translator positions the bearing indicator. Pulse S gives synchronization and distance information.

Navarho station transmits four CW (continuous wave) pulses, each of 167-millisecond duration, every second. By comparing the relative magnitudes of

three of these pulses, the airborne equipment establishes aircraft azimuth position relative to the ground station. The fourth pulse serves as a source of



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FLIGHT TESTING of Navaglobe system, during 1952, was conducted in this C-54 by Rome Air Development Center and Federal Telecommunications Labs engineers.

distance information and for synchronization purposes.

These signals are transmitted from three antenna towers located at the corners of an equilateral triangle, spaced roughly 4,000 feet apart (0.36 to 0.4 wavelength). Each of the antennas is fed from its own 15-20 kw. transmitter. The first of the four pulses is transmitted simultaneously from antennas 1 and 2. After a brief interval, antennas 2 and 3 are excited, and then a pulse is transmitted from antennas 3 and 1. The last (fourth) pulse, transmitted simultaneously from all three antennas, is for synchronization and distance measurement (see sketch, p. 54).

As each pair of antennas is excited, it produces a figure-eight radiation pattern which is rotated 60 degrees in space when the next pair is excited. By comparing the relative amplitudes of the three signal pulses (A, B, and C), the airborne receiver and its associated bearing-translator establish aircraft bearing to the station.

An inherent ambiguity in the bearing-measuring portion of the system means that an airplane will receive the same relative pulse amplitudes at geographical positions 180 degrees apart. However, a flight crew can be expected to know whether the plane is east or west (or north or south) of the Navarho station in order to resolve this ambiguity. An automatic direction finder could also be used.

► **Getting Distance Information**—The relative phase between a radio wave measured at the transmitting antenna and measured at some distance from the antenna is a function of the distance between the point and the antenna. This is the basis for the operation of the Rho portion of the system. To measure this phase difference accurately requires a phase-stable ground transmitter and an airborne frequency standard of comparable accuracy (one part

in a billion, for 24-hour period).

If the RF operating frequency is closely maintained, and if the initial phase relationship between the airborne and ground station can be established, then any change in phase is proportional to distance traveled by the plane.

In actual operation, the pilot would initially establish the correct relationship between the ground and airborne frequencies before taking off by setting in the known distance from the Navarho station to the point of departure.

► **Ambiguity**—A problem arises in this type of distance measurement because the relatively short wavelength of the 90-110 kc. Navarho carrier creates an ambiguity every 1.6 nautical miles.

To resolve this ambiguity, a 200-cycle signal is, in effect, transmitted during the synchronizing pulse. Actually, a second carrier, displaced by 200 cps., is transmitted simultaneously with the basic carrier. The 200-cycle (beat frequency) wave provides a rough distance-measuring signal and the 90-110 kc. wave provides the vernier measurement.

The 200-cycle wave has an ambiguity every 820 n. mi. However this is not serious since the pilot should know whether he is 800, 1,600, or 2,400 miles from the Navarho station.

► **Principle Proven**—While admitting that the Rho portion of the system needs further development, FTL says that its own and RADC tests have "indicated the practicability of distance measurement through the use of a very high precision 'crystal clock'."

Bell Telephone Labs have been working to develop an airborne frequency reference with the required degree of accuracy. American Machine & Foundry has constructed a "breadboard" model of the Rho-translator which has been used in USAF tests.

► **Navarho Propagation**—The use of pulsed transmissions at a relatively slow

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HO Style,  
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acid swab.



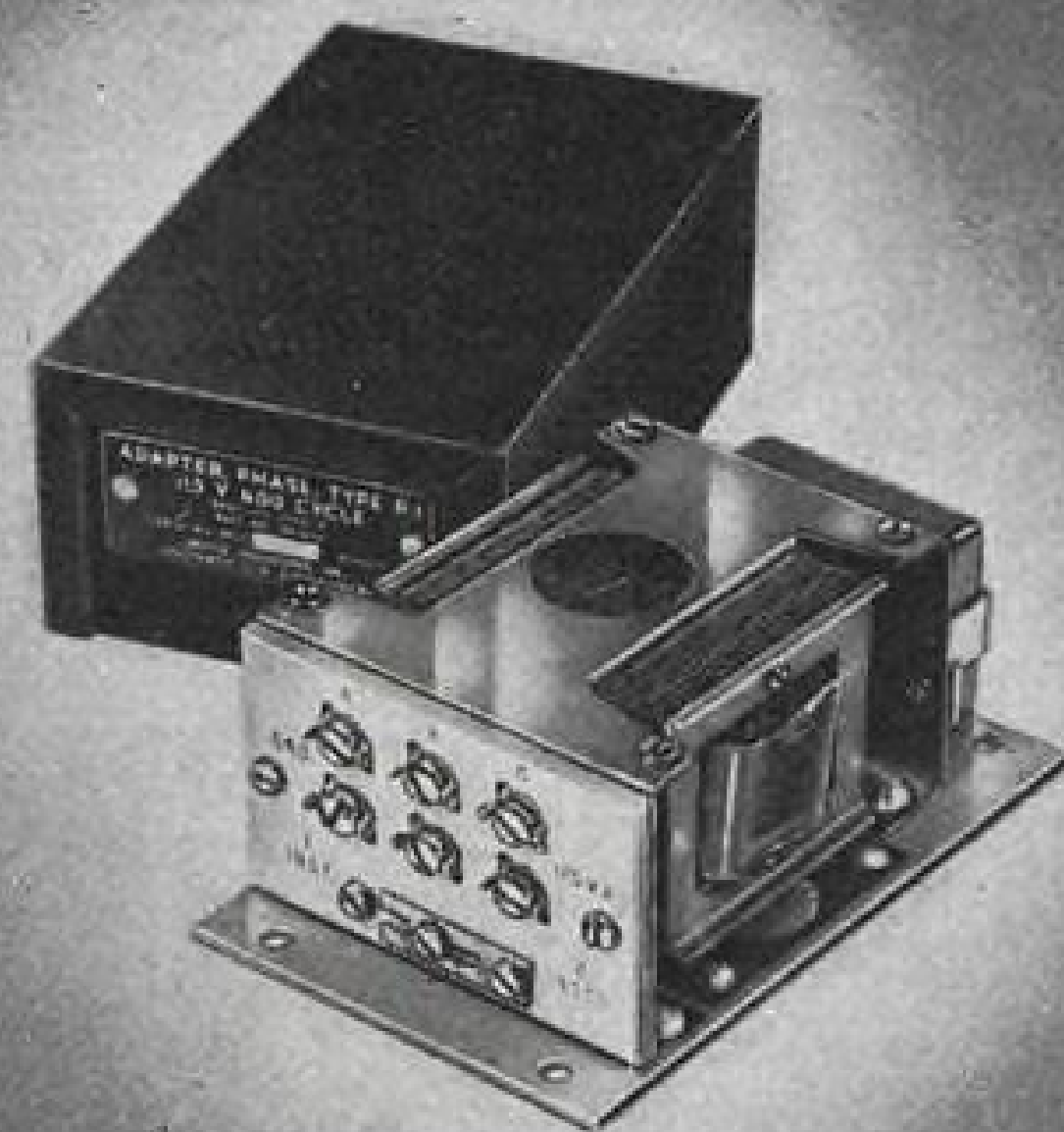
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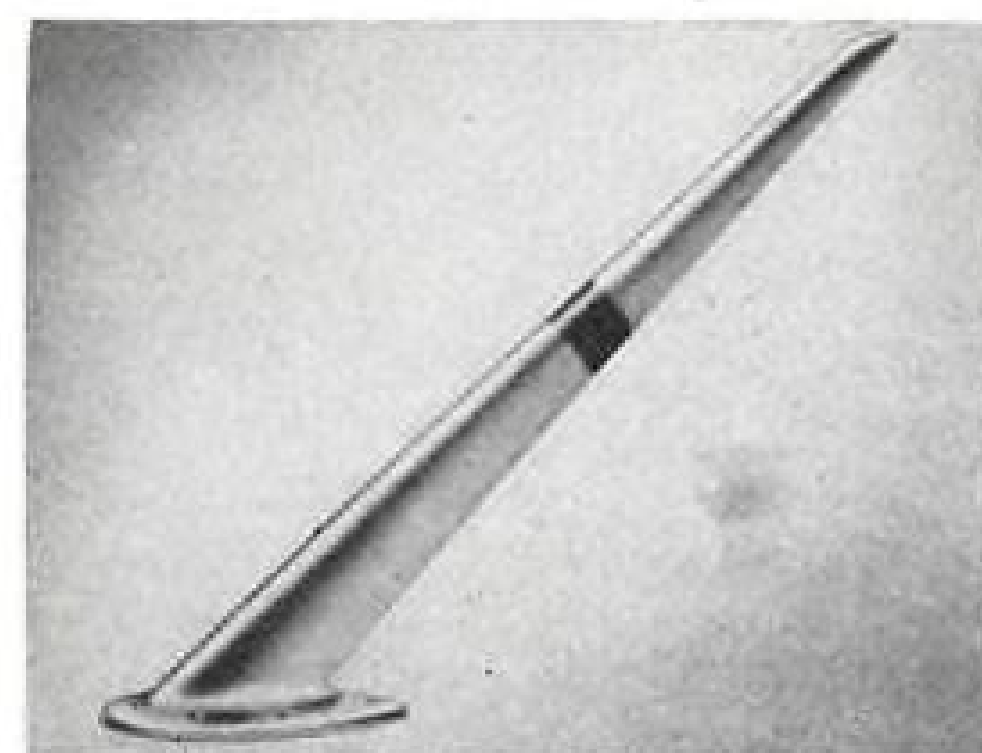
cycling rate (one per second), enables Navarho to operate over a narrow bandwidth (200 cycles.) The intermediate-frequency amplifier in the airborne receiver can be designed to have a pass-band of only 20 cycles. This is one reason why Navarho is able to operate through precipitation static and noise which proved so disruptive on the old low-frequency four-course radio ranges. The ACC report says a Navarho receiver will operate satisfactorily on a signal-to-noise ratio of 1:2 or less. Gating circuits are used to block out noise during the intervals between reception of individual pulses.

During the recent national Institute of Radio Engineers convention in New York, an FTL engineer reported satisfactory operation at long distances, despite the heaviest summer thunderstorms encountered during flight tests. C. T. Clark said that maximum bearing deviation experienced during storms was 5 deg. but this was only momentary.

Navarho will reportedly operate in either ground or skywave areas, although bearing errors as high as five degrees may be experienced briefly in areas where the two tend to cancel one another, Clark told the IRE. On one daylight flight, a skywave-groundwave interference area was encountered at a distance of 900 miles from the station and lasted for approximately 50 miles, Clark said. The ACC report says the region will exist normally at distances of 600 miles during the day, 200 miles at night.

System accuracy is not affected by whether transmission is over water or land, although greater ranges are achieved over water, ACC says.

► **Station Costs**—ACC "guesstimates" that the installed cost of a Navarho



### Streamlined Antenna

Streamlined broadband VHF communications antenna for use in frequency range of 118 to 138 mc. is now in production at LearCal division of Lear Inc. Antenna is shaped to reduce drag and icing, weighs 1.7 lb. Its VSWR varies between approximately 1.1 and 1.9 over frequency range. Technical information on this new Model 2217A can be obtained from LearCal Div., 11916 W. Pico Blvd., Los Angeles 64, Calif.

ground station will run around \$1 million. Based on a coverage of 20 million square miles, station costs would be only five cents/square mile. Operating and maintenance costs per station are estimated at \$50,000/year, or 4 cent/square mile/year.

► **Timetable**—Based on the present state of the development, and the long gestation period normally required to evaluate, standardize, and put a new nav-aid into use, ACC estimates that it will be nearly 10 years before fleetwide installations of Navarho will be in service use. In the interim, ACC supports the use of Loran and Consol.

## Makers Announce New Lab Equipment

A variety of test equipment suitable for use in electronic laboratories has recently been announced. The devices include signal and sweep generators and a spectrum analyzer.

• **Signal generator**, Model 10, covers range of 1.8 cps. to 2.2 mc., in six overlapping decades, with built-in regulated power supply. This limits frequency error to 0.1% for a 10% variation in supply voltage, according to manufacturer. Drift is reportedly less than 2%, including warm-up. Output exceeds 20 v. rms. over entire range, output impedance is 2,500 ohms. Donner Scientific Co., 2829 Seventh St., Berkeley 10, Calif.

• **Sweep generator**, Model 610, has continuously adjustable sweep speeds of 0.05 to 500 cm./microsecond. Unit can be triggered for single or repetitive sweeps, can provide brightened pulse and gate outputs. Spencer-Kennedy Laboratories, Inc., 186 Massachusetts Ave., Cambridge 39, Mass.

• **Spectrum analyzer**, Model TSA, covers range of 10 mc. to 22 kmc. by means of three interchangeable RF heads. Device has a built-in 5-in. cathode ray tube display, direct-reading RF tuning control, and a sensitivity better than -80 dbm. over entire range, according to manufacturer, Polarad Electronics Corp., 100 Metropolitan Ave., Brooklyn 11, N. Y.

• **Variable time delay network**, Type 2011, can provide time delay of 0 to 11 microseconds, continuously variable in 0.5  $\mu$ s increments, with resolution time less than  $5 \times 10^{-10}$  seconds. Rise time is less than 10% of delay time, maximum error is 1% of time delay or 0.1% when correction curve is used, according to manufacturer, Advance Electronics Co., Inc., P.O. Box 394, Passaic, N. J.

• **Audio oscillator**, Model DK-1, offers fixed-frequency, low distortion, with a zero-impedance output of 10 volts at 2 watts and a variable voltage output at



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No. 2-2.



**Bendix Computer**

DIVISION OF BENDIX AVIATION CORPORATION  
5630 Arbor Vitae St., Los Angeles 45, Calif.





## "ANGELS 40!"

Production and delivery of the new higher powered, rocket-firing Mark 4, CF-100 to the Royal Canadian Air Force is underway to equip squadrons at additional bases around Canada's vast territorial border.

With its radar tracking and fire control system, the Mark 4 can roam farther and exceeds the range of any other interceptor in the world. A CF-100 recently flew a 2100 mile R.C.A.F. non-stop mission in 3 hours and 50 minutes.

The role of this long-range, all-weather interceptor, powered by two OREND A jets, also designed and built by AVRO Canada, is the defense of North America against attack through the Arctic. However, because of its inherent versatility, the CF-100 could be readily adapted to a variety of tactical operations.

AIRCRAFT DIVISION  
**A.V. ROE CANADA LIMITED**  
 MALTON, ONTARIO  
 MEMBER OF THE HAWKER SIDDELEY GROUP

"Angels 40!" in flight crew chatter means "get to 40,000 feet in a hurry". R.C.A.F. pilots report their CF-100's do that—in any weather, day or night.

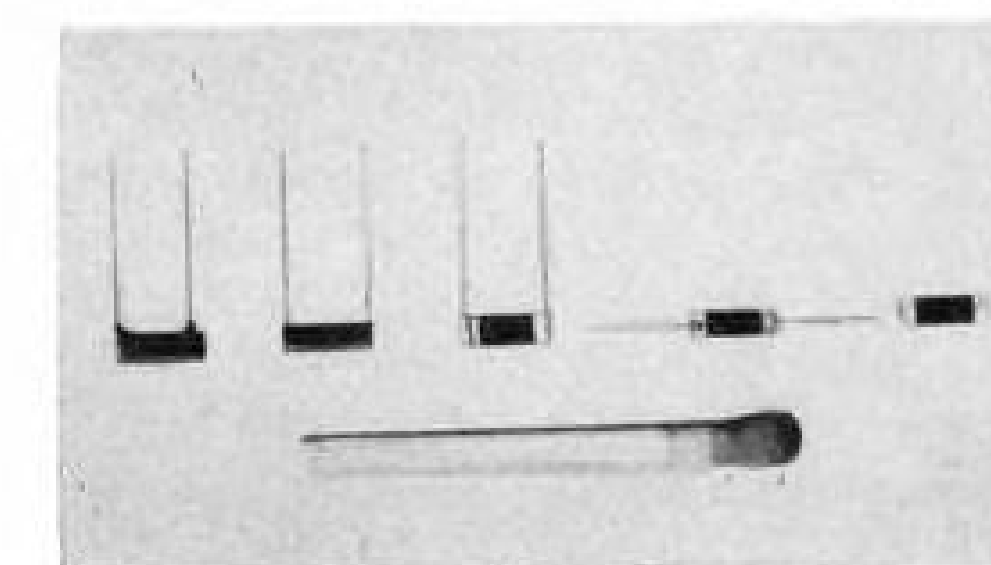
low impedance. Frequency selected may be anywhere in the range of 300 cps. to 10 kc. Manufacturer quotes harmonic content of less than 0.08% and an amplitude and frequency shift, from no-load to full-load, of under 0.2%. Nuclid Corp., 45 W. Union St., Pasadena 1, Calif.

### Small Components for Transistor Circuits

Tiny capacitors and resistors, particularly suited to transistor circuits, are among the recently announced components of interest to avionic designers. The list includes:

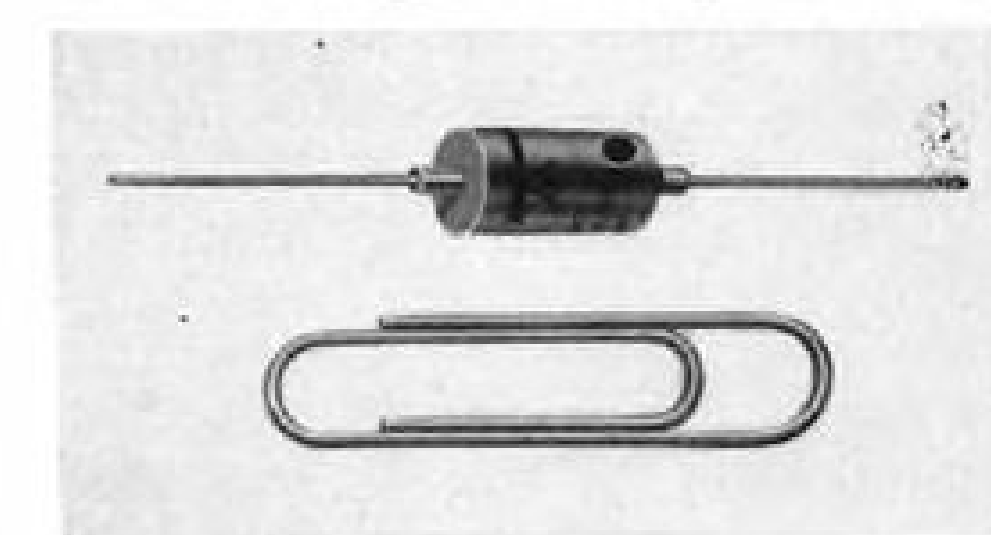
- **Micro-miniature capacitors.** General Electric says it has quadrupled the capacitance of its recently announced micro-miniature line of low-voltage capacitors (AVIATION WEEK Oct. 26, 1953, p 80) without increasing their size. For example, unit measuring  $\frac{1}{8}$  in. dia.,  $\frac{5}{16}$  in. long, is rated at 8  $\mu$ f. at 20 volts, instead of previous 2  $\mu$ f. Device is designed for use in transistor circuits. General Electric, (Capacitor Dept., Hudson Falls, N. Y.

