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SEPT. 14, 1953

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Aviation Week

Volume 59 September 14, 1953 Number 11

Editorial Offices: 330 W. 42nd St., New York 36. Tel. Longacre 4-3000
National Press Bldg., Washington 4, D. C. Tel. National 8-3414

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Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

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AVIATION WEEK • September 14, 1953 • Vol. 59—No. 11
Member ABP and ABC

Published weekly by McGraw-Hill Publishing Company, James H. McGraw (1860-1948), Founder. **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**
Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Vice-President and Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.
Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 North Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 36, N. Y. Allow 10 days for change of address.
Subscriptions are solicited only from persons having a commercial or professional interest in aviation. Position and company connection must be indicated on subscription orders.
Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada $8 a year; $12 for two years; $16 for three years, payable in Canadian currency at par; other Western Hemisphere, $10 a year; $16 for two years; $20 for three years. All other countries $20 a year; $30 for two years; $40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A.

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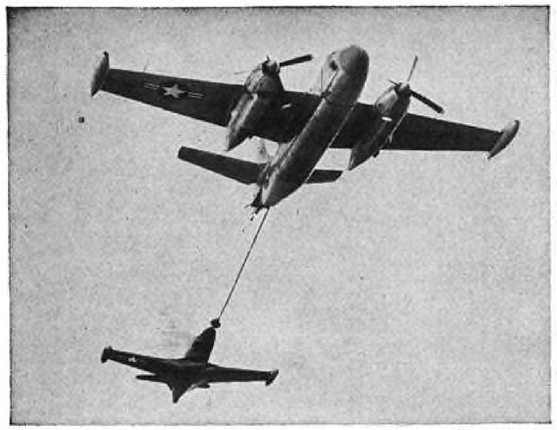
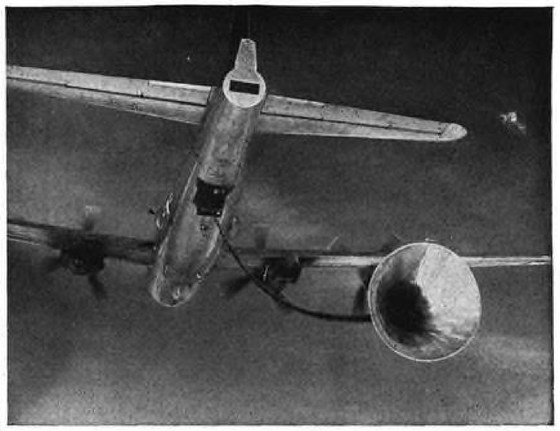
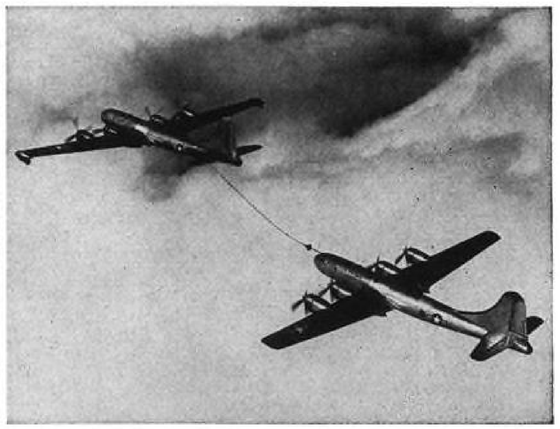


FLEXIBLE. Requires only normal formation flying proficiency, even in rough air, to maintain contact.



PRACTICAL. No special operator required; contact is simpler than making a landing.

MULTIPLE. Several fighters can be refueled simultaneously with wing-tip hose units.



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NEWS DIGEST

Domestic

Northwest Orient Airlines Super Constellation—crippled when two of its four engines failed on a Seattle-Chicago flight—crash-landed with only one wheel down at McChord AFB, Wash., last week, plunged off the runway and burned. Twenty-nine of 32 persons on board the transport suffered injuries.

Post Office last week asked Civil Aeronautics Board for permission to begin experimental shipments of three-cent, first-class mail by air for one year. Petition proposed rates of 18.6 cents per ton-mile on New York-Chicago flights, 20.04 cents between Chicago and Washington.

Wreckage of the first B-36 lost by Strategic Air Command was discovered in northern British Columbia Sept. 3, nearly two years and seven months after the big carrier disappeared. Twelve crewmen were found after engine trouble forced them to parachute, but the other five still are missing.

B-47 ejection seats will be designed, developed, tested and produced by Weber Aircraft Corp., Burbank, Calif., under a "multi-million-dollar" contract received from Boeing Airplane Co.

Air Force B-47 crossed the Atlantic from Fairford, England, to MacDill AFB, Fla., Sept. 4 in a record 9 hr. 13 min. at an average speed of 508 mph., clipping 40 min. off the mark set recently by a sister Stratojet.

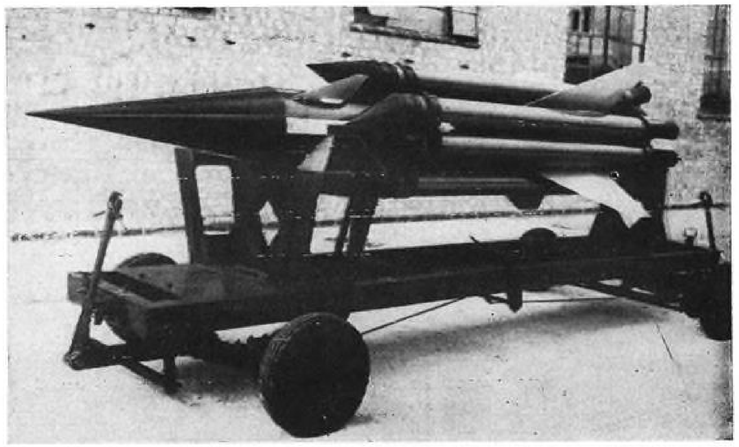
Flying Tiger Line and Slick Airways last week increased rates for charter of C-46 transports to 92 cents a mile from Tiger's former charge of 73.9 cents and Slick's 77 cents. Civil Aeronautics Board dismissed a Navy complaint against the higher rate four days before it went into effect.

Seven lightplane builders—Aero Design, Beech, Callair, Cessna, Mooney, Piper and Taylorcraft—shipped 363 aircraft at a total dollar value of $3,287,000 during July, an increase of 52 planes from the preceding month, Aircraft Industries Assn. reports.

Pan American World Airways has been authorized by CAB to make nine trans-Atlantic cargo flights for USAF between Burtonwood, England, and Westover AFB, Mass., carrying 87,000 lb. of aircraft parts.