- **Sub-miniature resistors.** New line of tiny resistors, only slightly larger than the head of a match, for use in transistor circuits, is available in resistances of 50 ohms to one megohm, 0.1 or 0.25 watt. Resistors are formed by de-



positing resistive material on ceramic base. Entire unit is resin coated. Units have a negative temperature coefficient whose maximum value is 0.2% per degree C, according to manufacturer, Glenco Corp., Metuchen, N. J.

- **High-temp. diode.** New line of high-temperature germanium diodes, called "Red Dot," can be operated at temperatures up to 100C. Type G44 has a minimum back resistance of 100,000 ohms in temperature range of -30C



to 100C. Bulletin ER-191 gives details. International Rectifier Corp., 1521 E. Grand Ave., El Segundo, Calif.

- **Precision non-inductive resistor.** Pre-

cision resistors, wound to accuracies of 1%, 0.5% or 0.1%, or non-inductive ceramic bobbins, are available in standard resistances of 0.1 ohm to 1 megohm,  $\frac{1}{4}$  to 1 watt. Resistors are impregnated for moisture resistance, and have temperature coefficient of 0.0000-25 ohms/deg.C, according to manufacturer, K-F Development Co., 2616 Spring St., Redwood City, Calif.

- **High-power resistors.** Two new resistors have been added to the Shallcross Mfg. Co. line of high-power, high-temperature, lightweight units. One is MIL Type R-29, rated 12 watts, available in resistances up to 10,000 ohms. The other is Type R-35, rated 60 watts,

available in resistances up to 35,000 ohms. Bulletin L-29 gives more information. Company's address is Collingdale, Pa.

### Company Activities Of Avionic Interest

Formation of a company specializing in solving vibration and shock-mounting problems is one of several recent corporate moves of interest to the avionics industry. The new company, Testco, is headed by E. S. Titus, formerly chief engineer of Robinson Aviation Inc., where he was instrumental in the design

## ENGINEERS

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### AERO-THERMODYNAMICIST

Experienced in the aerodynamic design of turbo-machinery.

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Experience desirable in pneumatic servomechanism and in mechanical pneumatic design.

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### STRESS ANALYST

Experience in stress and vibration problems of turbo-machinery structure and rotating components.

### GEAR DESIGNER HIGH SPEED GEARING SPECIALIST

Experience in gear geometry and stress analysis. Knowledge of gear production methods essential.

### MECHANICAL ENGINEERS

5 years experience in the design and development of small mechanical mechanisms and fabrication of small gears for use at high speed.

Please direct your inquiry to AiResearch Manufacturing Company of Arizona, Skyharbor Airport, 402 South 36th Street, Phoenix, Arizona or AiResearch Manufacturing Company, 9851 S. Sepulveda Blvd., Los Angeles, Calif., Attention: Personnel Department. Please include a resume of experience as well as personal data.



of metal mesh-and-spring vibration mounts. Testco's address is 172 Chestnut St., Ridgewood, N. J.

Other recent company actions:

- Precision Potentiometer Corp. has been organized as subsidiary of Master Mobile Mounts, Inc., will manufacture high-precision pots and windings. Address is 1243 W. Pico Blvd., Los Angeles 15, Calif.
- Farrington Manufacturing Co. has acquired Electralab, Inc., Cambridge (Mass.) manufacturer of printed circuits and a participant in the Navy-NBS "Project Tinkertoy" program.
- Thompson Products, Inc., has purchased Dage Electronics, maker of television cameras, to expand its electronics activities.

- Kearfott Co., Inc., has combined its engineering and sales functions at its plant at 1378 Main Ave., Clifton, N. J. Company has also opened a district office at 6115 Denton Drive, Dallas.
- G. M. Giannini & Co., Inc., has opened new sales and field engineering office at 580 Fifth Ave., New York.
- Electro Development Co., manufacturer of precision sliprings and brushholders, has acquired Instrument Components, Inc., maker of similar devices. Combined facilities are now located at Electro Development's plant at 6006 W. Washington Blvd., Culver City, Calif.
- Magnavox Corp., Ft. Wayne (Ind.) manufacturer of airborne radar and navigational aids (and TV), has been elected to RTCA.

## 00000 FILTER CENTER 00000

► **Transistor Reliability Up**—Raytheon transistors have racked up over a billion hours of operating time in the field with a failure rate of approximately 1% yearly, a company executive says. Failure rate during past six months has been even lower.

► **NEC Proceedings Available**—"Proceedings of the National Electronics Conference" for 1953 (Vol. 9), a 992-p. bound volume containing the 98 papers presented last fall in Chicago, may be purchased for \$5 from NEC. Send order for proceedings to: 84 E. Randolph St., Chicago 1, Ill.

► **New Premium Tubes**—General Electric and Bendix-Red Bank have each announced new additions to their line of premium tubes. The new GE sharp cut-off pentode GL-6265, a wideband high-frequency amplifier, is a premium version of the 6BH6. The new Bendix 6385 is a twin-triode intended to replace the 2C51/5670 tube types. The 6385 is run-in tested under vibration for 45 hours, can be operated at altitudes up to 80,000 feet, according to Bendix.

► **Remote Control Airport Lights**—Special Committee 56 of the Radio Technical Commission for Aeronautics is investigating feasibility of remote control operation of field lights at unattended airports. Technique was pioneered by Bonanza Air Lines at Kingman (Ariz.) airport (AVIATION WEEK Oct. 13, 1952, p. 92). By the addition of a suitable sequencing device to the airport VHF receiver it is possible for the pilot to turn field lights on or off by pressing his mike button a predetermined number of times.

► **Junction Transistor Source**—Hydro-Aire Inc., Burbank, Calif., first West Coast producer of point-contact transistors, is now making small quantities of junction-types and expects to be in full production by June.

► **Mechanized Circuits Group Formed**—Sylvania has set up a new mechanized circuits department, devoted to application of stamped and printed circuits, with Albert Lederman as engineering section head.

► **Electrical Symposium**—Recent General Electric symposium on aircraft electrical systems, held in Highland Park, Ill., attracted representatives from 16 U. S. and Canadian airframe manufacturers, 11 domestic and foreign airlines, USAF and Navy. —PK

## Avionic Bulletins

Recently announced technical bulletins and brochures of possible interest to the avionics industry include the following:

- **Sub-min trim pot**, wire-wound, is described and detailed specifications given in Brochure No. 3591 available from Dept. NL, Bourns Laboratories, 6135 Magnolia Ave., Riverside, Calif.
- **Transducer mag amplifiers**, their application to instrumentation and control, are described in Booklet TD 52-601, prepared by Westinghouse Electric Corp., P.O. Box 2099, Pittsburgh 30, Pa.
- **Time delay relay**, with pneumatically controlled delay at instant of being energized or de-energized, is described in Bulletin SR4. Write to AGA Div., Elastic Stop Nut Corp., Elizabeth, N. J.
- **Computing With Potentiometers**, an eight-page technical paper, examines linearity and loading effects in analog servo-driven computer systems and discusses circuit design techniques. Technical Information Service, Helipot Corp., 916 Meridian Ave., S. Pasadena, Calif.
- **Gyroscopes**, both rate and displacement, including floated-types, are described and specifications given in new booklet available from Aeronautical Div., Minneapolis-Honeywell Regulator Co., 2600 Ridgway Rd., Minneapolis, 13, Minn.
- **Relay data**, printed on a file-size folder, lists specifications on 42 types of relays made by the Price Electric Corp., Frederick, Md.
- **Wire-wound resistors**, power-type, designed to MIL-R-26B are listed in new catalog available from Sprague Electric Co., North Adams, Mass.
- **Airfloating**, a new principle in the design of magnetic computer memory drums, is described in bulletin. Write to Logistics Research, Inc., 141 S. Pacific, Redondo Beach, Calif.
- **Pulse network design and production facilities** of Corson Electric Mfg. Corp. are described in new bulletin. Address: 540 39th St., Union City, N. J.
- **Regulated power supplies** are described and specifications given in catalog prepared by Allied Engineering Div., Allied International, Inc., Connecticut and Richards Aves., South Norwalk, Conn.
- **Electronic counters** and their application to a variety of measurements, are described in Volume 5, No. 1-2 of the Hewlett-Packard Co. Journal. Company address: Dept. P, 395 Mill Page Rd., Palo Alto, Calif.
- **Electric clutches & brakes**, for use in small low-torque instrument and servo systems, are described in Bulletin No. 6158 prepared by Warner Electric Brake & Clutch Co., Beloit, Wis.
- **Flight control system**, new General Electric FC5 for use in stabilizing high-performance aircraft, is described in GET-2416 which includes block diagrams. Bulletin can be obtained from General Electric Apparatus Sales Div., Schenectady 5, N. Y.
- **Oscillographic recording systems** and accessories, are described in 38-page catalog prepared by Sanborn Co., Industrial Div., 195 Mass. Ave., Cambridge 39, Mass.
- **Power rectifiers** for aircraft use are described in Bulletins AC-54, AC-54-1, available from McColpin-Christie Corp., 3410 W. 67th St., Los Angeles 43, Calif.
- **Power resistors**, new line of seven- and 10-watt units, are described and characteristics given in Bulletin P-2. Write to International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.
- **Engineering In Depth** is the title of a new booklet describing the technical facilities and capabilities of Aviation Engineering Corp. (Avien), 58-15 Northern Blvd., Woodside, N. Y.
- **Connectors**, Series 20, rectangular, precision, miniature, available with up to 104 contacts, and new ME-Z 16 spring-loaded rectangular available with 18 and 34 contacts, are described in bulletins available from Electronics Sales Div., DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City, New York.



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**2 NEW REISHAUER GEAR GRINDING MACHINES IMPROVE ADVANCE PRODUCTION**




Modern equipment is a prime requisite in the production of precision gears and gear products. At ADVANCE the most modern machines are always used for each phase of gear production. Facilities for gear grinding have recently been increased by the addition of these two Reishauer gear grinding machines. ADVANCE combines the skill of expert craftsmen with equipment of this kind to assure deliveries that will meet your requirements. Whatever your gear problem may entail... gears, gear products or gear assemblies... let us assist you.

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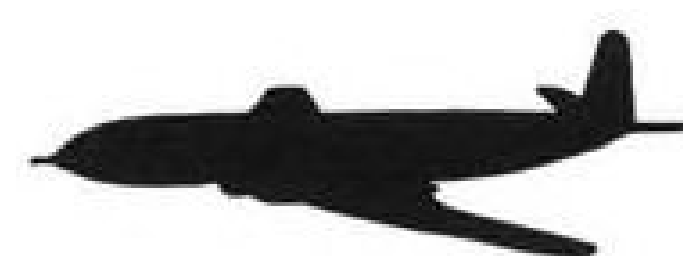


Approach Horizon

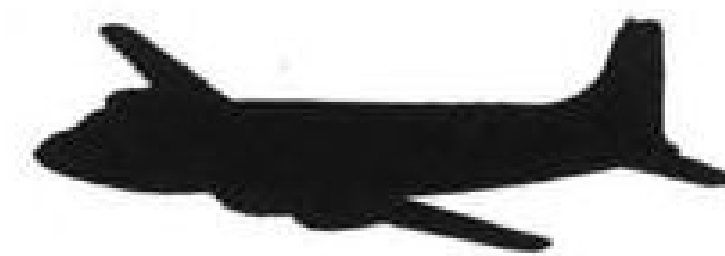
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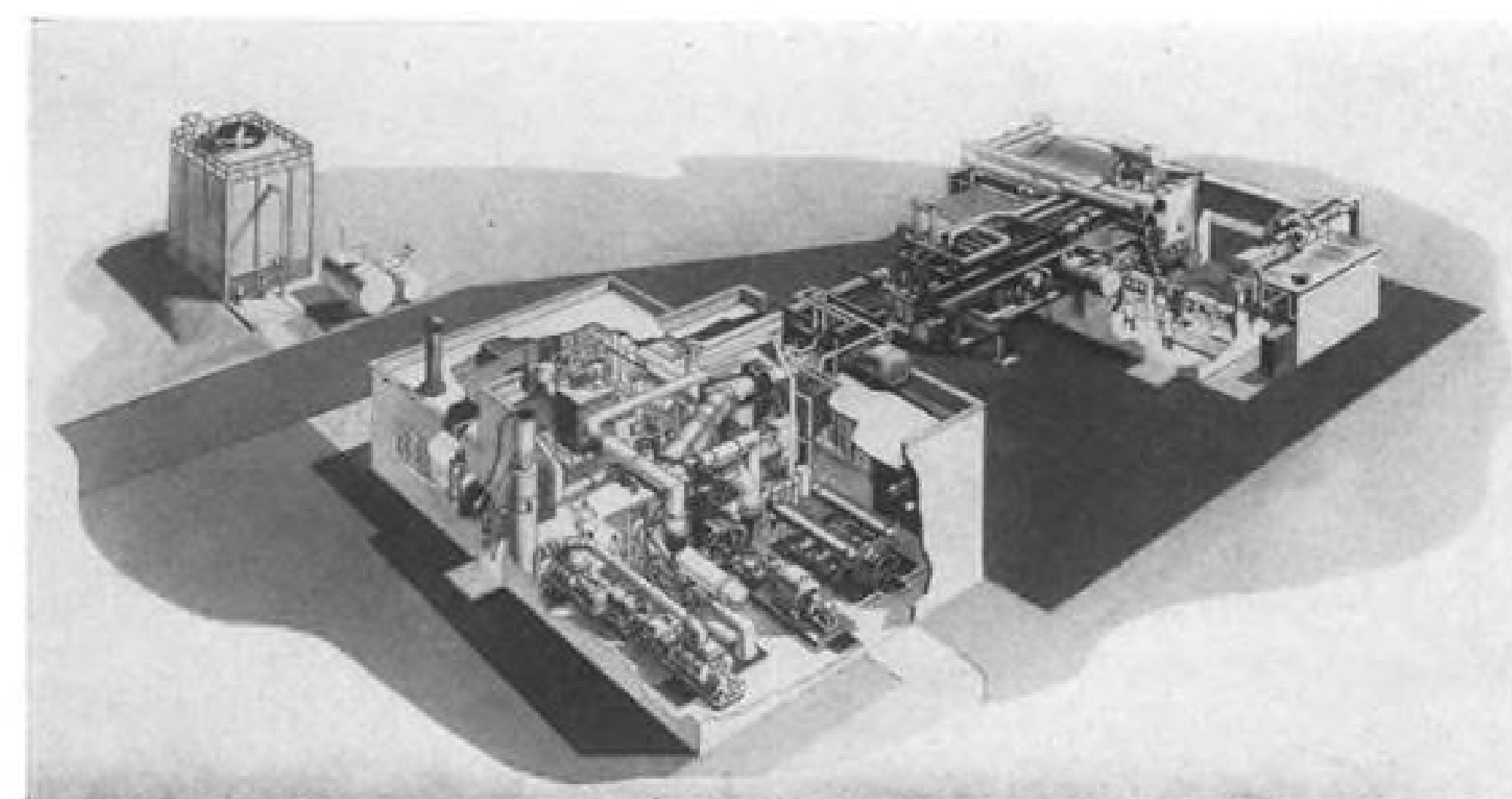
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## EQUIPMENT



RESEARCH AND TEST layout at Teterboro for Eclipse-Pioneer jet accessories.

### New Setup to Test Jet Accessories

Eclipse-Pioneer facility will duplicate the operating environment of aircraft and missile accessories.

A versatile and complete research and test facility, built exclusively for testing jet aircraft and missile accessory equipment, has just been completed on the 102-acre site of Bendix Aviation Corp.'s Eclipse-Pioneer Division, Teterboro, N. J.

Bendix says the new setup can simulate in a few seconds the actual conditions under which jet accessories will operate, including temperatures as low as -100F. Test conditions are controlled from consoles which include the "latest combinations of electronic, pneumatic and electrical equipment," the company says.

► **What It Will Test**—Some of the products the Bendix setup is designed to test are afterburner fuel pumps, water-alcohol pumps, turbine-driven alternators, bleed-and-burn turbine-driven accessories, cabin supercharger equipment, aircraft cooling equipment, pneumatic starters and numerous other types of turbine-driven ancillary equipment.

The facility simulates all possible flight conditions for Bendix equipment through control of exhaust vacuum, air pressure, air temperature, fuel temperature, auxiliary cooling temperature and fuel tank pressure and vacuum.

► **Man-Hour Saver**—Designed to save thousands of man-hours of engineering research, the new research facility can provide data on performance of air turbine-driven accessories at speeds up to the supersonic and at altitudes ranging from sea level to 80,000 ft.

A Freon-brine cooling system can chill temperatures to -100F to test equipment operation under extreme

arctic conditions. Test fuels can be controlled from -100F to 105F. Also, an oil-fired heater can raise temperature of compressed air used in the facility to 800F. Maximum pressure of the air exceeds 200 psi. Automatic regulation can hold air to any pressure desired.

A master console in the equipment building gives automatic primary control of exhaust vacuum, air pressure, air temperature, and cooling brine temperature.

Current fuel system can handle high fuel flow rates at pressures up to 1,500 psi.; flow rates and pressures may be increased later.

► **What It Is**—The new layout consists of three buildings—the first houses the power and primary control equipment to supply coolant, high- and low-pressure air, heated air, fuel and other services.

There are two test cell buildings. The major one, a completely separate structure, is connected to the equipment building by numerous headers and contains secondary control panels and a double test cell.

► **Test Cells**—Elaborate precautions have been taken in the major test cell building to make the entire area as safe as possible. Here are some examples:

- **Reinforced concrete walls** separate the two test cells from each other and from the control room. The special walls were designed to withstand a one-atmosphere shock explosion.

- **Periscope-type slit windows** are built into the walls separating the test cells from the control room. Windows are

made of bullet-proof glass. Adjustable mirrors within the periscope's cone permit full view of the test site in the cell.

- **Higher atmospheric pressure** in the control room prevents seepage of any explosive gases into the area where employees are working.

- **Lightweight aluminum hatches** are installed in the roof of each of twin test cells for explosion release.

- **Explosion-proof electrical installations** are used throughout for lights, switches and power outlets.

- **Complete annunciator hookups**, with audio visual alarm, are installed in the master control console and at all the control panels in the test building.

- **Water-deluge fire-control system** is installed in each test cell.

► **Second Test Cell**—Second test cell building in the project is designed to test combustion components which require high-pressure (3,000 psi.) air. Accessories include fuel air combustion starters, solid-propellant starters and similar types of high-energy and high-pressure air devices.

High pressures are produced by an automatically controlled, four-stage, electrically driven compressor connected to a system of high-pressure receivers.

The project area includes a water cooling tower where water used by the compressor, exhausters, refrigeration system and other heat exchangers in the test setup is recirculated.

### Brightness Control For Runway Lights

A brightness control regulator for highspeed switching of series runway lights is being offered by Hevi Duty Electric Co. The unit is said to eliminate blacking out the lights when brightness control is operated.

Available for either direct or remote control, Hevi Duty's 4-kw. static-type constant current regulators reportedly are qualified under Civil Aeronautics Administration specifications L-811 and L-812.

The regulators require very little maintenance, says manufacturer, since rugged construction is simple, without complicated circuits or mechanical devices.

Each unit is completely self-contained, ready for installation on supply voltage circuits from 208 to 250 v. by connecting the input, output and control circuits to the terminal board. Air-cooled design is featured, and units may be installed in control towers, vaults, or unused hangar or office space.

Resonant circuit eliminates surges to the lamps, increasing lamp life. Company says its regulator will operate when 30% of lights are out, without building up excessive output currents.

Hevi Duty is in Milwaukee, Wis.



Opportunities to create better products exist in every home and industry in America today. But only a few, dissatisfied men and women recognize these opportunities. Such leaders are advancing their respective industries. They possess vision. They are spurred by initiative. Feather dusters have no place in their planning.



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Since 1938, Meletron has been producing excellent instruments that are used by every major aircraft manufacturer. But we are constantly testing new materials and devising new methods. Leadership in this industry imposes the obligation to improve, because tomorrow's standards will be higher. Dis-

satisfaction with what has been accomplished, plus a determination to improve, is America's greatest asset.



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J. M. WALTHER CO., Boeing Field, Seattle. THOMSON ENGINEERING SERVICE, 708 Hemphill St., Fort Worth and 732 So. Broadway, Wichita. ROUSSEAU CONTROLS Ltd., 2215 Beaconsfield Ave., Montreal 28, Canada. W. M. HICKS & J. A. KEENETH, 29-27 Forty-first Avenue, Long Island City, New York. JOSEPH C. SORAGHAN & ASSOCIATES, 1612 Eye St., Northwest, Washington 6, D.C.

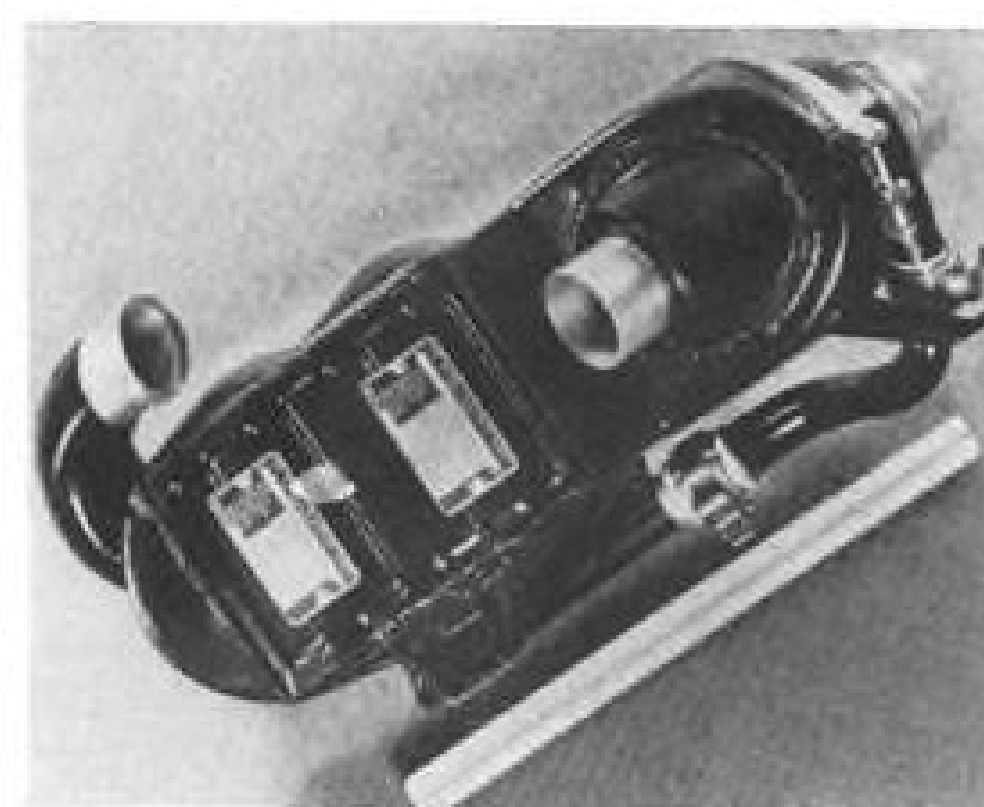
## OFF THE LINE

Battery-powered tractors pull baggage trailers at Fort Worth's Amon Carter Field. Powered by Gould batteries, the Freight Master tractors have a towing capacity of 2,000 lb., negotiate a 75-ft.-long ramp that has a 13% grade. Among reasons given for choice of battery-powered trucks is the reduced hazard from sparks while working around aircraft, and clean, fume-free operation in enclosed areas.

Navy has awarded a contract to Lockheed Aircraft Service to overhaul and modify an undisclosed number of Neptune P2V-5 and P2V-6 Neptunes. The contract includes installation of special equipment used for submarine detection.

Avio Supply Corp., has been organized to act as warehouse distributors and purchasing agents of aircraft parts, engines, accessories, airframes and radio and avionic components. Firm is headed by Aubrey L. Moss, formerly executive vice president of Aero Materials Co. Address: 129 Pierrepont St., Brooklyn, N. Y.

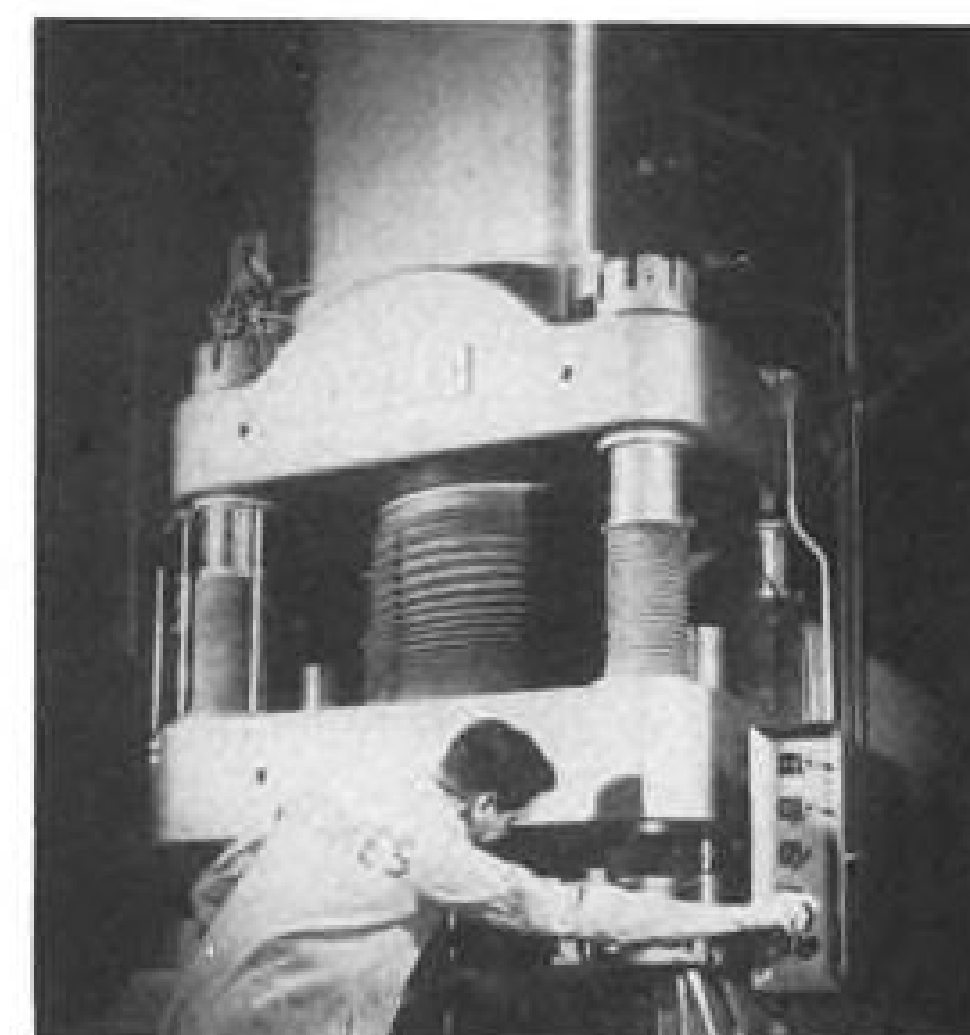
Nylon fuel cells are being installed by AiResearch Aviation Service Co. in two Lockheed Lodestars owned by Good-year Tire and Rubber Co. A Mississippi River Fuel Corp. Lodestar is getting the same treatment. The cells increase the plane's fuel capacity to 820 usable gallons. Accidental punctures are easy to seal, it is claimed. AiResearch was responsible for the engineering and tooling, and Goodyear fabricated the bags.



### Lighter Cooler

New AiResearch aircraft turbine refrigeration unit stresses lightness as its principal feature. This is achieved by integrating parts, thereby eliminating many nuts, bolts, screws, washers, etc. Unit weighs 5.8 lb. and has a cooling flow rate of 10 lb./min. It produces 0.67 tons of refrigeration. The turbine mounts directly on the heat exchanger, eliminating need for extra ducting.

## NEW AVIATION PRODUCTS



### Big Powder Metal Press Molds Parts Automatically

F. J. Stokes Machine Co. has built a 300-ton hydraulic press for automatic molding of large powder metal parts.

The first model, said to be the largest powder metal press ever built in the U. S., has been shipped to an aircraft brake manufacturer, says the company.

Parts up to 12 in. in diameter and approximately 3 in. thick are said to be easily compacted, while molds having a maximum depth of fill of 8 in. can be handled.

Control over the pressing cycle is fully automatic. Manufacturer says rate of production can be adjusted precisely to thickness of parts being compacted. For thickest parts, operation is at rate of four strokes per minute; with thinner parts, rate increases to maximum of 10 strokes per minute.

Press is a double-acting design, with each of the rams independent, both as to its speed of movement and as to pressure exerted. To achieve this, says the company, each ram has its own hydraulic pump and volume control.

A pair of threaded stops controls final spacing between upper and lower punches. Adjustment of these stops controls thickness and density of finished parts at all times, Stokes reports.

Control panel, located at front corner of press, allows instant conversion from fully automatic to semi-automatic or manual at any point in the cycle.

J. K. Stokes Machine Co., 5500 Tabor Rd., Philadelphia 20, Pa.

### Transparent Vacuum Jar Gives Testers Clear View

A new vacuum chamber, designed for laboratory use, gives clear view of units being tested.

Developed by American Research

## we make parts like these...

... in large or small lots, from all types of stainless steels and other heat- and corrosion-resistant materials. Unusually extensive secondary operation equipment, inspection and quality control facilities, and experimental and research techniques insure highest quality work. Capacities from 1/32" to 3 1/2" round on bar machines — up to 8" round on chucks.



Bolts of this type, in aircraft quality, are produced in large volume. Blanks are made on multiple spindle New Britains and parts are then processed through heat treating, form grinding, roll knurling and roll threading.

Interesting features of this bolt are the hardness of Rockwell 35-38, concentricity requirement of .001 T.I.R. and squareness requirements of .002 T.I.R. between surface under head and body diameters and an exact number of 46 teeth in the knurl.

This part is blanked on a multiple spindle machine, using 3 1/2" diameter tubing AMS 5645. Part is plunge ground on the body diameter and an additional forming is performed on a turret lathe. The entire internal form including all three internal diameters, tapered seat, radii, front and back chamfer are single point bored on a Model 36 New Britain contour boring machine. This is done all in one setting, to insure the internal form being concentric and being within .002 T.I.R. with the body diameter. The smallest internal diameter is then ground to a tolerance of .001.



Parts are blanked with a cut thread, out of aluminum bar on a Model 61 New Britain six-spindle screw machine. Parts are then rechucked on a Model 65 New Britain chucker to machine the opposite end at the angular displacement of 2° 34', holding a total angular tolerance of 0° 10'. Subsequent operations include milling the square and end slot, multiple drilling wire holes and grinding threads in three different sizes, maintaining a class 4 tolerance.

This part requires a hard shell of Rockwell 60-65 and a depth of case of .025 to .040. The micro finish of 8 and the tolerance of .0002 on the O.D. are produced through grinding and lapping operations. Parts are made from AMS 6260 steel and processed in controlled lots to insure proper depth of carburization and hardness.



Our new illustrated booklet explains how we combine extra-high precision with high production rates, at low unit cost. Please write on your letterhead for your copy.



## THE NEW BRITAIN MACHINE CO.

PRECISION PRODUCTS DIVISION  
425 SOUTH STREET, NEW BRITAIN, CONN.



# DC-7 NEVER BEFORE

such Magnificence . . . such Power  
such Performance!



and **NEVER BEFORE** has the  
**A. W. HAYDON COMPANY** been so  
proud of its contribution...

In the never-ending conquest of the vast barriers of space and time, Douglas goes ever forward meeting every challenge that men and machines must face. The newest — and brightest — star in the aviation firmament, the Douglas DC-7, is truly a miracle of the mastery of men over machines . . . and in this great work sixteen A. W. Haydon timing devices play an important part.

We at A. W. Haydon take pride in our contribution toward bringing a mass of metal and machinery into integrated performance which meets Douglas' high standards. Integrated performance is born of a multitude of small component parts, working in perfect mechanical and electrical coordination. The A. W. Haydon precision timing instruments are a vital part of this vast network.



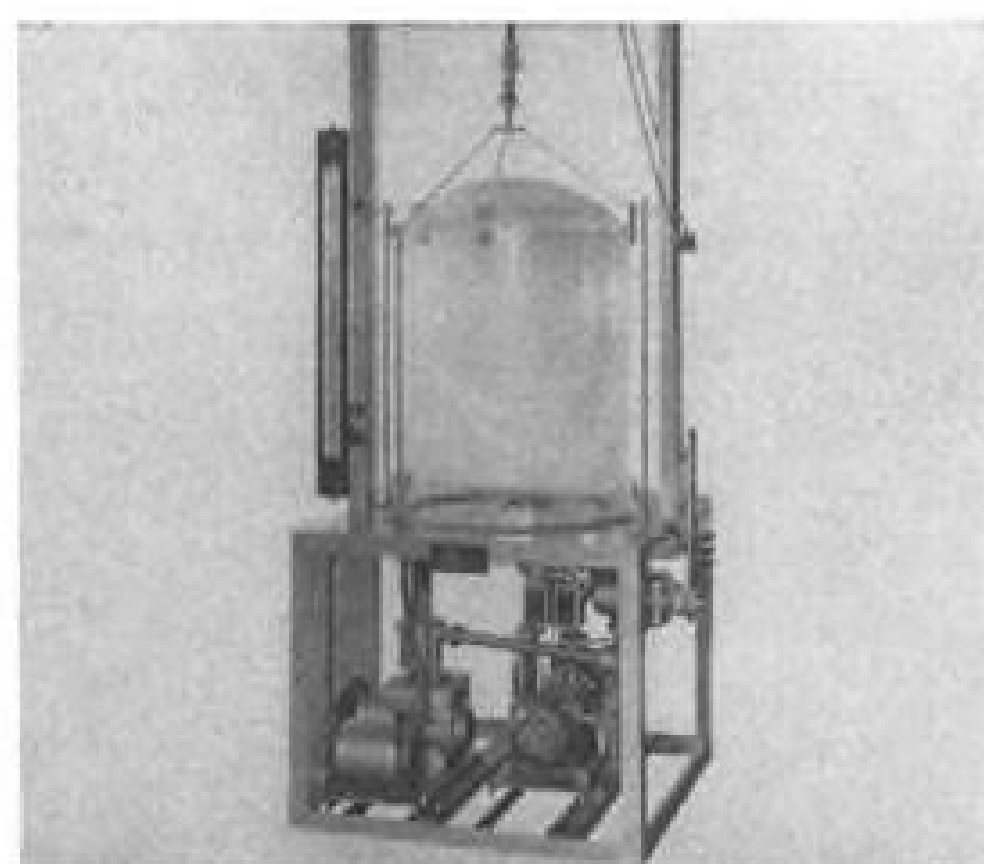
DOUGLAS DC-7, the ultimate in comfortable and safe air travel. Swift, luxurious, dependable — the new DOUGLAS DC-7 justly deserves the accolades it is receiving.

- ✓ A. W. Haydon Time Delay Relay is a very important component of the automatic prop feathering system.
- ✓ A. W. Haydon Time Delay Relay times duration of prop feathering.
- ✓ A. W. Haydon Repeat Cycle Timer is a vital part of the prop deicing equipment.
- ✓ A. W. Haydon D.C. Timing Motors are used in the cabin pressurization systems.

When timing poses a problem — consult

(Catalog sent on request)

**The A. W. HAYDON COMPANY**  
222 NORTH ELM STREET  
WATERBURY 20, CONNECTICUT  
Design and Manufacture of Electro-Mechanical Timing Devices



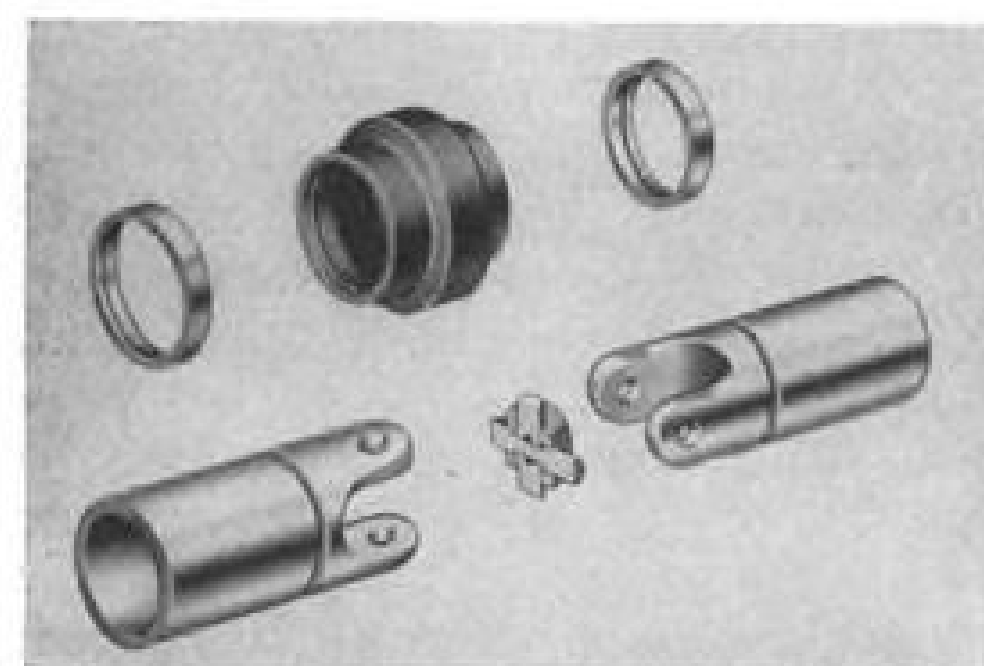
VACUUM test jar is transparent.

Corp., unit resembles a large jar. The chamber encloses a working space 24 in. high and 24 in. in diameter. It cannot be raised unless controls are in "dive" position. Power hoist is used for raising and lowering.