Air Materiel Command is shifting chiefs of air procurement districts to new posts in line with the elimination of six APD offices (AVIATION WEEK Aug. 24, p. 14). First reassignments: Maj. Gen. William H. Morgan, Western APD, Los Angeles, will leave this month for Frankfurt, Germany, to take over as director of materiel in Europe; Maj. Gen. Kenneth E. Webber, Eastern APD, New York, is scheduled to begin new duties Oct. 10 as deputy commander of the Middletown (Pa.) Air Materiel Area.

Charles Stegura, 30, president of the Steuben Aircraft Co., Bogota, N. J., and Peter Bennett, 32, PAA purchasing agent, were killed when their lightplane crashed eight miles from Somerset, Pa., on a Labor Day weekend flight to the National Aircraft Show, Dayton.



British Display New Missile

Seen on its dolly is a new British guided missile, slated for its first public showing at Society of British Aircraft Constructor's display, Farnborough, England (Story on p. 15). The missile is equipped with four booster rockets. Photos of another late British missile being fired were shown in Aviation Week Sept. 7, p. 21.

Financial

McDonnell Aircraft Corp., St. Louis, made record earnings after taxes totaling $4,234,301 from all-time high sales of $133,531,447 during the fiscal year ended June 30 and started fiscal 1954 with a peak backlog adding up to $496,902,953.

Ryan Aeronautical Co., San Diego, reports a net income of $1,342,946 for the nine-month period ended July 31, more than doubling the $609,669 net of the corresponding three-quarter year of fiscal 1952. Sales increased to $37,429,355 from $22,219,829. Backlog was estimated at $60 million.

Emery Air Freight Corp. made a net income of $43,200 from revenues totaling $2,532,400 during the first half of 1953, compared with $45,600 in net income and sales of $2,142,600 for the first six months of last year.

Curtiss-Wright Corp., Wood-Ridge, N. J., has declared a dividend of 15 cents per share of common stock, payable Sept. 26 to stockholders of record Sept. 8.

International

Swedish Aircraft Co., Saab, made a net profit of approximately $1,397,489.50 during the fiscal year ended June 30, compared with $376,938 for fiscal 1952.

Israel National Airlines reports it intends to buy three new 90-passenger Super Constellations, plans to take delivery in 1955.

Visual omnirange (VOR) station will be constructed at Beirut, Lebanon, from $76,000 provided by U. S. Point 4 Technical Assistance Program and an equal amount paid by the Lebanese government.

First Canberra built in Australia completed an 8,270-mi. training flight in 16 hr. 53 min., is reported to have an edge on its British-produced sister bomber competing in the England-Hydromatic propeller.

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Here's the answer to a need of both military and civilian aviation and other industries as well—a two-way VHF radio communication set that is easily *portable*, requiring only the addition of a 24 volt dc power source. Both transmitter and receiver combined, packed in a handy carrying case, weigh only 37 lbs. With sectionalized antenna, it can be set up quickly anywhere.

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Size of case is 18⅛ by 8¼ by 18 5/16 inches. Loudspeaker and/or headset. Write for complete details.

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The Aviation Week

September 14, 1953

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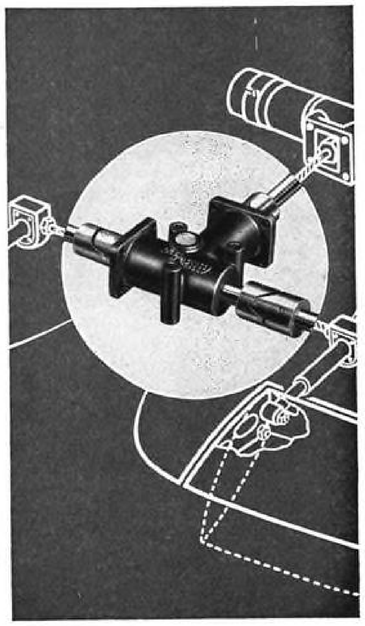

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WHO'S WHERE

In the Front Office

Roy Backman has been elected vice president-product sales of Pacific Airmotive Corp., Burbank, Calif.

E. Russell Hubbard is new executive vice president of National Engineering Associates, Stamford, Conn. Other changes: **James M. Culick**, vice president-government operations, and **Hugh S. Galbraith**, vice-president-sales.

Maj. Gen. Walter G. Bain, former procurment and production director of USAF's Air Materiel Command, has been appointed to the newly created position of executive assistant to the president of Republic Aviation Corp., Farmingdale, N. Y.

Bruce R. Carlson has been appointed statistical assistant to the president of Sprague Electric Co., North Adams, Mass.

Changes

Neil B. Berboth has been appointed assistant general manager for California Eastern Airways.

Col. Frederick A. Henry, retired USAF representative at Boeing Airplane Co.'s Wichita Division, has joined A. O. Smith, Milwaukee, Wisc., as assistant to the vice president-general manager.

Brig. Gen. Merle Halsey Davis, who retired last month as chief of Industrial Ammunition Branch of Army Ordnance, has joined Clary Multiplier Corp., San Gabriel, Calif., as manufacturing and engineering consultant for the company's expanded production operatings, including guided missile instruments.

Henry N. Titzler has been promoted to chief of major proposals in Northrop Aircraft's Military Relations Division, Hawthorne, Calif. **Carl F. Hagenmeier** is new coordinator of all military relations missile activities.

Marvin L. Davis has become system traffic manager of Continental Air Lines.

Dan Gilmore has joined Chance Vought Aircraft Division of United Aircraft Corp., Dallas, as chief tool engineer. **L. C. Stetson** has been promoted to assistant to the divisional controller, and **Lt. Col. W. B. Freeman (USMC Ret.)** is new member of the missile design section.

William J. Naylor has been appointed assistant sales manager of Northwest Orient Airlines' Continental Division.

Wilfred H. Shaw and **Vernon E. Hupp** have been promoted to supervisors of field service engineering for Hamilton Standard Division of United Aircraft Corp., Windsor Locks, Conn.

J. C. Felix has joined Rohr Aircraft Corp., Chula Vista, Calif., as controller, succeeding **P. R. Dickerman**, who has been named a staff assistant.

Honors and Elections

William L. Everitt, dean of the College of Engineering, University of Illinois, has been awarded the Institute of Radio Engineers' medal of honor for 1954.

INDUSTRY OBSERVER

(Editor's note: Following Industry Observer column was written from two Aviation Week *editors' observations at the National Aircraft Show at Dayton.)*

► Next assault on the absolute unofficial records for aircraft speed and altitude held by the Douglas D-558-II Skyrocket research plane is reported coming up soon with the Bell X-1A research plane, also rocket powered, as the challenger. The X-1A, advanced version of the famous Bell X-1, first plane to fly faster than sound (Aviation Week Dec. 22, 1947), has announced design capability of 1,600 mph., well beyond the best speed announced for the Skyrocket, Bill Bridgeman's 1,238 mph. The X-1A also is expected to go higher than the 82,235-ft. mark which Marine Lt. Col. Marion E. Carl recently set in the Skyrocket.