Manufacturer says unit is capable of altitudes up to 100,000 ft., with a simulated rate of climb of 32,000 ft. per minute up to 60,000 ft.

Equipment includes safety devices, manometer, electrical terminals and access penetrations in the base plate.

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



## New Long-Life Universals Get Air Force Approval

Clary Multiplier Corp. announces production of a series of light- and heavy-duty universal joints that have recently received Air Force approval.

All units will be available for military, commercial and private aircraft, reports the manufacturer. Chief features listed are greater strength, increased safety and longer life.

Clary states that both the light-duty Series 270 and the heavy-duty Series 271 met or exceeded AN heavy-duty requirements.

Center block design provides toggle pins of equal strength and dimension. Solid construction reportedly provides greater axial and torsion strength, greater safety margin and smoother flexing. Backlash is held to absolute minimum, company reports.

Boot design is said to retain bearing lubricant for several months without sweating or leaking. Boot reportedly withstands temperatures from -67F to 300F, flexing through full range of joint

# ENGINEERS

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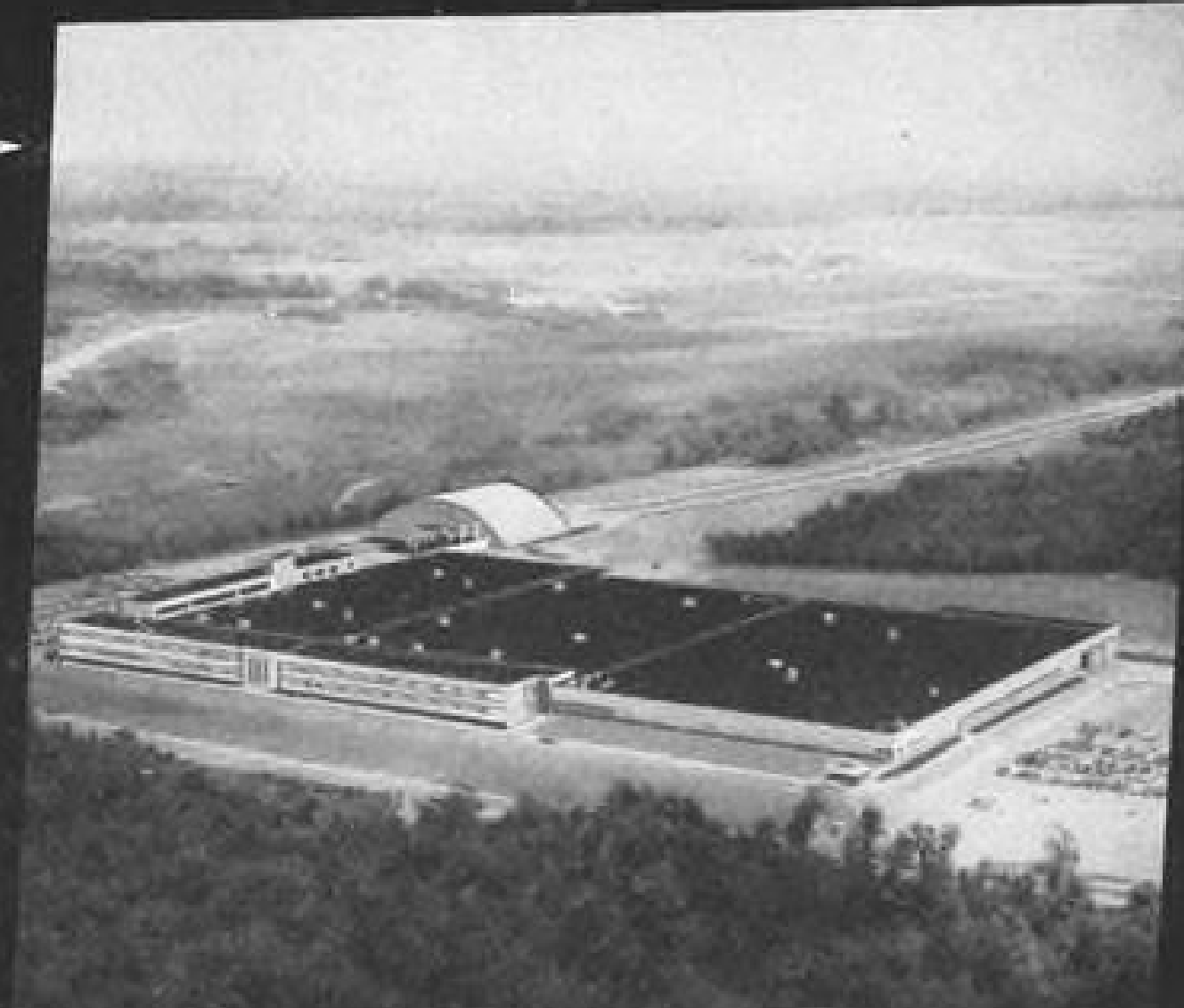
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### Electronic Components Engineers

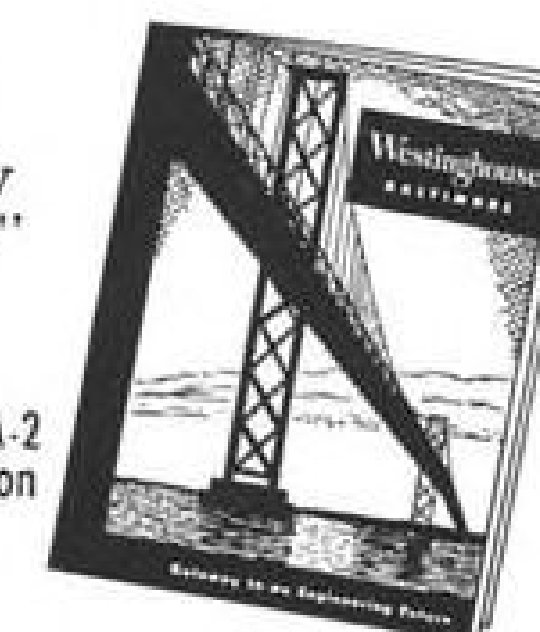
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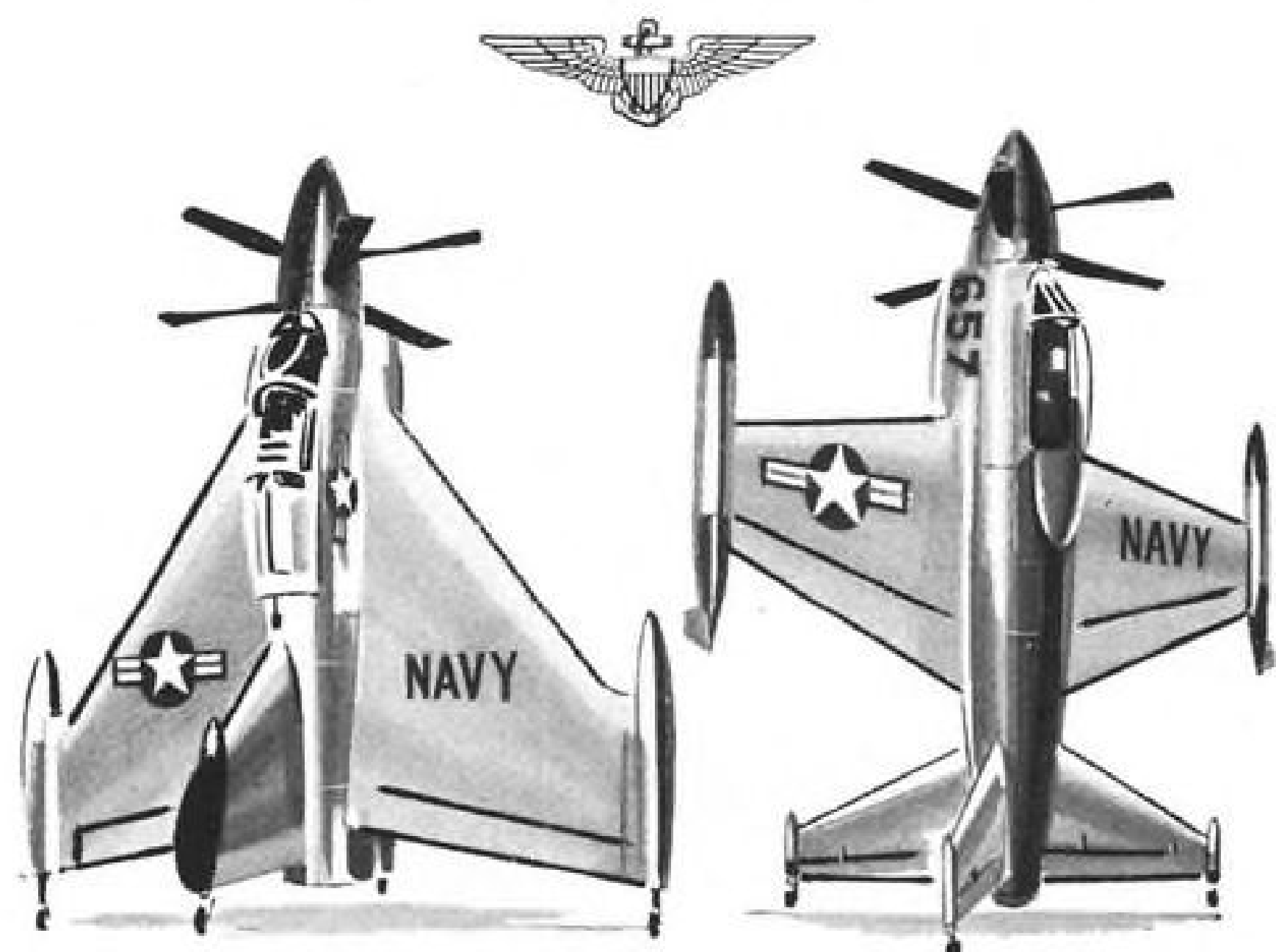




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# TURBOELECTRIC PROPELLERS

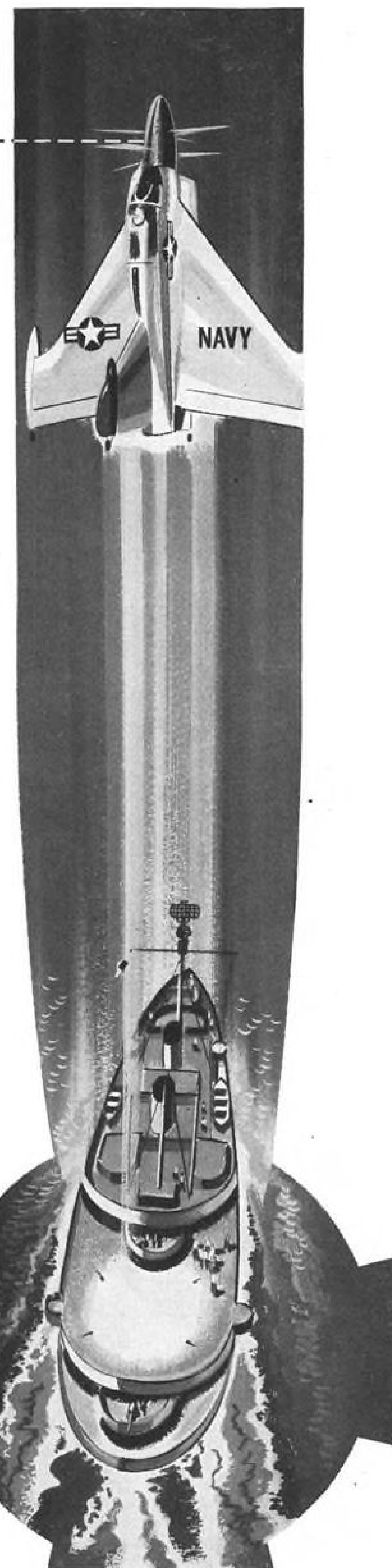
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Tack cloth wipes dirt and dust particles from surfaces to be painted, and is recommended for use before spraying. Product, No. 706 Super Tack Cloth, is said to be particularly useful before aircraft painting.—Associated Producers, Inc., 1019 East Eight Mile Rd., Hazel Park, Mich.

Explosion-proof portable floodlight is said to assure 100% safety in lighting of hazardous areas such as arsenals, painting areas, airplane maintenance depots. Manufacturer says unit has received underwriters approval and is only floodlight permitted for use in hydrogen, acetylene and manufactured gas areas.—Safe Lighting, Inc., 91-03 Astoria Blvd., Jackson Heights, N. Y.

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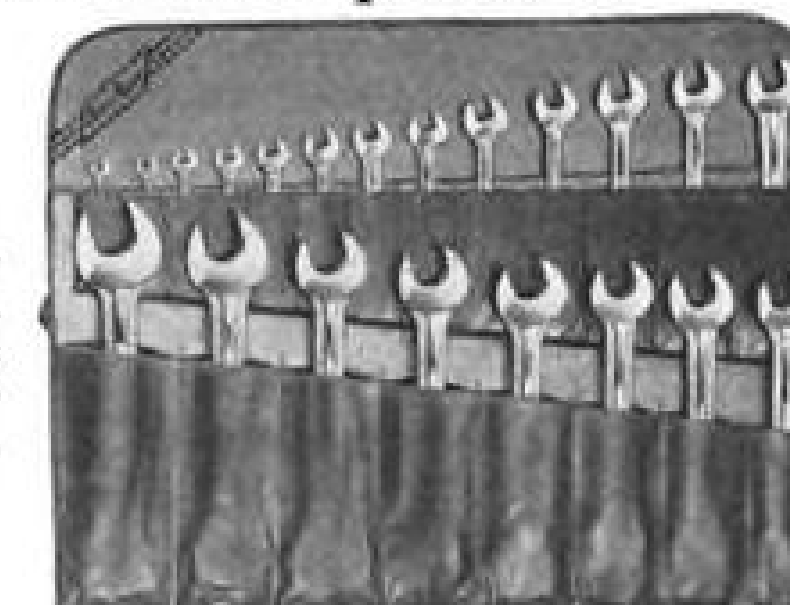
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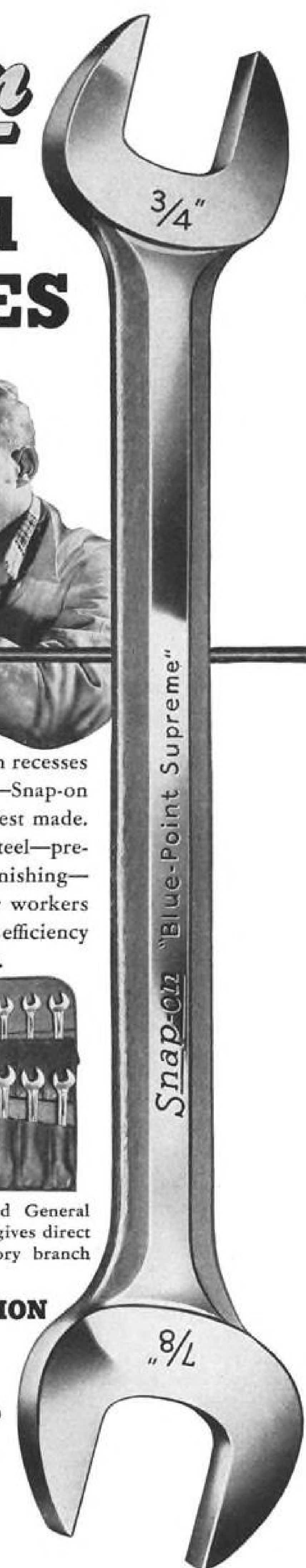
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# AVIATION SAFETY

*CAB Report on Regina Cargo Airlines DC-3 Crash*

## Pilot Flew Visual in IFR Weather

### THE ACCIDENT

A Douglas DC-3, N 19941, owned and operated by Regina Cargo Airlines, Inc., crashed 12 miles southeast of Vail, Wash. (about 26 miles from McChord AFB, Tacoma, Wash.), between 1830 and 1900,<sup>1</sup> Sept. 1, 1953. The two pilots and 19 military passengers were killed. The aircraft was demolished by impact and subsequent fire; the site of the accident was the south side of a 3,000-ft. timbered ridge at approximately 2,600 ft. mean sea level.

### HISTORY OF THE FLIGHT

Regina Cargo Airlines, Inc., an irregular air carrier, was operating this flight as a Commercial Air Movement from Fort Ord, Monterey, Calif., to McChord.

The aircraft, with Capt. Eugene Jones, Co-Pilot Glenn W. Dorsett, no cabin attendant, and 19 military passengers, departed Monterey, Calif., at 1408, Sept. 1, 1953, on a flight plan specifying IFR (instrument flight rules) via Airways Red 58, Blue 7, Amber 1 for McChord AFB. The estimated time en route was four hours and 18 minutes, with six hours and 40 minutes fuel aboard. The flight crew had been briefed on weather by Navy weather personnel at Monterey, and the flight was given ARTC traffic clearance for 500 feet on top via airways to McChord AFB. The trip proceeded to Portland, Ore., in a routine manner, making normal position reports and estimates of times over the next reporting points. These times closely approximated ETA's.

At Portland, at 1820, after requesting and receiving weather for Portland, Toledo, Washington, and McChord, the flight canceled its IFR flight plan, advising that the trip would be completed VFR with an estimated time of arrival over Toledo at 1842. This was the last radio contact with the flight and there are no known witnesses to the rest of the flight or the crash. Search was started shortly after the flight became overdue at McChord. The crash was heard by a workman about a half mile away on the opposite side of a ridge at a time he estimated to be between 1830 and 1900. He did not associate this sound with an aircraft until hearing a news broadcast the next morning, when he investigated and located the wreckage.

### INVESTIGATION

The flight's estimated ground speed from Portland to Toledo was 164 mph., and the crash scene is 16 miles north of Toledo and about 26 miles short of the destination. A continuation of the same course at this ground speed indicates a crash time of 1848. No timepieces were recovered from the wreckage due to severity of impact and intense ground fire.

<sup>1</sup>All times referred to herein are Pacific Standard, unless otherwise noted, and based on the 24-hour clock.

The hill that was struck is the highest point between Toledo and McChord AFB, and is approximately 3,000 ft. MSL. The aircraft struck in level flight at approximately the 2,600-ft. level on Airway Amber 1. At the time of impact the heading was 360 degrees magnetic while the airway's course is 355 degrees magnetic.

Investigation revealed that both Capt. Jones and Co-Pilot Dorsett had flown over the region several times during the past few months, and that the aircraft and captain's flight kit contained aeronautical charts which show elevations along the airway.

The weather was generally overcast with layers of stratus clouds with a 4,500-ft. ceiling reported in the Portland area, lowering to 1,500 ft. at McChord AFB. Fifteen miles west of the crash, there were breaks in the overcast through which the aircraft could have descended contact. The actual 1730 weather conditions given the flight by Portland radio while over Portland were: Portland 4,800 ft. measured, overcast, visibility 15 mi., altimeter 30.05 in.; Toledo 2,200 ft. estimated, broken clouds, overcast at 3,500 ft., visibility 20 mi., altimeter 30.08 in.; McChord scattered clouds at 1,500 ft., overcast 3,000 ft., visibility 1½ mi., very light drizzle, altimeter 30.06 in. Temperatures were high enough to preclude wing ice formation in flight.

An Air Force pilot was flying a small civil aircraft northbound from Eugene, Ore., about 100 miles south of Portland, to Tacoma at about the time of this accident. Actually he passed over a point about 15 miles west of the accident site at about 1800, about 45 minutes before the accident. He described the weather in the direction of the site as fog and showers on the hillsides.

This pilot was well qualified and he was familiar with the terrain near McChord AFB. He offered the opinion that visual flight from the crash site to McChord would not have been possible at that time. His flight was entirely visual and he was able to see the ground at all times from his altitude of about 1,000 ft. MSL. However, because of the low ceiling and visibility he landed at an airport a few miles to the west of where he had intended to land, a small airport near McChord. The ground witness who heard the noise of impact described the weather as rain with clouds on the trees.

There appears to have been no engine malfunctioning or fire in flight and no structural failure prior to impact, nor did the crew report any difficulty. All aircraft components were found or accounted for. The cockpit area was so extensively damaged that no instrument, including the altimeters, could be read.

Examination of the engines and propellers indicated power development and inspection of the propeller domes revealed a cruise pitch position of the blades at the time of impact. The gross weight of the

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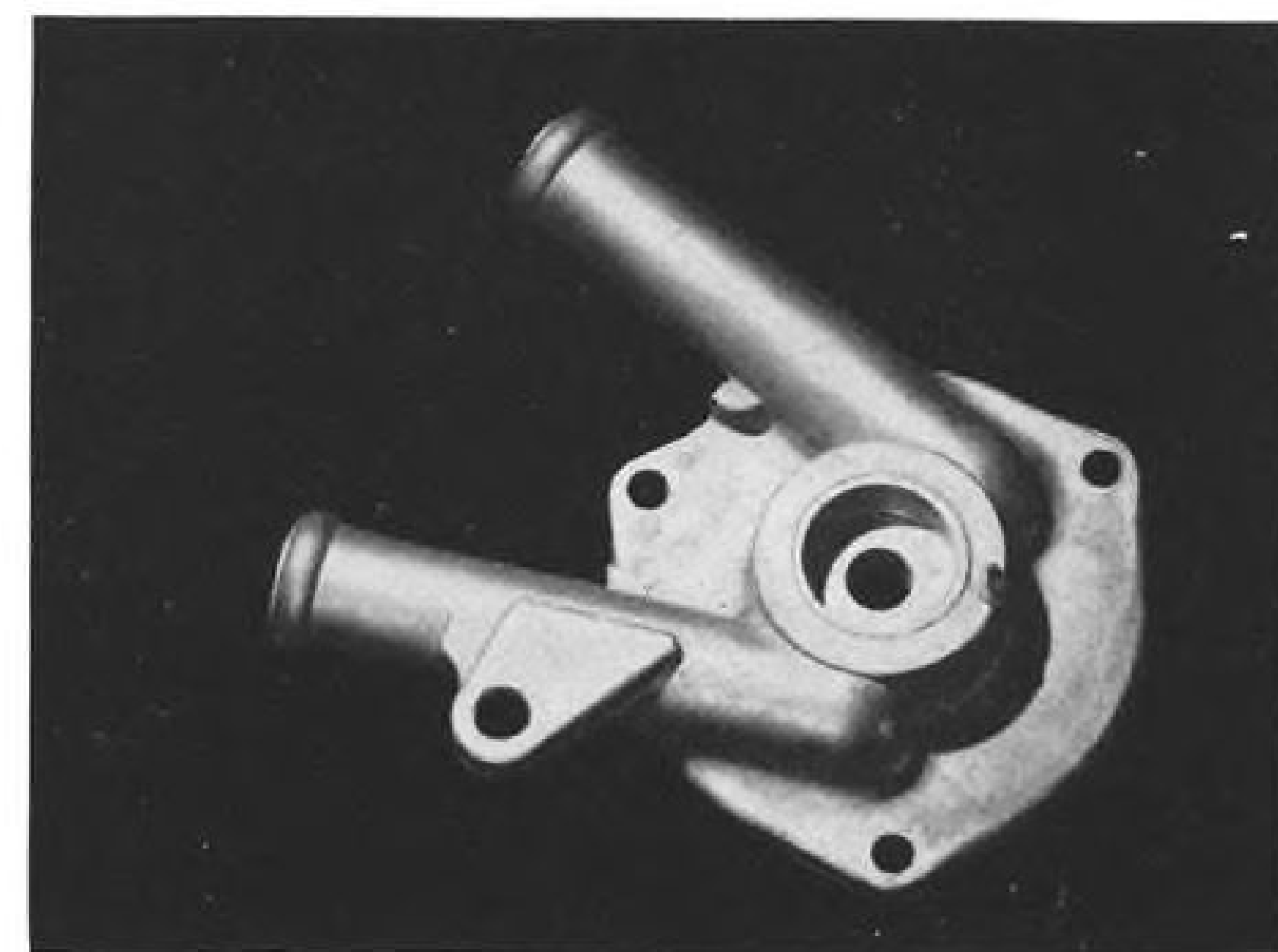
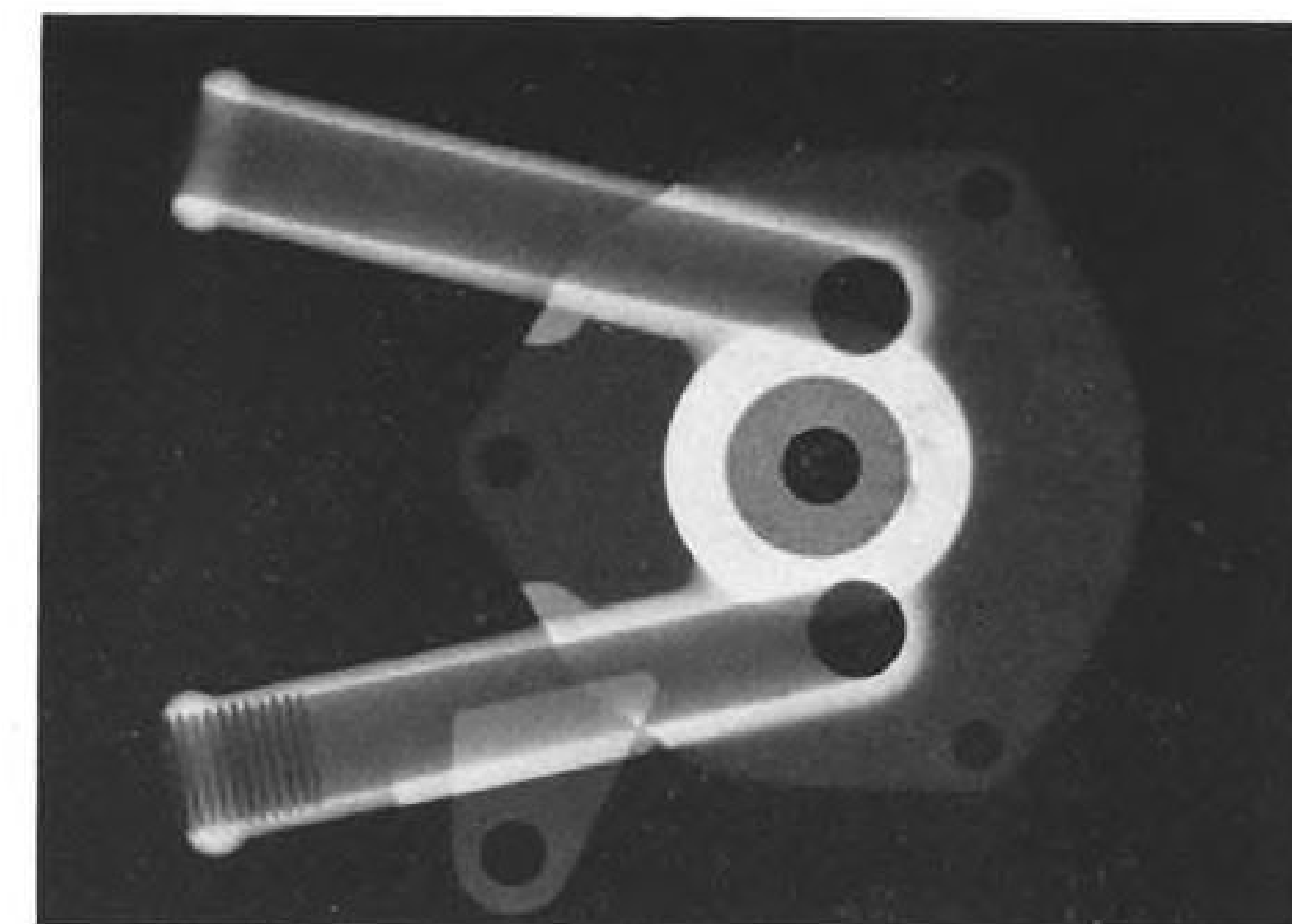
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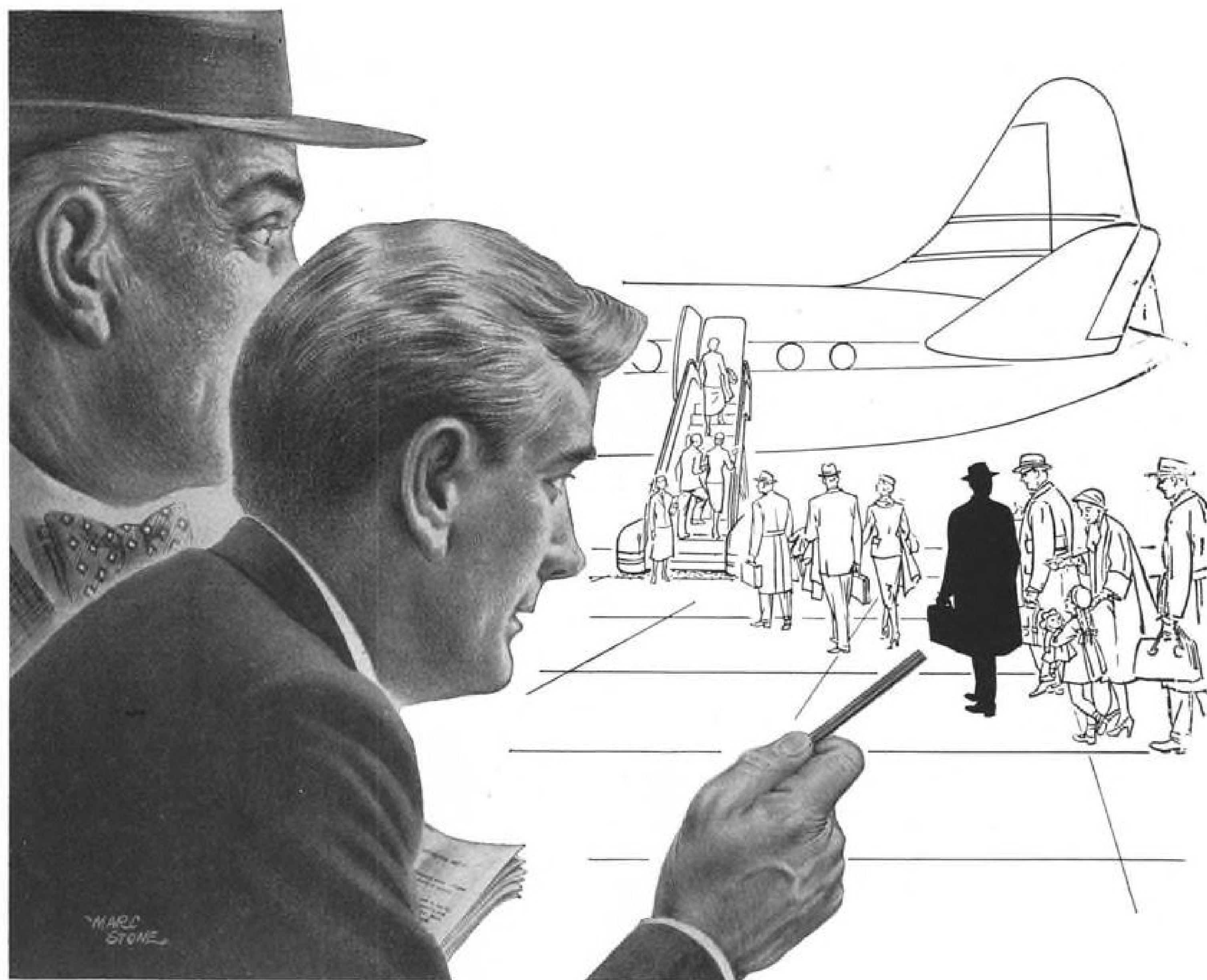
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## THERE GOES THAT PASSENGER...

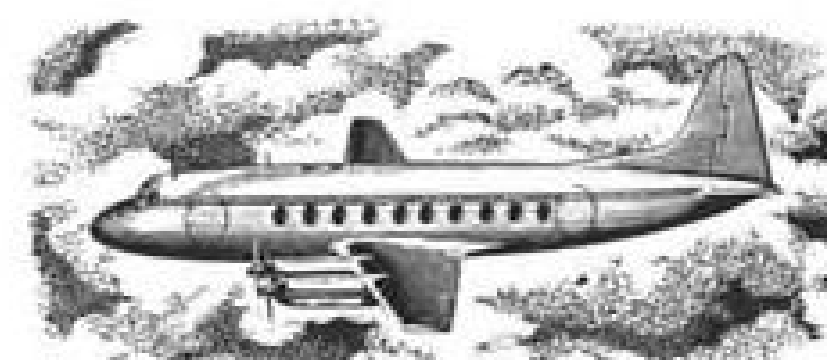
Since he came back from Europe he's been a man to watch. Over there leading airlines are operating the Viscount and setting up new records for passenger preference—and profits! That passenger found flying by Viscount was something really new! *Certainly* it was the most comfortable flight he had ever made. *Certainly* it was the quietest. *Certainly* one noticed hardly any vibration—and those four turboprop engines inspired a feeling of real confidence.

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aircraft at time of takeoff was 25,052 lb.; its allowable weight was 25,346 lb. The aircraft's center of gravity was located within prescribed limits. There was ample fuel aboard.

Navigation facilities consisting of low-frequency ranges, which the aircraft was equipped to receive, were in normal operation. The setting of the aircraft's range receiver was about 235 kc. (with the possibility of impact change); Toledo range is an 239 kc. and McChord is on 272 kc.

The military had installed a fan marker (a radio navigational facility for signaling location) nine miles out on the south leg of the McChord radio range. This fan marker, known as the Hart's Lake F. M., had not been commissioned. It was not in continuous use, and therefore notice of its location and operation had not appeared in NOTAMs nor on aeronautical charts. However, it was being tested at the time of the accident, and this fact gave rise to some conjecture as to its signal possibly having been mistaken for that of another fan marker (the Lakeview F. M.) a few miles to the north. Both had the same identification signal of three dashes.

Investigation of the operation and positioning of these two fan markers, together with study of a speed-distance diagram of the flight, indicated that the military fan marker was not a causative factor to this accident. Actually the crash site was well out of either aural or visual range of the military (Hart's Lake) fan marker, as proved during subsequent flight check. The CAA was to have been notified 24 hours in advance of this facility being tested. In this instance, notification was not given.

### ANALYSIS

There appears to be no factor entering into this accident other than an attempt to fly visually at too low an altitude during instrument weather. Between Toledo, which was about 16 miles south of the crash site, and McChord, about 26 miles ahead of it, the ground on the airway is relatively low, except at the crash site. There a ridge of high land projects westward from much higher land to the east, and not only extends into the airway, but crosses it. It was close to the summit of this ridge where the airplane struck.

A logical surmise, therefore, as to just what caused the pilot to be so low is that he must have believed himself to be somewhat closer to his destination than he actually was, and was attempting to fly visually in intermittent instrument conditions. Had he been a few miles farther to the north, he could have continued level or even descending flight to McChord without encountering any obstruction. At the time that the airplane struck, it is highly likely that the hillside was entirely obscured by cloud, so that it would have been impossible to fly by visual reference. Moreover, Capt. Jones did not ask for a change of flight plan back to an assigned instrument altitude which would have allowed the flight to proceed safely.

Furthermore, had the captain referred to the aeronautical charts, which were on board and readily available prior to or at the time the flight plan was changed to VFR, he would have had knowledge of the height of the terrain and any prominent elevations between Portland and Tacoma, particularly

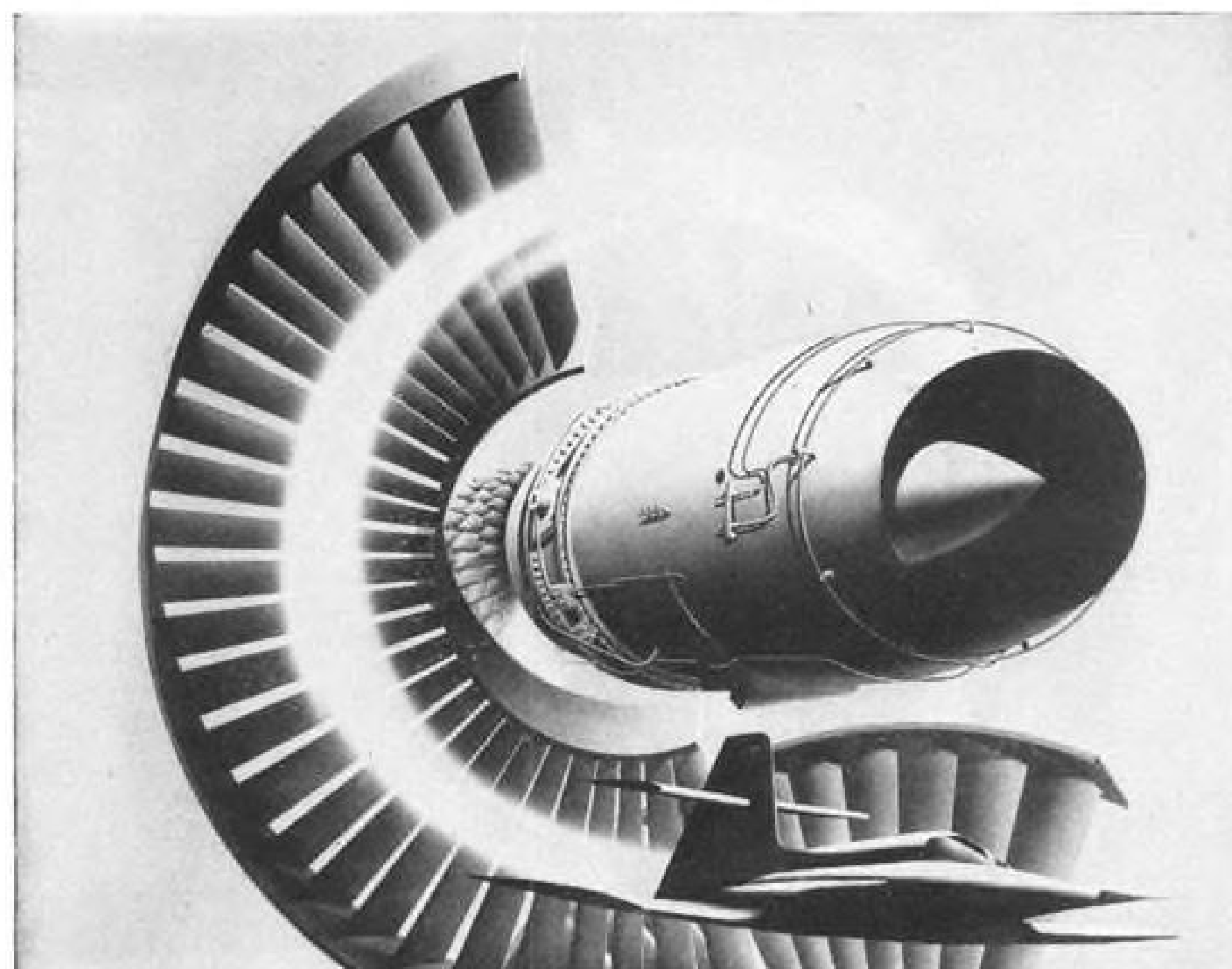
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beyond Toledo. Either Capt. Jones did not refer to those charts or he relied upon his knowledge of the terrain, possibly believing that he was beyond the ridge.