► **Phenomenal glide angle of the Aero Commander twin-engine executive plane, vigorously reported as from 15-to-1 to 17-to-1, was spectacularly demonstrated in daily tests at the Dayton National Aircraft Show when the plane, with both engines stopped at 5,000 ft., circled the field twice before making a spot deadstick landing.**

► Jet ejector cooling system that Fletcher Aviation Corp. has applied to its Fletcher FD-25 Defender light attack plane and to the Ryan Navion, as well as to the new Fletcher Flair semi-amphibious air-portable military automobile, is developed from basic patents of Prof. Otto Koppen of the Massachusetts Institute of Technology. Koppen used the same principle in a cooling and muffling system for an experimental quiet airplane which he modified for Fletcher in 1947.

► **Continental Motors Corp. has delivered its first American-produced Palouste I turbine air compressor to the Air Force for acceptance tests. The 180-lb. unit, to be used in pneumatic aircraft applications, has an air delivery rate of approximately 3 lb./sec.**

► Next step on the new McCauley hydraulic controllable propeller, is to make it full feathering. A full-feathering experimental prop is now in test and will be flight tested in October on the new twin-engine Cessna executive plane.

► **Industry sources last week were speculating on the obvious incompleteness of an Aircraft Industry Assn. announcement putting the total U. S. jet production at 10,000 military planes. Republic Aviation recently has been cleared to disclose that it has produced 4,457 F-84s, and a recent Lockheed advertisement claimed production of 5,000 Lockheed jets. This makes up virtually the 10,000 total without including jet production of North American Aviation, Grumman, McDonnell, Boeing, Chance Vought, Northrop, Douglas, Martin and Convair. Estimates are that total U. S. jet production is probably close to double the AIA figure.**

► Bell X-1B research plane on public display for the first time at the recent National Aircraft Show carried a placard stating the airplane's fuel endurance was 4.2 min. with its 6,000-lb. Reaction Motors rocket engine, and during that time could fly from at Vandalia, Ohio, (site of Dayton's airport) to six miles west of Indianapolis (or approximately 116 miles).

► **Firestone Tire & Rubber Co. says its new tubeless airplane tire, using nylon fabric for lightness and first flight-tested by the Navy this spring, is 20% lighter than conventional airplane tires with tubes. This means a total weight savings of seven to 125 lb. per airplane, depending on size of tires. Tests have been run on the tires up to 250-mph. simulated landing speeds, with 50 such landings completed with the same tire without failure.**

► New Navy smokeless rockets for takeoff, demonstrated at Dayton with the Lockheed P2V Neptune, actually were almost that. The little smoke generated dissipated very rapidly. On carrier decks, they will be a big improvement over the old-style smokescreen which was laid down by standard Rato.

Remington Rand Methods News

"RUSH! Need information by 6 P.M. today!" teletyped Air Force Engineers

Here's how Douglas Aircraft used the electric typewriter to cut corners and beat the deadline!

Wright-Patterson Field needed some fast facts about a new alloy so that they could wind up an important conference.

Ordinarily Douglas typed up such requests on a stencil, and sent it to Reproduction for copies to route to 20 Engineering Sub-chiefs. But there was no time for duplication this day. The facts had to be in the proper engineering hands at once. So, an engineering chief scanned the teletype, penciled its contents on a special form and rushed it to the typing pool.

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We wish you could talk with the Production and Sales people at National Motor Bearing Co. What they say about their new punched-card system makes mighty profitable listening. For example:

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Profit-Building **IDEAS** For Business

AVIATION WEEK

VOL. 59, NO. 11
SEPTEMBER 14, 1953

Jets, Copters Have Field Day at Air Show

- **F-86Ds and YH-21 set four new world records.**
- **Stratojet refueling also is big feature at Dayton.**

By Alexander McSurely

Dayton—Air Force pilots set four new world records and otherwise dominated flight events in the National Aircraft Show, biggest U.S. aviation exhibition of 1953, at James M. Cox Municipal Airport here over the Labor Day weekend.

It was a field day for North American Aviation's famous F-86 Sabre jet fighters, for Boeing's B-47 Stratojet bombers and for Piasecki's new YH-21 helicopter, which went home with two new world records—for helicopter speed and altitude.

▶ **Stock Models**—Brig. Gen. Stanley B. Holtoner, Jr., 42-year-old commander of Edwards AFB, Calif., set a new record of 690.118 mph. for the 100-kilometer closed course run, bettering the 675.47-mph. record set by Jacqueline Cochran in a Canadair-built Orenda-powered F-86E last June 3. Holtoner's stock model F-86D was powered by a General Electric J47-GE-23 engine.

Capt. Harold E. (Tom) Collins, Wright-Patterson AFB, pushed another stock F-86D with similar powerplant to 707.889 mph. in a 15-kilometer dash.

▶ **Trial Runs Records**—Holtoner's and Collins' new records actually were made during practice runs before the show. They made slightly slower time in demonstration runs—for the Thompson Trophy and the General Electric Trophy events for the show.

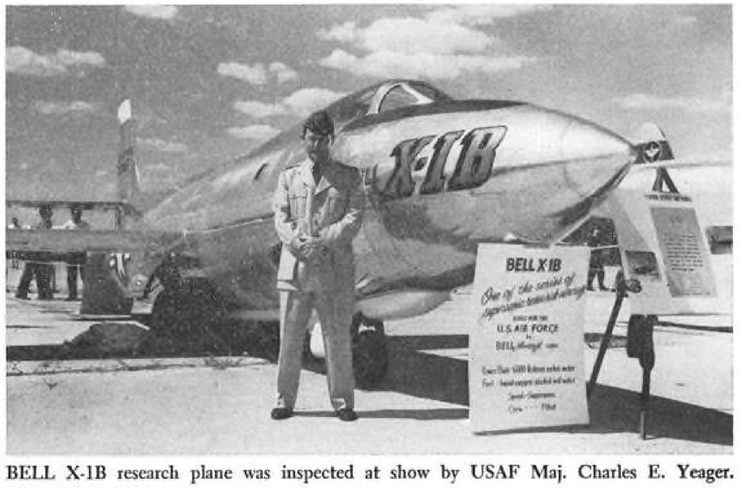
Holtoner told AVIATION WEEK his higher speed run Sept. 2 was due largely to the very hot day, with the temperature 24 deg. higher than the day of his run in the show. He said the show run was in very rough air, but visibility was excellent. He hit a speed of 681 mph. for the Labor Day show demonstration.

▶ **Bendix Race**—Most spectacular competition came in the Bendix Race from Edwards AFB to Dayton, when 10 USAF pilots in North American F-86F fighter-bombers flew the 1,868.48-mi. trip, with refueling stops, in elapsed time varving less than nine minutes for all entrants.