The 1830 weather transmitted on range frequencies at about 1845 gave McChord conditions, including the altimeter setting, about the same as at 1730. The weather was not conducive to abrupt pressure changes. There is no way of ascertaining if Capt. Jones received this last information.

### FINDINGS

On the basis of all known evidence the Board finds that:

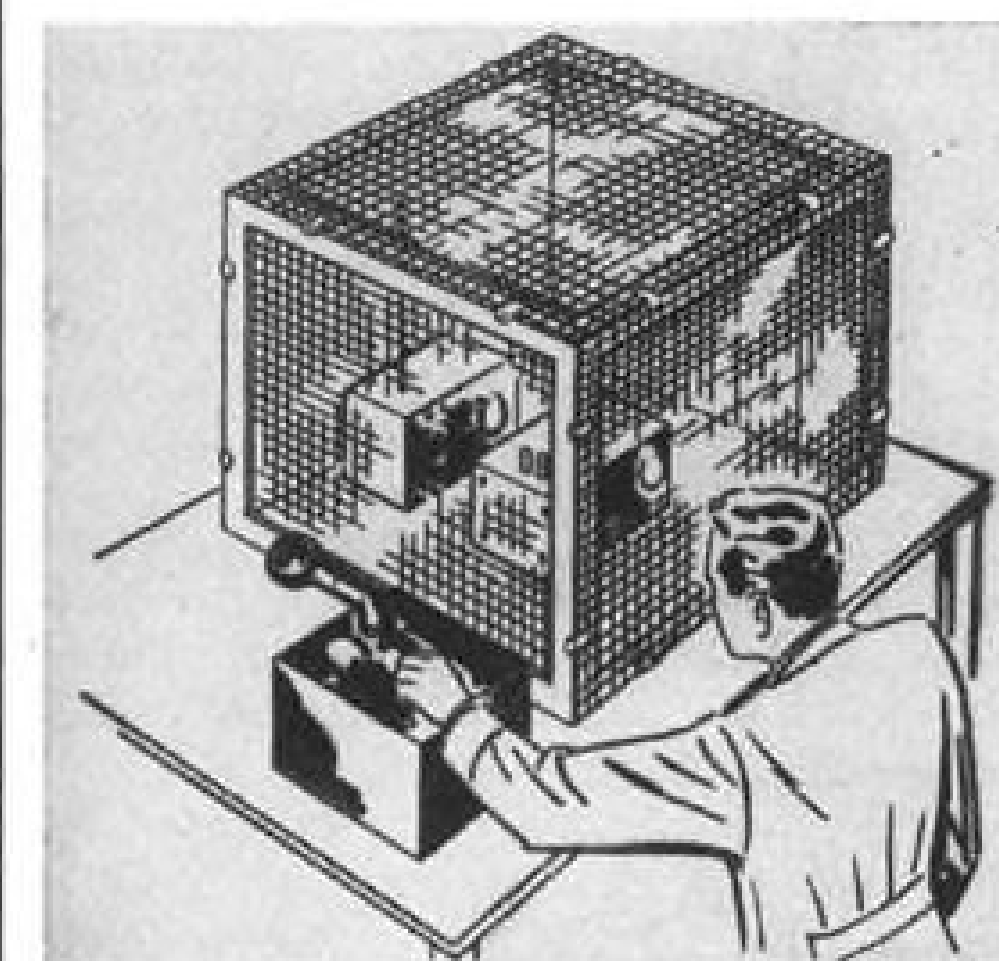
1. The carrier, the aircraft and the crew were properly certificated.
2. The aircraft was loaded to a weight less than its maximum allowable and its center of gravity was located within prescribed limits.
3. The aircraft was airworthy.
4. All ground radio facilities were functioning normally.
5. An instrument flight plan had been canceled and the flight was proceeding in accordance with visual flight rules.
6. The crash occurred during daylight on a fog-covered hillside at an altitude of about 2,600 ft. MSL.
7. The crash site was on the airway and the direction of impact was near the on-course heading.

### PROBABLE CAUSE

The Board finds that the probable cause of this accident was the pilot's attempt to continue flight under the provisions of visual flight rules during instrument conditions.

BY THE CIVIL AERONAUTICS BOARD:

/s/ Chan Gurney  
/s/ Harmar D. Denny  
/s/ Oswald Ryan  
/s/ Josh Lee  
/s/ Joseph P. Adams



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## FINANCIAL

### UAC, C-W Report Postwar Peaks

New postwar peaks in sales and earnings for 1953 are revealed in the separate annual reports for United Aircraft Corp. and Curtiss-Wright Corp.

These two major companies, where engine and propeller production predominates, revealed a number of striking similarities in accomplishments last year and both hold out the promise of sustained good results for the immediate future (AVIATION WEEK Apr. 12, p. 21).

• **United Aircraft** reported total sales in excess of \$817.5 million for 1953, up 22% over the previous year. Net operating income, before taxes, came to \$69.7 million for 1953 as against \$51.4 million for 1952. With an overall tax rate of almost 70% for the last year of the excess profits tax, the company was left with a net income of \$21.2 million for 1953, compared with \$17.8 million for 1952. Last year's net earnings were equivalent to \$6.22 per common share, against \$5.18 for 1952.

Profit margins showed a slight improvement, before taxes, rising to 8.5% for 1953 from 7.7% for 1952. However, after taxes, net profit margins declined to 2.6% from 2.7% for 1952.

• **Curtiss-Wright** revealed total sales of \$438.7 million for 1953, up 34% from the previous year. Net operating income before taxes reached \$35.4 million for 1953, against only \$20.9 million for 1952, a 69% gain. With an effective tax rate indicated at around 68%, also reflecting the last vestige of excess profits taxation, net income for Curtiss-Wright amounted to \$11.4 million for 1953, up from the \$9 million for 1952. Net earnings were equal to \$1.28 per common share for 1953, comparing with 94 cents for 1952.

Profit margins, before taxes, reached 8.1% for 1953, up from 6.4% of 1952. The tax impact can be seen in that net profit margins averaged 2.6% last year, down from the 2.9% of 1952.

► **Progress Payments**—The new government policy on progress payments and its dangers comes in for special mention by Curtiss-Wright, but its importance is evident in both reports.

For example, of total inventories aggregating \$114.6 million at the 1953 year-end for Curtiss-Wright, almost 50% was financed by government partial payments. At the 1952 year-end the same company showed total inventories of \$95.3 million, with 58% covered by partial payments. In both years the actual amount of the partial payments remained about the same, between \$56-\$56.9 million.

United Aircraft's progress payments also remained on the same level for 1952 and 1953, from \$114.2 to \$114.9 million respectively. However, at the 1953 year-end, of total inventories of \$228 million, partial payments represented around 50%. For the 1952 year-end, total inventories were \$215.3 million, with partial payments accounting for 53% of the total.

► **Capital Expenditures**—The two companies also reveal substantial capital expenditures for plant and equipment additions and improvements.

United Aircraft reports that for the four-year period starting with 1950, plant and equipment increased by \$75.9 million before retirements and writeoffs of \$14.9 million. For 1953 the company appears to have increased its fixed assets by more than \$5 million after retirements. Most of United Aircraft's additions to fixed assets during the emergency period are covered by certificates of necessity, as provided for under the tax regulations. An average 75% of the cost is being amortized for tax purposes over a five-year period. Such amortization in excess of depreciation at regular rates charged to income in 1953 was \$5.8 million, comparing with almost \$3.8 million in 1952.

Curtiss-Wright's report does not reveal the detail of capital expenditures for plant and equipment additions for last year or recent periods. An independent check made by this writer, however, shows that for the eight-year period since the 1945 year-end, Curtiss-Wright increased its gross plant account from \$26.1 million to \$72.8 million. Most of this expansion took place during the early part of this period. Only \$3.8 million appears to have been expended for this purpose during the last two years.

► **In Good Shape**—Strong financial positions are evident for both companies. United Aircraft increased its working capital from \$67.6 million at 1952 to \$79.9 million for the 1953 year-end. Curtiss-Wright showed working capital of \$91.3 million at the end of 1953, down slightly from the \$93 million of a year earlier.

Dividend "payouts" were about the same for the two companies. United Aircraft paid a total of \$2.75 per share in dividends on its common stock, or about 45% of available earnings. Curtiss-Wright paid \$2.00 per share on its Class A stock and 60 cents per share on its common. Its total dividend payout averaged 53% of available earnings. United Aircraft is now on a regular 75-

cent quarterly basis. Curtiss-Wright has already declared the full \$2.00 dividend for 1954 on its "A" stock with an initial 15 cents per share on the common.

Backlogs continue very large, assuring sustained volume for the years ahead. United Aircraft last reported total orders of about \$1.5 billion at the 1953 year-end; Curtiss-Wright showed unfilled orders in excess of \$865 million.

Engineering, research and development expenditures continue very high for the two companies. Curtiss-Wright places such expenditures at almost \$47 million for 1953, up from the 1952 total of \$35.7 million. United Aircraft does not reveal a breakdown of such items but they also are known to be substantial.

► **Chance-Vought Operations**—In connection with the proposed segregation and distribution of Chance-Vought Aircraft, United Aircraft reveals for the first time the nature of that division's contribution to overall results. Chance-Vought at the 1953 year-end represented about 11% of United Aircraft's net worth. This division averaged from about 12.7% in 1950 to 15.8% in 1953 of total sales, but contributed 7.4% of 1950 pre-tax profits and 14.5% of 1953's earnings before taxes.

With Chance-Vought emerging as an independent company, United Aircraft and Curtiss-Wright will become more nearly comparable in the nature of their operations. Sikorsky, of course, continues as a major element of United Aircraft, and there is no evidence that this division will follow the course of Chance-Vought in the foreseeable future.

The fact remains that engines and propellers are the backbone of United Aircraft and Curtiss-Wright and both companies have done well in this enterprise.

—Selig Altschul

### Cessna Pays Wallace \$65,000 in 1953

Cessna Aircraft Co. paid its president, Dwane L. Wallace, \$43,333 salary and \$21,667 bonus during fiscal 1953 ended Sept. 30, the firm reports to Securities & Exchange Commission.

Thomas B. Salter, vice president-engineering, received \$24,667 in salary and a \$12,333 bonus; Frank A. Boettger, vice president-finance and treasurer, \$28,000 salary and \$14,000 bonus.

All officers received a total of \$124,983 in salaries and a total bonus of \$60,092.

The firm reports Wallace holds 69,500 shares of stock, Boettger 5,000 and Salter 2,000. Sheldon Coleman, director, holds 800 shares, and Getto McDonald, director, 7,700 shares.







# TWA Pilots Threaten to Walk Out

ALPA fights removal of navigators on Rome-Cairo route, refutes CAA claims of improved air nav aids.

By Frank Shea, Jr.

Trans World Airlines last week faced the possibility of a mass "walk-out" of its entire pilot force as a result of the company's action calling for removal of navigators from all aircraft flying the Rome-Cairo Mediterranean route.

First flights without navigators are scheduled to go into operation this week. TWA's international pilots have served notice that they will not board the plane without a navigator and threaten a general work stoppage if the company attempts to compel them to fly.

► **1,400-Man Walkout**—Initially, the problem centered around the international pilots only. But last week, at a master executive council committee meeting of the Air Line Pilots Assn., TWA's domestic pilots made it their problem too. Standing firmly behind the international group, they passed a resolution whereby all Trans World pilots, 1,400 strong, would walk out if they were required to fly the Mediterranean routes without benefit of navigators.

The airline management, on the other hand, stands just as firm, insisting that the navigators will be taken off the crews this week. Company officials met with pilot representatives last Monday, but neither group would budge. Management said the navigators definitely "will be removed." The pilots countered with, "We won't fly."

► **Safety Argument**—The pilots base their argument on the safety factor involved, holding that the running of flights over the Mediterranean between Rome-Cairo and Rome-Lydda (Lod) Israel, relying on present navigational and communications facilities in that area without aid of a navigator, would be an unsafe operation.

"We're not necessarily sticking up for the navigators in this fight," reported a pilot spokesman. "All we know is that we need them badly in the Mediterranean area. We can't rightfully accept our command responsibilities without them."

► **CAA Backing**—The company, on the other hand, had Civil Aeronautics Administration's backing in the matter. A CAA staff of aviation safety advisors, headed by Theodore Eckis, recently returned from a tour of the area and reported that "slowly and continuously improving" navigational facilities in the Mediterranean area now are sufficient

to permit operations without navigators aboard the flights.

The agency based its recommendation for removal of navigators on the following:

- The Technical Assistance Mission of Greece has provided several high-powered beacons and advanced communications facilities in and around Athens.

- Radio ranges have been reconditioned at Cairo.

- A new non-directional radio beacon has been installed at Alexandria.

- Two high-powered beacons are at strategic points on the island of Crete.

- Another high-powered beacon has been installed on the island of Rhodes.

In addition, CAA reported that frequency assignments have been adjusted by various governments in the area and that the former difficulty of finding a clear channel for radio transmission has been cleaned up.

► **No Improvements?**—Pilots flying the routes, however, professed complete amazement at these statements. Their operational reports indicate that no additional facilities of any consequence have been provided since CAA's July 1953 study, in which it was recommended that navigators be retained because of "inadequate facilities."

They further argued that CAA fails to be specific in listing "new" improvements, "because CAA realizes that there actually haven't been any since their last adverse decision." As one pilot put it: "If anything new has been added, it would sure help if the pilots knew about it."

► **Point by Point**—The pilots took CAA's list of recent improvements and refute them, point by point. Here's their story:

- The only improvement in Greece since July 1953 was an increase in the

wattage output of the Athens range from 800 to 1,200 w. But this had to be brought back down to 800 w. due to interference with the frequencies of other countries. The result, said the pilots, was no improvement in Greece.

- As far as reconditioning of radio ranges at Cairo is concerned, pilots claimed it was "news to us unless CAA considers polishing and oiling the equipment as 'reconditioning'."

- The beacon at Alexandria is not new. It was there prior to July 1953.

- There have been no changes in facilities on the islands of Crete and Rhodes since July 1953. In addition, present facilities on these islands have frequently been found "inoperative" or "off the air" when aircraft are attempting to establish contact.

- Frequency assignments are constantly being adjusted by various governments in the area, but to no avail.

- The difficulty of finding a clear channel for radio transmission still exists.

► **Ditching Problem**—The pilots also said there is a distance of approximately 500 miles between Crete and Alexandria over open ocean with no facilities whatsoever. From Catmazar, Italy, to Alexandria, they argued, there is a distance of over 1,000 miles with no islands or navigation-communication facilities.

"If I have to ditch my airplane over all that water," said one spokesman, "I want to be able to get a fix on my location and be able to tell someone where to come and look for me. I exercise a tremendous responsibility over human lives, and I cannot conscientiously insure the safety of my passengers without the aid of a navigator."

► **Recommendations**—In a special report, TWA international pilots make the following recommendations:

- Development and establishment of reliable, interference-free, full 24-hour operating radio aids to navigation over every route flown by TWA international.

- Installation of more VOR stations enroute and at terminals, and improvement of the reliability of and continuous operation of VORs in existence at Paris and Rome (pilots report facilities are not in continuous operation).

- Improvement of and reliable full-time operation of ILS facilities at all terminals.

- Continuance of the present crew complement, including radio operator and navigator, over all TWA routes unless it is established to the satisfaction of the majority of pilots flying those routes that, segment by segment, the facilities are adequate.

One major criticism of CAA's action in recommending removal of the navigators over the Mediterranean is that the pilots concerned were never

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consulted. Pilots claim that their views never were solicited, and that when they were offered CAA refused to listen. Pilots note that, according to CAA regulations, pilots must be consulted prior to any new route approvals including crew changes.

Repeated efforts by AVIATION WEEK to obtain the viewpoint of TWA officials were unsuccessful. A company spokesman reported that the man "most familiar with the situation" was enroute to the Midwest and was not available for comment.

Pilots said the company's chief motive is economy, noting that not only would the navigators' salaries be saved but also absence of a navigator's station aboard the Lockheed Constellation 749A would leave room for an additional eight passengers.

## Union Attacks ATA In CAR Cockpit Fight

Flight Engineers' International Assn., representing about 1,500 engineers on the nation's airlines, has attacked the entrance of the Air Transport Assn. (AVIATION WEEK Apr. 5, p. 86) into the fight for revision of Civil Air Regulations.

William D. Kent, FEIA president, calls the matter "a five-year jurisdictional dispute within the AF of L" between his organization and Air Line Pilots Assn. At issue is the role of the flight engineer in the cockpit of all four-engine aircraft that require a flight engineer.

► **Regulation Change**—"We have tried for five years to settle the dispute within the body of AFL and directly between us and the pilots without success to date," Kent says. "However, the matter is before the AFL Executive Council now and will be resolved shortly . . ."

"It is our view, that the Civil Aeronautics Board has exercised sound

judgment in adopting sound safety regulations in the new Part 40 after due process of many hearings, briefs, comments and arguments. The new regulations do not incorporate all of the changes which we felt were necessary or desirable but they are sound and a great improvement over the old rules."

The provisions of the act in question deal with:

- Need for a crew member familiar with the flight engineer's duties to provide emergency coverage should the engineer become incapacitated.
- Requirement that a certificated flight engineer be a member of the crew on certain aircraft.
- Qualifications of the airman who gives an engineer a flight check required by Part 40.
- Recent experience requirements and necessity for a flight check of an engineer.

CAB's amendments became effective Apr. 1 when it denied ATA's request for a 90-day postponement. The Board found that ATA's petition failed to give any specific instance in which the relationship between the pilot-in-command and the flight engineer became so strained that an unsafe condition was actually created.

It adopted Part 40 of the regulations Apr. 1, 1953, which initially was to become effective Oct. 1, 1953. This was subsequently extended to Oct. 1 and later to this month, one year after CAB originally approved the amendments.

► **Strike Halted**—Eastern Air Line pilots, one of the major participants in the controversy (AVIATION WEEK Mar. 22, p. 72), immediately voted to strike but were stopped when the National Mediation Board docketed the case under terms of the Railway Labor Act.

NMB will mediate the case, probably in Miami, although it has not yet set a date for the proceeding. Eastern pilots mainly question an interpretation of new amendments they believe would

restrict the authority of the pilot and require his holding a flight engineer's certificate.

► **FEIA Arguments**—CAB has circulated ATA's proposals to the industry for comments to be submitted to the Board before June 1. FEIA is busy preparing its arguments on the question now.

"The connection between ATA's attempt to relate the AFL jurisdiction case between FEIA and ALPA in some manner to the work aboard the airplane or to the Civil Air Regulations completely escapes us," the union president maintains.

"ATA's references to 'unfavorable cockpit atmosphere,' 'fences in the cockpits' and 'seriously unsafe conditions in scheduled air transportation' are belied by the every-day operation of cockpit teams consisting of the finest airmen in the world's safest transportation system," he adds.

"That ATA should engage in this campaign to undermine the work of CAB and all interested parties in arriving at new, better safety regulations and simultaneously frighten the public by alleging an unsafe condition aboard the airplanes it expects passengers to ride is an unwarranted attack."

► **Jurisdiction**—In its petition the airline organization claimed FEIA continually had maintained that the flight engineer's panel is "wholly within their jurisdiction and not subject to the direction of the pilot." Kent labels this "an absolute lie."

"We have never taken such a position," he says. "The jurisdiction referred to obviously has nothing to do with the labor jurisdiction problem within the AFL. The CAB's interpretation one on Part 40 makes it clear that the pilot-in-command authority extends to every part of the airplane and every crew member and passenger. We have never questioned that fact. We agree with the CAB's interpretation."

"We are opposed to the elimination of the flight engineer certificate proposed by the 12 airlines for holders of commercial pilot certificates," he continues. "If the obtaining of a flight engineer certificate is so simple for holders of commercial pilot certificates, they should not object to meeting the requirements as all flight engineers have done heretofore and dashing off the written and practical examinations set up by regulations and the CAA."

► **FEIA Position**—Kent maintains, "The American public and the U. S. government should not have to shell out tax money for flight engineer licenses for pilots who do not require them to perform their function as pilots. Neither should the airline managements be blackjacked into having to shell out the millions of dollars it would require to obtain flight engineer certificates for all of the pilots."

"On the question raised by ATA on the checking of flight engineers," he says, "it is our position that crew coordination may be checked for all flight crew members by the check pilot. The check of the individual competency of each specialist airman as to his technical proficiency must be done by a check airman who has the certificate of the airman being checked and who is actively engaged in the same occupation as the airman being checked. . . ."

"We hope that ATA doesn't broadcast to the travelling public that they consider a man qualified if he has as little as 50 hr. in the preceding 12 months. The new Part 40 safety rule requiring 50 hr. in the preceding six months is a wise safety regulation and we support it. The required flight check or simulator check for a man who becomes delinquent in this requirement is an absolute necessity. . . ."

## CAB ORDERS

(Apr. 9-15)

### AUTHORIZED:

Trans-Texas Airways to omit service at Lufkin, Tex.

### DENIED:

Southwest Airways Co. motion to defer final decision in the Bonanza Air Lines certificate renewal case for simultaneous decision with Southwest's certificate renewal case.

Flight Engineers' International Assn., Continental Air Lines Chapter (AFL), petition for leave to intervene in the Continental-Pioneer Air Lines merger case.

Kokomo, Ind., Board of Aviation Commissioners and Kokomo Chamber of Commerce petition for leave to intervene in American Airlines Chicago-Detroit route investigation.

Empresa Guatemalteca de Aviacion petition to assign its application for foreign air carrier permit and simultaneous decision with the renewal application of TACA International Airlines S. A.

Riddle Airlines petition for reconsideration of its application to serve Philadelphia.

### DISMISSED:

Air Carrier Mechanics Assn. petition for relief of one of its members, alleging that Braniff Airways wrongfully is withholding certain benefits to which the employee is entitled.

Slick Airways and William E. Hollan's joint application for approval of interlocking relationships arising from Hollan's positions as vice president of Slick and director of Dorval Air Transport.

### APPROVED:

Intercompany agreements between Braniff Airways and Western Air Lines and various other air carriers.

Temporary suspension of interchange service involving Continental Air Lines and United Air Lines between Seattle, Wash., and Tulsa, Okla., from Apr. 25 to Aug. 21.

### ORDERED:

Investigation of Transocean Air Lines fares between Guam Island and Honolulu. Temporary certificate of public convenience and necessity be issued to Samoan Airlines, Ltd.

Issuance of a foreign air carrier permit to Lineas Aereas Costarricenses, S. A.

Approval of present and future interlocking and common control relationships resulting from R. E. McKaughan's positions as president and director of Trans-Texas Airways while holding identical offices in the Houston Transportation Co. plus substantial control of both companies.

### EXTENDED:

Suspension period of family plan fares of Currey Air Transport, Great Lakes Airlines and Monarch Air Service for further investigation from Apr. 20 to July 19.

Suspension period of reduced local and joint fares proposed for States-Alaska service by Alaska Coastal Airlines, Ellis Air Lines, Pan American World Airways, United Air Lines, Western Air Lines and West Coast Airlines.

### GRANTED:

Riddle Airlines application for extension of an exemption that would authorize operation between Sarasota-Bradenton, Fla., and New York.

### FIXED:

Final mail rate of Pioneer Air Lines. Temporary mail rate of Southwest Airways Co.

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Air travel tax is \$5 less on each \$100 purchase as a result of the reduction in the transportation tax from 15% to 10% on Apr. 1.

Here are the changes in ticket costs over major routes:

	Previously		Since Apr. 1.	
	Regular	Coach	Regular	Coach
New York-Chicago . . . . .	\$51.87	\$37.95	\$49.61	\$36.30
New York-Dallas . . . . .	102.35	72.45	97.90	69.30
New York-Los Angeles . . . .	181.53	113.85	183.64	108.90
New York-Miami . . . . .	88.21	58.08	84.37	55.55 (day)
New York-Boston . . . . .	13.97	10.81	13.37	10.34
Chicago-Seattle . . . . .	131.96	102.35	126.23	97.90
Chicago-Miami . . . . .	92.23	62.56	88.22	59.84
Los Angeles-San Francisco . .	25.36	15.53	24.26	14.95
New York-Washington . . . .	16.56	12.77	15.84	12.21

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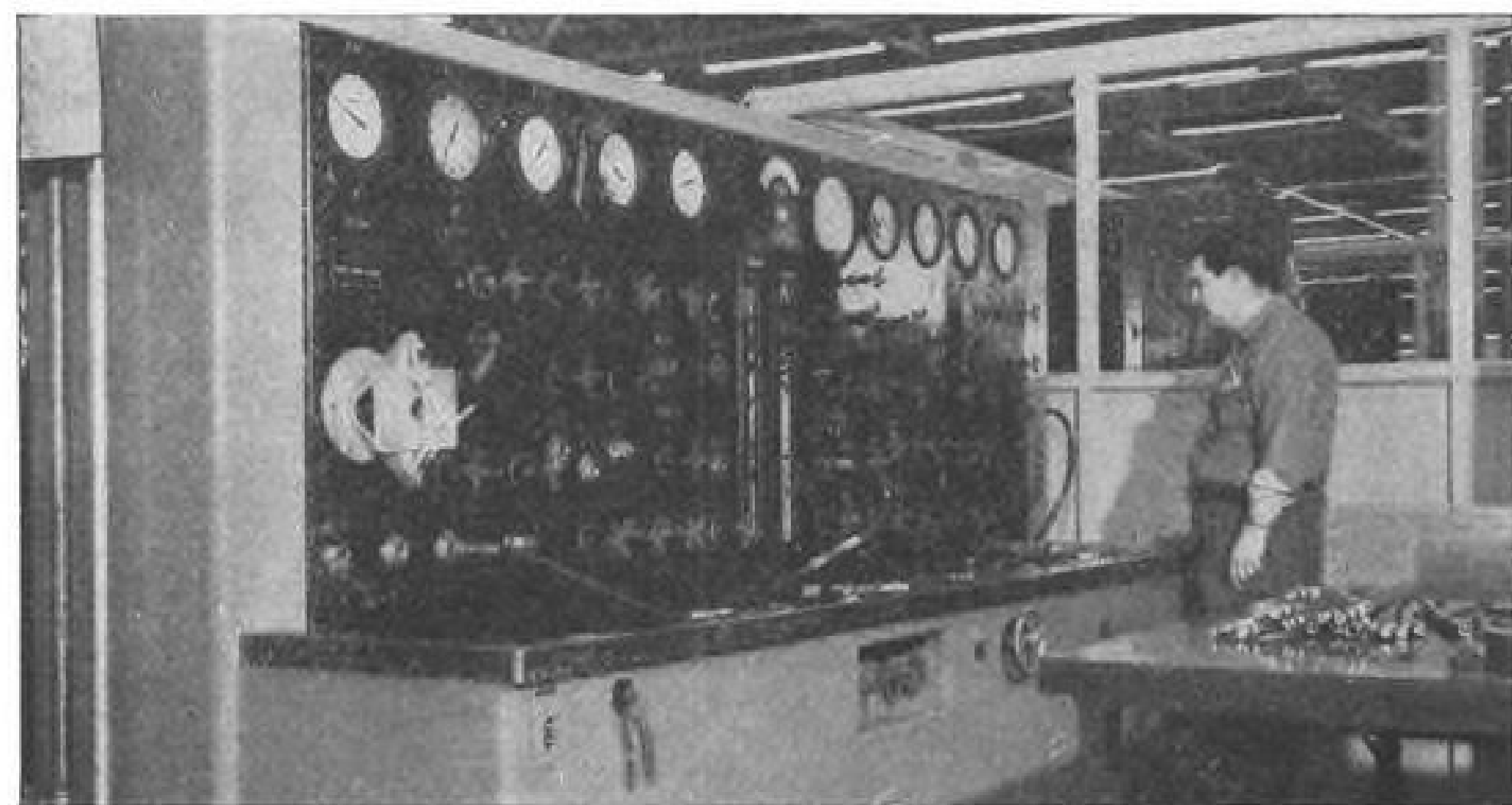
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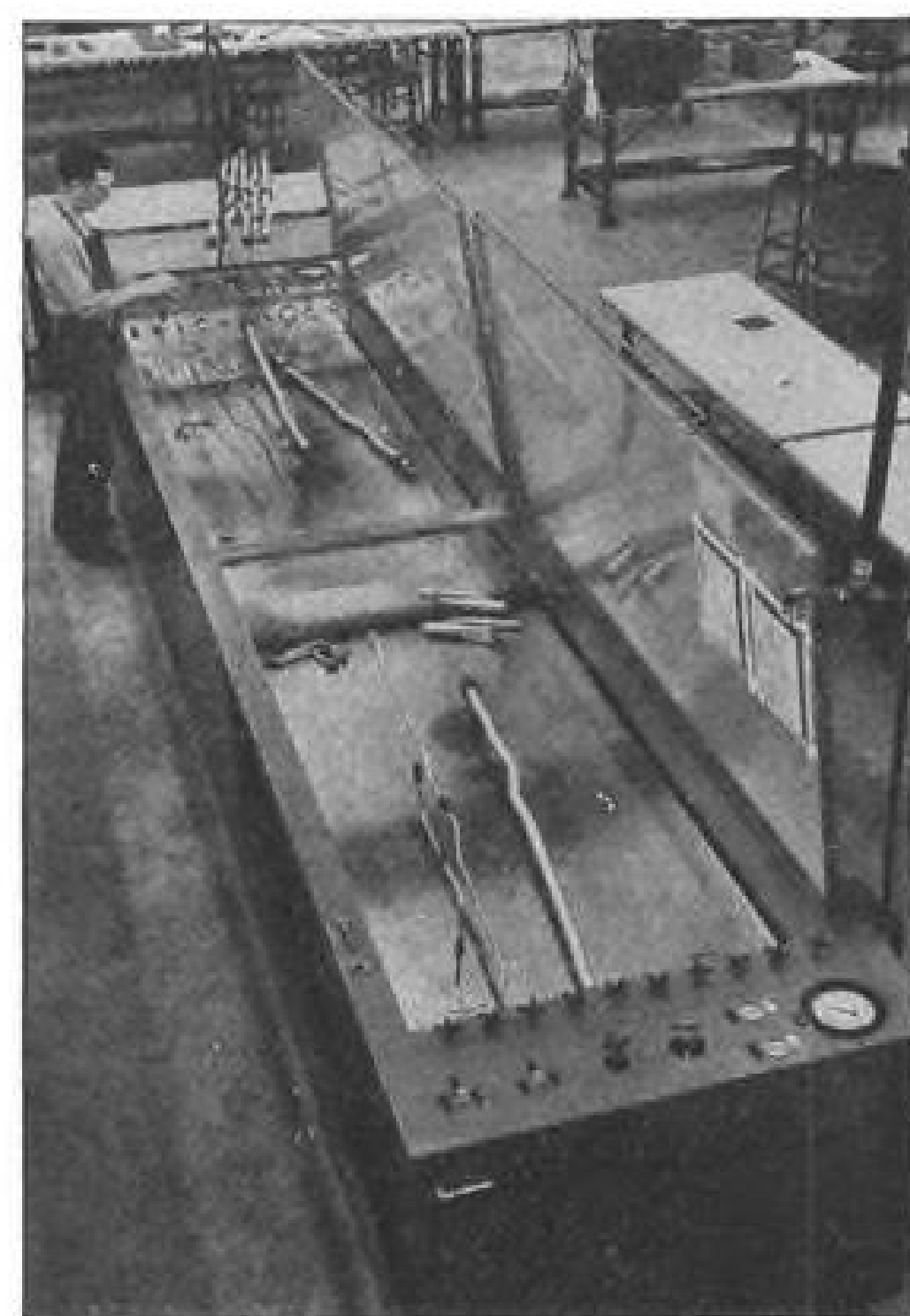
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## Feeder Subsidy

- Damon says trunks may have to help pay locals.
- TWA chief emphasizes need for new transport.

Los Angeles—Trans World Airlines president Ralph S. Damon predicts that in some future government economy wave the cost of subsidy for local service carriers might be assessed against trunklines.

This move is possible, he says, because of the important place feeder airlines occupy in the domestic air transport route structure.

"They are to the airline industry what rural free delivery is to the Post Office," the TWA chief executive told Lockheed Aircraft Corp.'s Management Club (AVIATION WEEK Apr. 19, p. 7). "In other words, they are the thin capillaries which help to supply to the body the thick blood from heavy arteries of the trunk airlines."

► **Income vs. Cost**—Major problem of feeder airlines, Damon says, is that of economics: "Because travel is lighter on the local service lines, the income is less and unit costs higher and the need for financial help greater."

To help cut costs, the local service airlines need a good twin-engine transport that can be operated more economically than those now in use, the TWA chief says.

"A number of attempts have been made to meet this need, mostly by skimping on plane or crew specifications; but this won't work."

Regularity and reliability of service on regional carriers are too important, Damon states, adding that this means all-weather operation, just as on trunk airlines.

"That in turn means more than one engine, more than one pilot, a full complement of radio and instruments, and something brand new, perhaps even revolutionary, in the way of plane design," he says.

► **Copter Interest**—Damon says aircraft manufacturers have been frank to admit they see no great or continuing market for their product with feeder airlines.

"Many of the local service carriers have expressed interest in using helicopters in combination with the airplanes they now have on hand—mostly obsolete DC-3s—rather than to make heavy expenditures to buy new and more efficient aircraft," he says.

► **Revenue Gains**—The trend upward in passenger revenues in the past three years has been encouraging, Damon reports. Last year the 14 local service airlines derived 47 1/2% of their total rev-

enues from passengers and about 49% from mail, with the balance from express and freight.

But feeder carriers have received more than 38% of the total domestic airline payment while carrying only about 1 1/2% of the total domestic mail ton-miles, he says.

Damon points out that the amount paid to the local service lines for carrying the mail is more than 45 times as much per ton-mile as the amount paid the domestic trunklines.

► **Route Planning**—Part of the economic problem can be answered with wise route planning, the TWA executive declares.

"The primary purpose of the local service carriers should be to connect many small communities with trunkline terminals," he says. "A local service line that starts with a trunkline terminal and then peters out somewhere in the hinterlands, with no place to go except back, is in a poorer position than one connecting intermediate points between two good terminals."

A multi-stop chain service between a number of small communities is not of much value unless it also provides service between them and a trunkline, he says.

"Anyone who has ever had to travel off the trunk airline routes will probably support me when I say that the local service air carriers in the United States provide better transportation than that of any surface carrier," Damon states. "The biggest problem is to find a way to continue and expand this excellent service at an economical cost."

—WJC

## SHORTLINES

► **Air India** plans to extend its international service from United Kingdom to U.S., increase flights from India to U.K. and possibly East Africa, and begin operations to Hong Kong, Tokyo and possibly Australia. All of these routes are among immediate development plans of the nationalized air transport corporations.

► **Saudi Arabian Airlines** has begun twice-weekly service between Dhahran and Beirut, running Wednesday and Friday mornings. It is a government-financed company, using DC-4s with American pilots.

► **United Air Lines** has begun DC-6 air-coach service between Washington and the Pacific Northwest, making the nation's capital the 19th city on the company's 80-city system to receive this service . . . UAL has expanded its DC-4 cargo service to include Salt Lake City.