Maj. W. T. Whisner, representing

MARINE FJ-2 FURY was flown by Lt. Col. Marion Carl during National Aircraft Show.

AERIAL REFUELING of Navy F9F-5 Panther jet using AJ-1 tanker was demonstrated.



BELL X-1B research plane was inspected at show by USAF Maj. Charles E. Yeager.

NORTHROP F-89D all-rocket-armed interceptor was viewed by Dayton show crowds.

LOCKHEED P2V-5 with new "stinger" tail was flown in as part of Navy's display.

SQUARE DANCING by painted and dressed Bell copters was an amusement highlight.

PIASECKI YH-21 copter set new world speed and altitude marks for rotary-wing craft.

Air Training Command, flew the race in 3 hr. 5 min., 45 sec., for a speed of 603.547 mph. while the tenth flyer to finish, Capt. J. S. Carson, flew it in 3 hr. 14 min. 11.3 sec., for a speed of 577.32 mph.

Carson experienced a flameout as he approached the finish pylon, but received permission to complete the race deadstick. He had enough altitude to coast to a landing at Wright-Patterson.

All 10 fliers bettered the winning time of the last Bendix jet race—from Edwards AFB to Detroit in 1951. That year, Col. Keith K. Compton made a winning time of 553.761 mph. in an F-86A, slower by 23 mph. than the tenth man's time this year.

► **B-47 Run**—Seven B-47 Stratojets flew over the show, 10 hours after they took off from Fairford, England, and six of them continued nonstop to Tampa, while the first arrival stopped to report on his flight.

Col. Richard Evans said his plane averaged more than 650 mph. on its Atlantic crossing. The planes made aerial refuelings over Scotland and again over New York. The run to Tampa, approximately 5,000 mi, is the longest operational training flight yet made in the B-47s.

► **From Other Side**—Rendezvousing over Dayton with the B-47s from Britain were two Convair B-36D bombers, which flew nonstop, nonrefueled 6,750 mi. from Tokyo. Pilots of the planes exchanged London for Tokyo newspapers. The B-36 flight time was approximately 33 hr.

► **Helicopter Records**—Capt. Russell M. Dobyns of Eglin AFB, Fla., set the two new helicopter records, of 146.735 mph. for speed, 22,289 ft. for altitude in an Air Force YH-21. They displace a speed record of 129.552 mph., and an altitude record of 21,220 ft. held by the Sikorsky S-52.

► **Allison Trophy**—Simulating a fighter-bomber scramble, four Republic F-84Gs flew from Indianapolis to the show 110.13 mi. away. Capt. Forrest Wilson of Bergstrom AFB, Tex., won the scramble, flying the course in 12 min. 17.2 sec. for a speed of 537.8 mph. Relatively low speed was attributed to the standing start, and to the short distance which did not lend itself to high-altitude jet operation. Capt. Wilson won the Allison Trophy. All four planes were powered with Allison J35-29 engines.

► **Boeing Tanker**—First public demonstration of the Boeing KB-47 jet tanker, a bomber with a flight refueling conversion kit in the bomb-bay, caught the public eye. The tanker, a receiver B-47 following along with probe inserted in the drouge at the end of the KB-47's hoseline, undoubtedly was making the fastest speed in a refueling run demonstrated at any show.

► **FICON**—Spectators gasped during the first day show when the FICON demonstration was given at an altitude of about 800 ft. A Republic F-84F hitched on to the belly of a Convair B-36D as a parasite dropped in what appeared to be a near-stall when the planes parted company, but it recovered without apparent difficulty at a very low altitude.

► **Helicopter Collision**—One accident with relatively minor injuries marred the show. It came when two Marine HR4S Sikorsky helicopters flew in too-close formation during a low sweep beyond the airport limits.

Rotor blades collided and the tail of one copter was virtually chopped off. Maj. William T. Tebow, Jr., Quantico NAS, Va., was injured and hauled from the craft which caught fire. His rescuer was another Marine, Staff Sgt. O. L. Steen, Quantico, who landed alongside in another copter. The pilot of the colliding copter was unhurt. While helicopter collisions have been rare, this was at least the second. One Army training helicopter collision is on record.

Assault tactics employing the basic Sikorsky S-55 model, as the Army H-19 and the Marine HR4S, were demonstrated at the show. The demonstration followed the familiar pattern of landing infantry gun crews, field artillery and supplies that has made a major advance in ground military tactics with advent of the larger helicopters.

► **Precision Flying**—A simulated atomic bomb which rose in a huge mushroom of fire and smoke was a realistic climax of the Army demonstration.

Two smooth-flying quartets of Navy and Air Force pilots, the Blue Angels in Grumman F9F-5 Panthers and the Thunderbirds in Republic F-84G Thunderjets vied for top honors in a closely matched duel of highspeed precision maneuvers. For one observer, the high-altitude formation burst of Thunderbirds followed by highspeed passes at treetop level for a finale was unequalled.

► **Other Highlights**—Eight USAF Korean aces opened the Air Force part of the show with a series of sonic booms at five-second intervals in F-86Fs from a top altitude of 43,000 ft. The booms were especially noticeable within the hangars by persons attending the static airshow.

Altitude climbs by three Northrop F-89 Scorpions, three North American F-86D Sabres and three Lockheed F-94C Starfires demonstrated their respective abilities with afterburner boost. To some observers it appeared the F-86D climbed best.

Navy's solo flight demonstration of the Chance Vought Cutlass F7U-1 with Cmdr. Ron Puckett in the cockpit was spectacular, although it raised a question over the absence of later F7U-3 Cutlass, which has had recurring powerplant difficulties.

Other outstanding Navy flight demonstrations included more of the omnipresent North American Sabres in blue paint as FJ-2s and the sweptwing Grumman Cougar F9F-6Ps. One lone FJ-2 appeared in its new Marine garb to emphasize the announcement that it has just been assigned to Marine use.

Much of the Navy flight demonstration was with semiobsolescent propeller craft in carrier landing maneuvers.

► **Square Dance**—Army's helicopter square dance with four Bell H-13s from Ft. Sill, and Bozo the H-13 clown helicopter were amusement highlights.

► **Small Civil Part**—While 90% of the show was military, the executive airplane came in for a demonstration of Lycoming engines. The Lycoming flyby included such planes as the Riley Navion conversion, the Aero Commander and the Beech Model 50 Twin Bonanza. Not present, however, was the new Piper twin-engine Apache, another Lycoming-powered craft.

Two experimental Air Force planes which made highspeed passes over the field were not shown to the audience at close range. They were: the Bell X-5, which has variable sweepback, and the Martin XB-51 three-jet light bomber with variable-incidence wing and tail.