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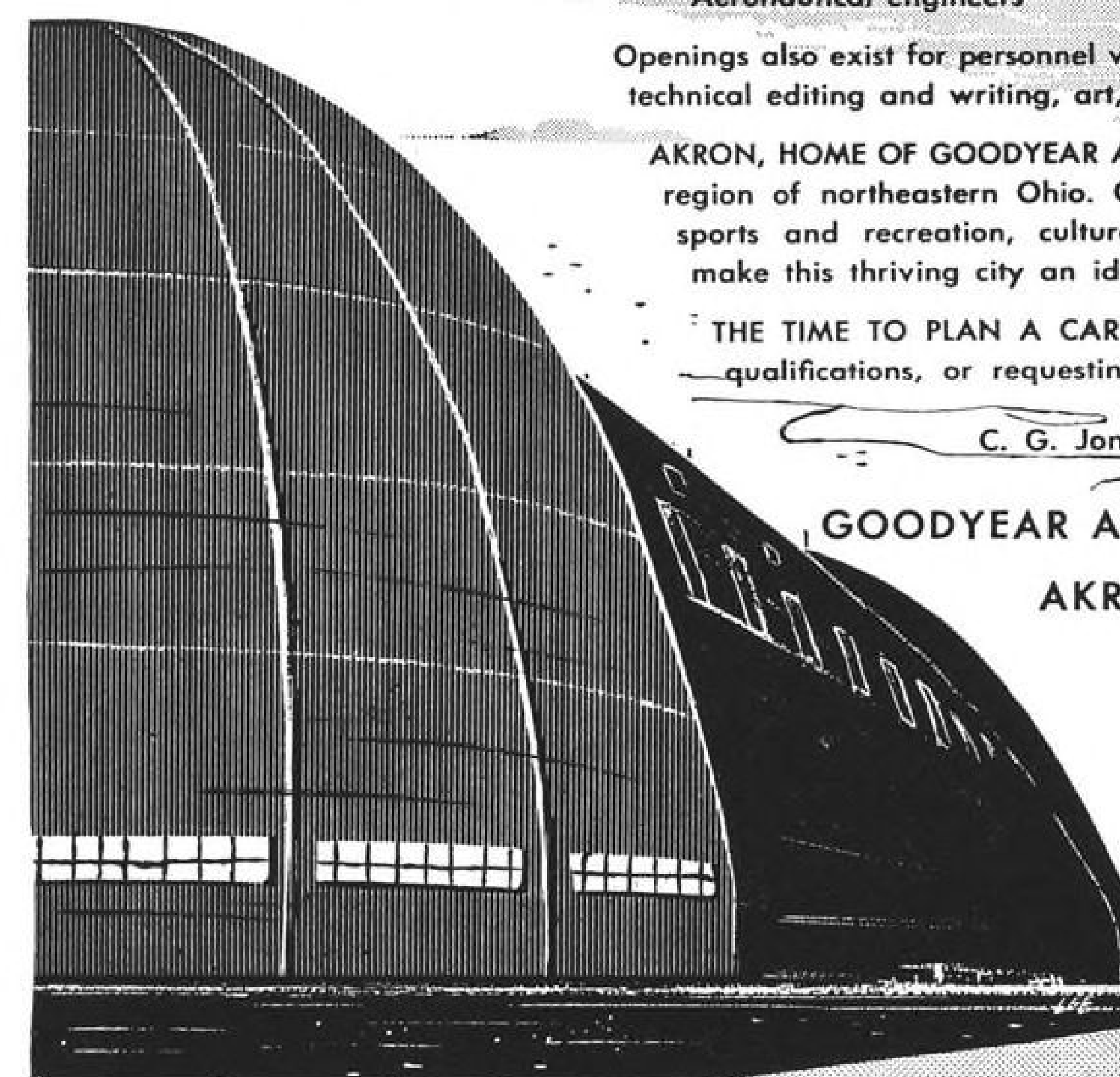
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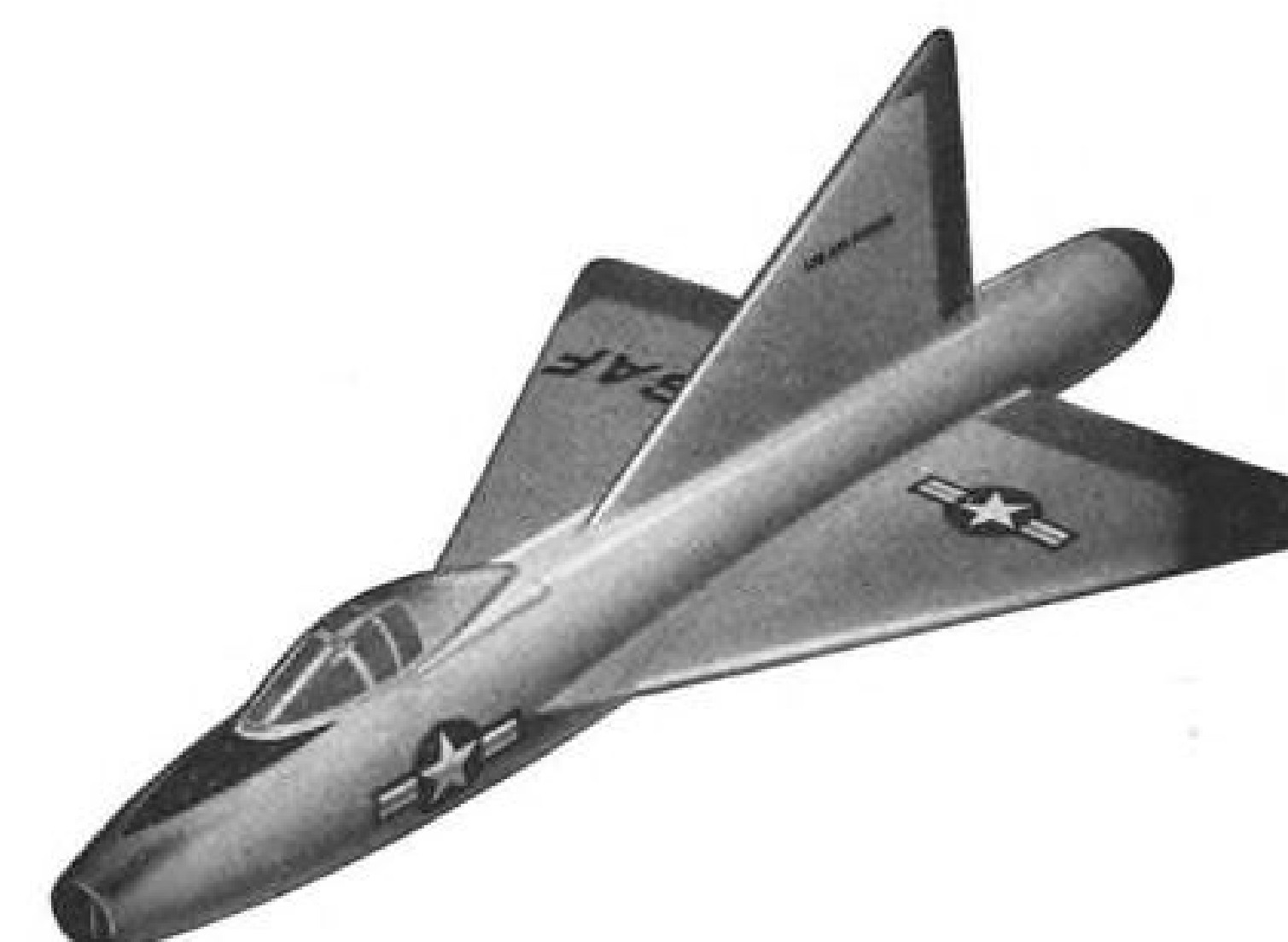
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## COCKPIT VIEWPOINT

By Capt. R. C. Robson

### Prop Problems—or, Flat-World Thinking

The remarks made here on automatic propeller feathering (AVIATION WEEK Feb. 22) prompted comments from aviation people which ranged from here to there. My evaluation of this device, in case you just tuned in, can be summed up: "It stinks." Since that writing, this gadget, true to form, has failed several more times.

Hand-in-hand with the feathering proposition is the case against "automatic" propeller reversing. This subject produced some trying days in the airline industry a few years back when some unwanted reversals caused nasty black headlines. At that time, the short-circuiting culprit was soon isolated. But another—and more important—problem remains. It is caused by an entirely different kind of short circuiting, one that is most aptly described as a "flat world" mentality.

► **Didn't Add Up**—This term needs a bit of explaining. A thousand years or so ago, leading scholars and geographers believed they lived on a flat world. This thinking raised hob with things in general—navigators couldn't seem to arrive at the places they aimed for, actually couldn't even aim—because the calculations just didn't add up. So transportation, and consequently life, stayed put.

Today's aviation world still is hampered now and then by this same type of "dead reckoning." This brand of thinking—and I use the word loosely—produces theories which adversely affect many things, in this instance propeller reversing.

As the situation stands, the reverse lock mechanism is actuated by a micro-switch on one or more landing gear struts. Strut compression after landing closes the switch. For many reasons this system is far from fool-proof. The delicate plunger and spring components are subject to considerable jarring each time several tons of airframe contacts the runway at high speed, and the unfavorable physical location, with its exposure to all manner of foreign matter, makes for a certain amount of disorder.

► **How They Occur**—Reversals continue to occur in the air because of haywire operation. Hard landings, followed by bounces, have broken the backs of several aircraft when reversal occurred on the ground and continued to the crest of the bounce, and many times the device fails to unlock after landing, whereupon there ensues a wild cockpit scramble to grab the manual override.

With all this nonsense, one would suppose the sensible solution would be to eliminate this "automatic" unlock in favor of a manual one.

Now picture, if you will, a typical cockpit. Notice the number of lethal weapons the pilot already has at, or for, his disposal. The gear can be pulled up at the ramp; switches or mixtures can be cut on takeoff; deicers left off in icing conditions, or the pilot can dive at top speed into thunderstorms, mountains or buildings for he has easy access to the stick and throttles.

► **Many Combinations**—In short, there are a hundred disaster-producing combinations. But do you know something? Relatively few pilots engage in this type of sport. Yet some in CAB still insist that giving the pilot one additional gadget is dangerous. Really, fellows!

Please note that the argument is not being made that I am against automatic devices per se. But if an automatic device has proved itself erratic and, therefore, dangerous, it is foolish to refuse a change by saying that the pilot is incapable of proper operation. Automatic devices can be better than humans, if they work properly and are fail safe. If not, they can be worse. But flat-world thinking can be even worse.

## AVIATION CALENDAR

- Apr. 29—Institute of Navigation, eastern regional meeting, Friendship International Airport, Friendship, Md.
- May 5-7—Third International Aviation Trade Show, managed by Aircraft Trade Shows, Inc., 71st Regiment Armory, New York.
- May 6-8—Institute of the Aeronautical Sciences, first annual West Coast Industry-Faculty Conference and fourth annual West Coast Student Conference, Los Angeles.
- May 7-8—National Intercollegiate Flying Assn., air meet, University of Illinois, Urbana, Ill.
- May 10-12—Institute of Radio Engineers, National Conference on Airborne Electronics, Biltmore Hotel, Dayton, Ohio.
- May 10-13—Society of Aeronautical Weight Engineers, 11th annual conference, Lord Baltimore Hotel, Baltimore.
- May 11—Daniel Guggenheim Medal Board of Award, annual meeting for preliminary selection of 1954 candidates, Engineering Society Building, New York.
- May 14-17—American Volunteer Group (Flying Tigers), biennial reunion, Belmont Plaza Hotel, New York.
- May 16-19—American Association of Airport Executives, convention, Louisville, Ky.
- May 17-18—National Fire Protection Assn., Aviation Seminar, Hotel Statler, Washington, D. C.
- May 17-20—Basic Materials Exposition and Conference, International Amphitheater, Chicago.
- May 20—Women's National Aeronautic Assn., 1954 Skylady Derby for stock model aircraft of 300 hp. or less, Raton, N. M. to Kansas City, Mo.
- May 21-22—Operations Research Society of America, second annual meeting, Edgewater Beach Hotel, Chicago.
- May 21-23—Texas Private Fliers Assn., state convention, Galvez Hotel, Galveston.
- May 24-26—National Telemetering and Remote Control Conference, sponsored by IRE, AIEE, IAS and ISA, Morrison Hotel, Chicago.
- May 31-June 11—Canadian International Trade Fair, to be held in conjunction with the National Air Show and Canada's Aviation Day, Toronto.
- June 2-4—Triennial industry inspection of NACA's Lewis Flight Propulsion Laboratory, Cleveland, Ohio.
- June 5—Fifth annual Maintenance and Operations Clinic, sponsored by Reading Aviation Service, Inc., Reading Municipal Airport, Reading, Pa.
- June 5-12—Philadelphia Junior Chamber of Commerce, second annual Transcontinental Air Cruise for stock model aircraft of 300 hp. and less, Philadelphia to Palm Springs, Calif.
- June 9-11—American Society for Quality Control, eighth annual convention, Jefferson Hotel, St. Louis.
- June 21-24—Institute of the Aeronautical Sciences, annual summer meeting, IAS Building, Los Angeles.
- June 24-26—American Helicopter Society, 10th annual forum, Washington, D. C.
- Sept. 4-6—National Aircraft Show, Dayton, Ohio.

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## EDITORIAL

### An Industry's Conscience

(Wherever we go around the country, readers express their interest and surprise at the free expression of opinion on this page. They also are surprised to find any editorials in an aviation magazine that point out anything wrong with aviation. The publishers of AVIATION WEEK deserve the laurels, not the editors. The widest freedom given the editors is a powerful ingredient for successful journalism—successful not only in income but in such intangible qualities as reader respect and influence. This freedom makes it possible for the editors to formulate and carry out such a platform as the one below. This creed was first published here Aug. 6, 1951. Since then, we have acquired thousands of new readers, and we reproduce the following thoughts especially for them.—RHW.)

#### Criticism

First, criticism here is always meant to be constructive. We want aviation to progress. We have unbounded faith in aviation's future. But although this is an aviation business paper, we don't have the editorial attitude that everything about aviation is perfect, or that we defend industry whether it is right or wrong. We are the apologist for no group within industry; nor are we anyone's tub-thumper. If we had wanted to "play it safe," AVIATION WEEK would have discontinued its editorial page long ago, as some business magazines have done. But in that case we would always follow industry, seldom nudge it forward, and never lead it.

#### The Platform

The crux of our editorial policy is to encourage the utmost development of aviation to serve safely and efficiently the most people at the lowest cost. We think this can be done only by private initiative in the free enterprise system.

The paragraph above covers military as well as commercial aspects of aviation. Today we refer mainly to commercial aviation.

#### Safety

Aviation must strive vigorously, relentlessly, and forever, for greater safety. It is the top problem, always.

#### Subsidies

We are against any subsidies that can be avoided, or those that are not diminished as soon as the infancy phase passes for any segment of the business. Subsidies should be reduced at the most rapid possible rate that good business methods and improving income will permit.

#### Competition

We favor competition in both manufacturing and transport. We shall always urge a fair hearing to those who ask an opportunity to do a better job at less cost. Monopolists in business should be allowed to have no monopolies in ideas. If newcomers can show they can set up a yardstick for the oldtimers, give them a cautious trial, and let them in if the old guard refuses to improve its ways. Few companies or industries operate at maximum efficiency without competition or threat of it. Progress is made by those who are

perpetually dissatisfied with the status quo. Aviation abhors the status quo as nature abhors a vacuum.

Because we believe this, we supported the airfreight lines in their long fight for certification. We have supported a trial for the non-mail passenger carriers for similar reasons. If any of them succeed in carving a niche for themselves, creating a new market and serving it, they should stay.

#### Government

Our attitude toward government—whether it be CAA, CAB, the Air Force, or the President of the United States—is that fundamentally government is the servant—not the master—of the people.

One of the obligations of the press is to reflect the will of the people. We have confidence in public opinion and in the intelligence of Americans. We hope to lose few opportunities to bring to light any public servant who gets too big for his job and fails to remember his proper place in the scheme of things in this democracy. Let him not forget who pays him, and why. The people have a right to honest, conscientious, and able service on the part of those in their government. They have a right to expect decisions based on public service, not on politics and self-ambition. They furthermore have a right to know what their government is doing and how their money is being spent—except for the most secret national defense work.

#### Government Regulation

We are for all possible industry self-regulation and as little government control as possible. The more independent of government subsidy an industry is, the stronger can be its arguments for self-regulation. The better an industry's product is, the less excuse government has for taking over industry or any part of industry's job. In transportation, we believe CAB has done more to retard commercial aviation in the past four years than it has done to advance it. In manufacturing, trends toward more aircraft designing by government rather than industry have alarming possibilities.

#### Service & Lower Rates

Aviation cannot continue to lure new patrons from surface transport, or persuade others to use aviation for business they otherwise would not conduct at all, unless rates for all air services remain low or drop in relation to other transportation. So we have little patience with those who seek to jack up rates to the public merely to pile profits on profits. The big profits will come, but only if aviation becomes mass transportation.

We have dinned away for maximum development of air-coaches, because they discourage unnecessary frills and bring lower fares and mass transportation that much nearer.

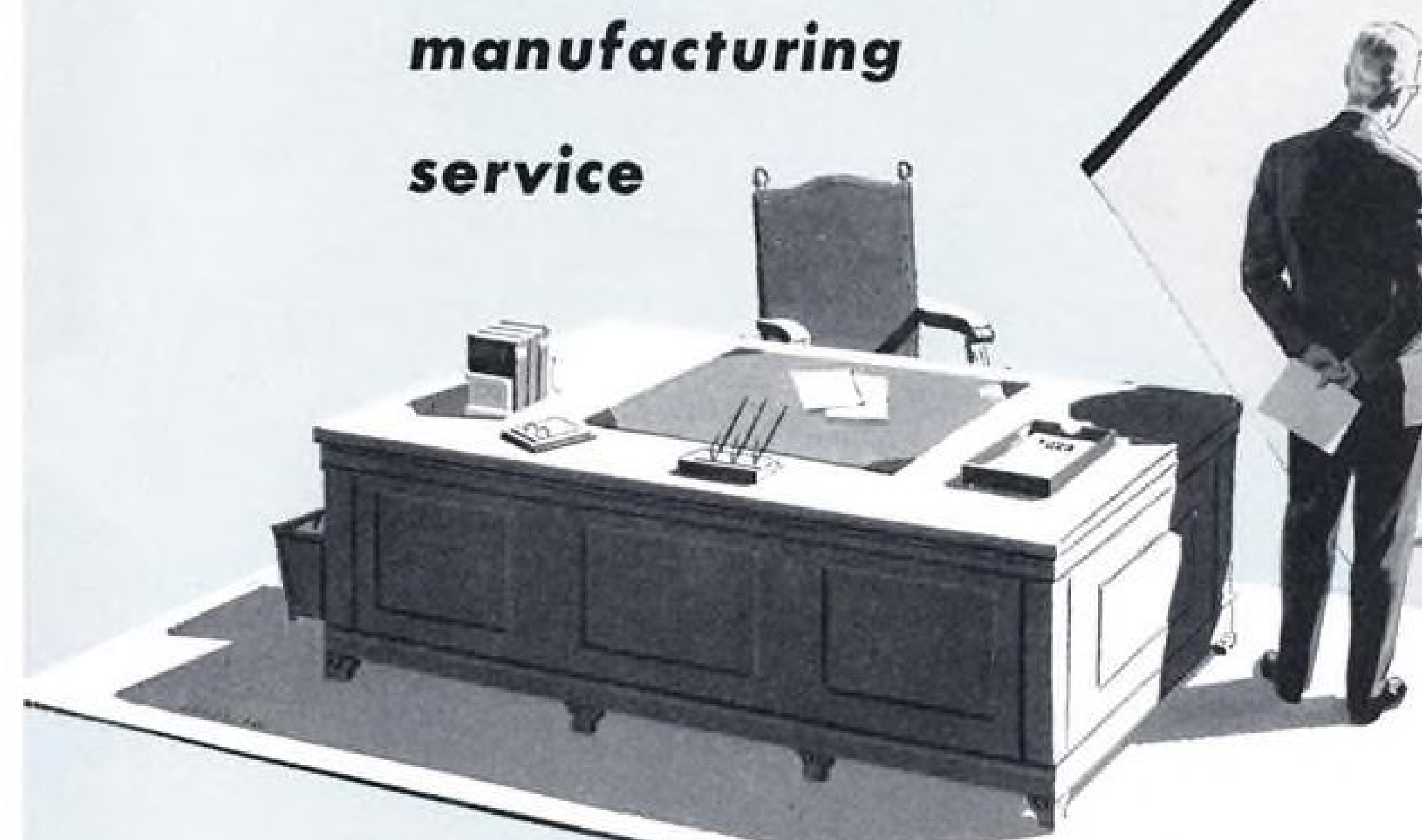
#### Public Welfare First

An industry that puts its own interest ahead of the public's is doomed to a sad awakening. Sometimes this fateful day comes swiftly; sometimes it lurks hesitantly in the background for years. But it always comes. So, we view AVIATION WEEK as more than a chronicler, analyst, teacher and missionary. Perhaps its editorial page can also be an industry's conscience.

—Robert H. Wood

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