National Aircraft Show Results

New World Records

► **Thompson Trophy**—100-kilometer closed course—690.118 mph. set by Brig. Gen. Stanley B. Holtoner, Jr., Edwards AFB, Calif., Flying North American F-86D interceptor powered by General Electric J47-23 engine. Record made Sept. 2.

► **General Electric Trophy**—15-kilometer straightaway—707.889 mph. set by Capt. Harold E. (Tom) Collins, Wright-Patterson AFB, Ohio, flying North American F-86D interceptor powered by J47-GE-23 engine. Record made Sept. 1.

► **Helicopter Speed**—3-kilometer straightaway—146.735 mph. set by Capt. Russell M. Dobyns, Eglin AFB, Fla., flying Piasecki YH-21 helicopter, powered by Wright R1820 engine. Record made Sept. 4.

► **Helicopter Altitude**—22,289 ft. set by Capt. Russell M. Dobyns, Eglin AFB, flying Piasecki YH-21 helicopter powered by Wright R1820 engine. Record made Sept. 2.

Competitive Events

► **Bendix Trophy Race** from Edwards AFB to Dayton—1,868.48 mi., ten USAF pilots competing, all flying North American F-86F fighters powered by J47-GE-27 engines. All refueled en route.

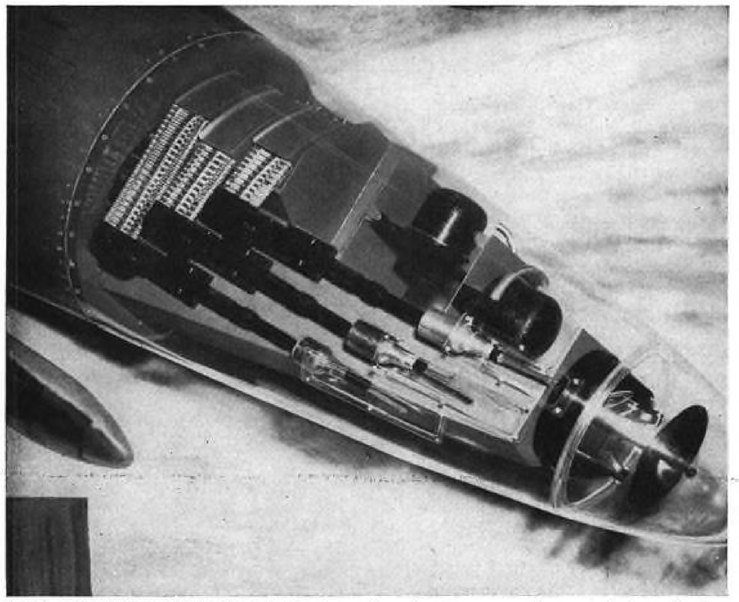
- **First.** Maj. William Whisner, Barksdale AFB, La., 603.547 mph.
- **Second.** Maj. E. R. Johnston, Eglin AFB, Fla., 603.287 mph.
- **Third.** Col. Clay Tice, Nellis AFB, Nev., 598.573 mph.

► **Allison Trophy Race** from Indianapolis to Dayton—110.13 mi., four USAF pilots competing flying Republic F-84G fighters powered by Allison J35-1-A-29 engines.

- **First.** Capt. Forrest Wilson, Bergstrom AFB, Tex., 537.802 mph.
- **Second.** Capt. R. J. Schuler, Bergstrom AFB, Tex., 531.316 mph.
- **Third.** Maj. V. E. Sansing, Bergstrom AFB, Tex., 527.218 mph.

Brig. Gen. Stanley B. Holtoner

Maj. W. T. Whisner



FIRE CONTROL SYSTEM of Northrop Scorpion was one of many indoor displays.

USAF Takes Wraps Off X-1B

Supersonic research plane is shown at Dayton; static lineup also includes SAC's new ETB-47B trainer.

By Erwin J. Bulban

Dayton—USAF stole static aircraft display honors at the National Aircraft Show with the still-incomplete shiny new Bell X-1B research plane, flown from Bell Aircraft Co.'s Buffalo, N. Y., plant to Dayton Municipal Airport.

Parked alongside the Republic F-84G Thunderjet, Northrop F-89C Scorpion, North American F-86F Sabre and Lockheed F-94C, the X-1B suggested future supersonic fighters that will replace the planes sharing its stage.

The X-1B was flown to Dayton in the belly of a Korean war veteran Boeing B-29 Superfortress. Rocket-powered like its X-1 predecessor, the X-1B is five feet longer and incorporates an improved fuel system that will enable it to top the X-1's speed and altitude.

After the static show, Bell's research plane was to go back to the factory to be completed and then flown to Edwards AFB, Calif., for its flight tests.

▶ **Stratojet Trainer**—Parked on the bomber line was the hitherto-unseen Boeing ETB-47B, six-jet training version of the Stratojet bomber. The plane's rocket assist takeoff ports, located in the fuselage sides behind the wings, were faired over.

The Air Force also showed an F-86F Sabre jet fighter fitted with new "6-3" wings and wing fences (AVIATION WEEK Sept. 7, p. 15). Horizontal stabilizers on the plane's underwing tanks were fitted with twin vertical fins.

Also exhibited in USAF's static lineup were a Convair ERB-36D, Piasecki H-21, Grumman SA-16 Albatross air rescue amphibian, Fairchild C-119 Packet, Chase C-123B, Sikorsky H-19, Lockheed F-80 Shooting Star, a Boeing C-97 Stratofreighter and Douglas C-54M. The latter transports were equipped to take litters.

▶ **Navy Planes**—Newest plane in the Navy exhibit was a Marine North American FJ-2 Fury fighter powered by a J47-GE-2 turbojet and fitted with four cannon.

Nearby was parked the now-obsolete Vought F7U-1 Cutlass, which has been succeeded by the larger, more powerful F7U-3.

Also shown was a McDonnell F2H-4 Banshee, which differs from the F2H-3 mainly in later nose radar and other equipment. Approximately 55 F2H-4s are being built at the present time.

A Grumman F9F-6 Cougar sweptwing fighter was displayed, leaking fuel from its wingtips. AVIATION WEEK was told that heat expanded the fuel in the tanks, which take up a large part of the wing interior. Some difficulties are being experienced with the Cougar's "flying tail," a factor in delayed deliveries to Navy.

A Lockheed P2V-5 Neptune, featuring an extended tail "stinger" for housing electronic submarine detection devices, was shown with a full load of rockets under its wings.

Parked nearby was a North American AJ-2 Savage combination piston-jet-powered carrier-based attack plane.

Navy also displayed a bright red Grumman F6F-5K electronically controlled drone plane.

The Marine aircraft lineup included a Douglas AD-4 Skyraider loaded with bombs, rockets and torpedoes, a McDonnell F2H-2P Banshee with the camera hatch open, a Grumman Panther jet, a Douglas Skyknight fighter and a Sikorsky HRS helicopter. Also on view was a vertical catapault used in seat ejection training.

▶ **Fletcher Defender**—The small single-seat Fletcher FD-25B Defender tactical support plane was examined closely by crowds of spectators.

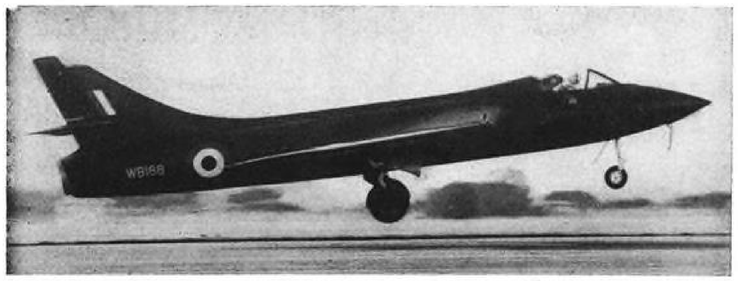
An interesting feature of this exhibit was an FD-25B wing section equipped with a new rocket rack that takes either 8- or 5-cm. projectiles. The rack was built by Oerlikon at Nashville, N. C.

▶ **Civil Types**—The commercial plane display was limited to personal aircraft. Aero Design and Engineering Co.'s Commander five-to-six place twin-engine transport attracted major spectator attention. The display Commander was 103rd plane off the company's Tulakes, Okla., production line. A new feature is a hydraulic cylinder on the steerable nosewheel strut activated by pressure on the plane's brake, providing, in effect, power steering.

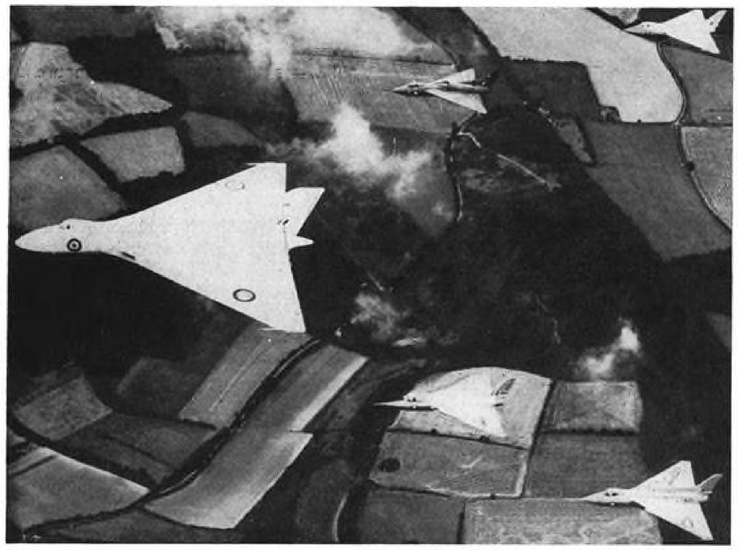
Two Aero Commanders made belly landings inadvertently during takeoff and were cleared by Civil Aeronautics Administration for continued operation without going into the shop, says a company official. The firm has worked out a cargo version of the Commander to take two large doors behind the cockpit but does not plan to put this feature into effect unless sizable orders are indicated.

Other planes in the exhibit included a Navion four-placer equipped with a Fletcher augmenter exhaust stack, a Beech Bonanza, Twin Bonanza and Model 18, de Havilland-Canada's Beaver single-engine light transport and the new and larger DH-Canada Otter. The new Cessna 180 and a 105 also were shown.

The Army Field Forces lineup at Dayton included a Beech L-23A Twin Bonanza, a Cessna L-19A and LC-126A and Piasecki H-25A.



HAWKER HUNTER averaged 727.6 mph. over a four-kilometer course off English coast.



AVRO DELTAS in formation, with Vulcan bomber leading 707 research types and trainer.

Flying Testbed Steals U.K. Show

R.A.14-powered Canberra outperforms sweptwing fighters at Farnborough; Duke sets speed record.

By David A. Anderton

Farnborough, England—A startling climb performance by a flying engine testbed stole the show from Britain's newer sweptwing fighters at a dress rehearsal of the 14th Society of British Aircraft Constructors flying display last week.

Twin Rolls-Royce R.A.14 turbojets thrust a modified English Electric Canberra from a standing start into a rocketing climb that topped an estimated 3,000-4,000 ft. before the bomber passed over the midpoint of the 9,000-ft. runway.

▶ **10,000 Lb. Thrust**—This new engine, which develops more than 10,000 lb. thrust without afterburning, is the latest addition to Avon's powerplant family.

Avons now are coming out of five factories in England at a rate far exceeding demand. One informed estimate places the number of available Avons at twice the number required by current airframe production.

▶ **Comet 3 Engine**—In its present version, type tested to 9,500 lb. drive, the R.A.14 is slated to power at least three Royal Air Force planes. It flew last week in the Vickers Valiant Mark 2 bomber.

With afterburning, the engine will power future production versions of the Hawker Hunter and the Vickers Swift.

The civil version—R.A.16—is designated as the powerplant for Comet transports.

Many observers here believe the R.A. 14 soon will fly in American planes as the first tangible result of the recently announced agreement between Rolls-Royce and Westinghouse Electric Corp. (AVIATION WEEK June 22, p. 16).

Talbott Flies Jet

Secretary of the U. S. Air Force Harold E. Talbott on Aug. 18 visited Handley Page, Ltd., Radlett, England, where he inspected and flew the new RAF "super-priority" crescent-wing four-jet Victor bomber. Here is the text of a British interview with Talbott after the flight:

Interviewer: Mr. Talbott, you've just landed in the Victor. What are your impressions of the aircraft?

Mr. Talbott: Well, I'm very much surprised with it, really. It's a most beautifully handling plane, and, from a pilot's viewpoint—I sat in the co-pilot's seat and handled the plane, and it's just as easy to handle as a baby-carriage—it's perfectly simple. And Sir Handley Page has done a great job in developing this plane to have a prototype that performs as satisfactorily and as easily as this does shows that great engineering and great work has been put into this plane. I think it will be very serviceable to either your air force or our Air Force, or both. I think it's a fine development.

Interviewer: Well, thank you very much. You actually took the controls yourself?

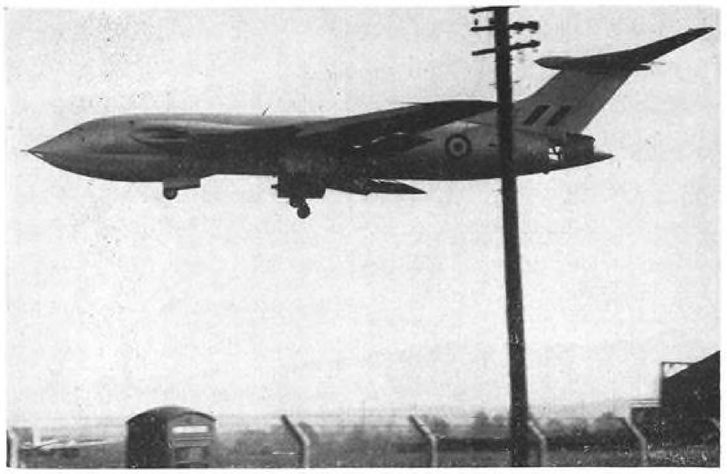
Mr. Talbott: Oh yes, sure, I took the controls, yes. I've flown a B-47, which is rather the comparable type, but there you have a tandem team; you sit in the co-pilot's seat, and there you're far away from the pilot, there's no companionship. I like this a lot better, When you're in the air and your engines are on you're so far enough forward of the sound, so you can talk very comfortably; and with the automatic pilot I think that the pilot and the co-pilot could sit at the side and play gin rummy if they wanted to.

▶ **727.6 Mph.**—In other respects, the Farnborough show lacked the surprises of earlier years.

Squadron Leader Neville Duke, whose blistering runs brought last year's crowd to its feet, claimed the world's speed record for level flight after he streaked a Hawker Hunter four times over a three-kilometer course off the south coast of England for an average speed of 727.6 mph.

The Hawker test pilot bettered by 12 mph. the still-unofficial record of 715.697 mph. set last July by USAF Lt. Col. William Barns in an F-86D Corp. (AVIATION WEEK June 22, p. 16). 16).

Both speeds still must be accepted



Handley Page Victor

Short S.B.6 Sea Mew

by the Federation Aeronatique Internationale.

► **Functional Sea Mew**—With one exception, all aircraft in the show either were production versions of last year's prototypes or planes just getting into RAF squadron service after display at as many as five Farnboroughs prior to the latest.

The exception was the Short Sea Mew, an unlovely but functional anti-submarine aircraft and the first "simplified" military design to fly in this age of complexity.

Built to serve naval forces of North Atlantic Treaty Organization countries, the Sea Mew is powered by an Armstrong Siddeley Mamba. Landing gear is fixed, and the entire design has been built with simplified stripped-down design principles in mind. Sea Mews have been ordered for the Royal Navy, with the possibility of export to the French and Dutch navies.

► **Delta Formation**—Second prototype Avro Vulcan—housing scheduled Bristol Olympus powerplant—lead a formation of all six Avro deltas.

Paradoxically, Britain—a latecomer to the delta business—has more deltas flying than the U. S.

In addition to two Vulcans there are two 707As, one 707B research type and a side-by-side 707C trainer.

► **Feeder Transports**—Models of three DC-3 replacement designs were featured in the static exhibition. They were proposals by Handley Page Percival and Aviation Traders, Ltd.

None of these designs have left the drawing board. No orders have been placed and, in view of the near immortality of the DC-3, there is not much chance of further progress with any of been discontinued.

J40 Phaseout

Westinghouse Electric Corp. confirms industry reports that further development work on the J40 engine has been discontinued. About 250 F3H Demons are to be powered by the J40. Other planes slated for J40, such as F4D and A3D, will get P&WA J57.

The company says it is concentrating full development and research facilities on perfecting new models of the J46 and has placed into production the long-delayed J46, slated for the F7U-3 Cutlass, now powered by Allison J35.

The J46 is a development of the Westinghouse J34. It will be produced at Westinghouse's Kansas City plant.

Rotor Milestone

- **Sikorsky builds 5,000th all-metal copter blade.**
- **And tail rotor production exceeds 4,000 blades.**

Sikorsky Aircraft last week passed a helicopter production milestone with disclosure that it had built its 5,000th all-metal main rotor blade and more than 4,000 all-metal tail rotor blades.

Bernard L. Whelan, Sikorsky general manager, said the production figure had been achieved since 1949 when metal blade production was started after three years of research and development at a cost of approximately $1 million.

The Sikorsky blades are the only ones in quantity production that are fully interchangeable, he said, meaning that any blade in a set of three can be replaced in event of damage. Before the Sikorsky metal blade development, it had been necessary to replace a complete set of blades whenever one blade was damaged because of delicate balance factors.

► **Wood Blades**—Prior to the metal development, Sikorsky had built more than 1,500 fabric-covered wood rotor blades for its VS-300, R-4, R-5 and R-6 helicopters and part of the S-51 production. Later S-51 models used the first all-metal blades, and these are now going on the current production models, the 12-place S-55 and the smaller S-52.

In the blade fabrication department at Sikorsky's Bridgeport, Conn., plant an Aviation Week editor recently watched the manufacturing process. Basic load carrying member is an extruded aluminum alloy spar which forms the leading edge. Spars used in the present production run have two ribs inside the hollow airfoil-shaped member. A revised design achieves better than equivalent strength more simply, without the internal reinforcements.

► **How It's Done**—To each spar is attached a row of 22 small "pockets," folded pieces of dural sheet with internal stiffeners. These are bonded to the spar with a Scotchweld adhesive and the blade is heated under pressure to a temperature of 325-350F, thermostatically controlled, for one hour to complete the bond. The pocket tapers to make a thin trailing edge for the blade.

To insure the strength of the bonding process, test samples of the metal are bonded with each blade, and the sample must pass a shear test of 2,500 lb., before the blade is accepted for use.

Each blade used must lift 2,500 lb., or one-third of the S-55's gross weight. This is a load of 76.9 lb. per sq. ft.

Each blade spar has a 7-deg.-twist. The airfoil used for the S-55 blades is the NACA 0012 section, a symmetrical foil chosen because of its efficient lift-drag ratio for the full range of velocities encountered from root to tip of the blade.

► **Fatigue Tests**—Igor Sikorsky, engineering manager and designer of the first successful American helicopters, told Aviation Week he considers the Sikorsky metal blade a notable advance because of its durability and uniformity. It now has passed tests for a fatigue life of 1,000 hr., and he expects a fatigue blade life ranging from several thousand hours to infinity in the foreseeable future.

Fabrication of the smaller two-blade S-55 tail rotor is accomplished by a similar process of bonding dural sheet to a leading edge extruded spar, but a single stiffened fold of the dural forms the trailing edge of each half of the blade instead of a multiple pocket arrangement.

USAF Orders T34 Turboprop for C-133

USAF has ordered quantity production of Pratt & Whitney Aircraft's 5,700-eshp T34 turboprop to power the new Douglas C-133 transport.

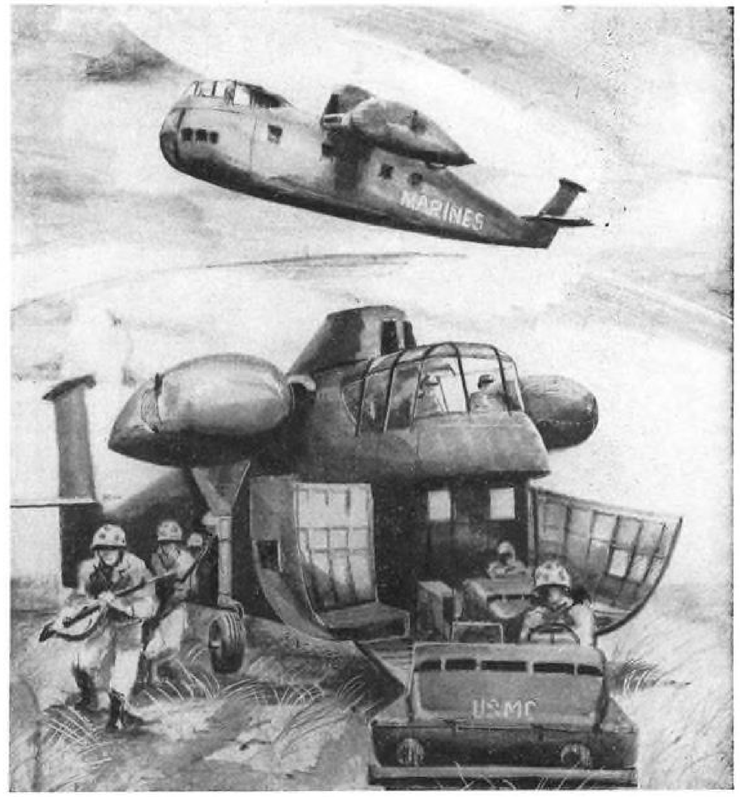
P&WA general manager William P. Gwinn says the PT2F-1, commercial version of the T-34, has been withdrawn from sale "until a market at sufficient magnitude has been developed to make its commercial manufacture economically feasible."

P&WA is scheduled to begin quantity output of the T34 in 1954 to support the production program for the C-133, advanced version of the C-124 incorporating maximum performance increases offered by gas turbine power.

Douglas is completing a prototype C-124 powered by four T34 engines. The C-133 will be built primarily as a long-range aerial tanker to refuel jet bombers and fighters.

Production of the T34 will be done at Pratt & Whitney's Hartford, Conn., plant. Allis-Chalmers Mfg. Co., Milwaukee, has done the bulk of work of preproduction T-34s for the C-124 prototype, four Lockheed Super Constellations and two Boeing C-97s. Preproduction T34s have been assembled and tested at East Hartford.

In addition to its T34 program, P&WA is developing an 8,500-eshp T52 turboprop for the Navy and has an Air Force development program for an even larger turboprop incorporating design features of the J57 split-compressor turbojet.



SIKORSKY HR2S-1 features are shown in artist's conception of copter in action.

Details of Marines' New Copter

First released drawing of the new Marine Sikorsky XHR2S-1 helicopter, designed to carry up to two squads (26 Marines) for an assault and yet be operational from an aircraft carrier, shows interesting new features of the design.

The aircraft, designated S-56 by Sikorsky, is due for first flight late this year. It is powered by two Pratt & Whitney R2800 engines rated at 1,800 hp. for helicopters. Its large five-blade main rotor is aided in its job of lift by the stub-wing, which serves to "unload" the rotor partially. A later commercial version of this helicopter, powered by two Allison T38 turboprop engines, is expected to be capable of hauling up to 50 passengers as a commercial copter bus.

While no performance data have been released, the helicopter is expected to be capable of speeds of at least 150 mph. in its R2800 powerplant version, probably 10 miles an hour faster with the turbines.

Part of the unusually high speed—for a copter—is attributed to the retractable landing gear.

Congressional hearings have disclosed that the Marines expect to use a specially designed set of flak curtains with this machine to help protect it against ground fire in assault landings.

The drawing shows two of the XHR2S-1s, one in flight with landing gear retracted, the other unloading on the ground. Sikorsky is negotiating for land near Bridgeport, Conn., to build a new plant for production of the big copter for Marines and Army.

An Army spokesman says the big helicopter will be used for contemplated missions of 150-200 mi. round-trip, that Army expects it to carry approximately 34 troops for such missions.

India's Price for Ouragan: $145,000

(McGraw-Hill World News)

Bombay—The Indian Government is paying approximately $145,000 each for the 70 Dassault Ouragan jet fighters ordered from the French company (Aviation Week June 22, p. 14).

Price includes armament, radio, rocket attachments, ejector seat and delivery to India.

AF Slashes New Plane Orders

Revised program accelerates F-100 production, cuts output of F-84Fs, F-86Fs, B-47s, trainers and helicopters.

Air Force has reshuffled its jet fighter production program, eliminating 579 Republic Aviation F-84Fs and North American Aviation F-86Fs and ordering additional quantities of NAA's sweptwing supersonic F-100, successor to the F-86 series.

All of the eliminated fighters were programmed by USAF for future production, but none had been ordered by contract with manufacturers.

USAF Undersecretary James H. Douglas said the current revision would in no way affect the 143-wing goal.

"We could make the 143 wings by June 1956," he said, "if called for by the Joint Chiefs of Staff."

▶**Remarkable Capability**—The F-100 has displayed remarkable capability in recent tests at Edwards AFB, Calif.

In commenting on the new order of F-100s, Douglas said it is "the most advanced day fighter that is ready for production. Its rapid satisfactory development is a great source of satisfaction."

North American Aviation originally was scheduled to build the new jet at a rate of 25 a month, but this will be accelerated.

▶**Careful Procurement**—Approximately 200 of the fighters cut from the program were F-86Fs. The others were F-84Fs. As far as North American is concerned, the revision merely involves rescheduling.

J. H. Kindelberger, NAA board chairman, said of the rescheduling: "I feel now, as I did following a recent Washington conference with top defense officials, that procurement is being handled carefully and intelligently."

Republic has production contracts for its F-103 and F-105 supersonic fighters (AVIATION WEEK Aug. 31, p. 11).

At about the same time USAF confirmed its fighter revision, it revealed a preproduction contract calling for tooling and production engineering in preparation for producing McDonnell Aircraft Corp.'s RF-101A, a photo-reconnaissance version of the F-101 Voodoo twin-jet fighter.

▶**B-47 Cuts**—Air Force also confirmed AVIATION WEEK's forecast (June 15, p. 13) that Boeing Airplane Co.'s B-47 Stratojet production program would be cut.

Of the total 169 B-47s slashed from the program, 151 had been ordered by contract.

Approximately 100 of the jet bombers were slated for the Air Training Command for use in training combat crews. Strategic Air Command, for which the bombers were designed, is taking over B-47 training, thus eliminating the ATC requirement.

Fourteen of the 169 B-47s were the RB-47 reconnaissance version.

The reduction will be spread among Boeing's Wichita Division and at Lockheed Aircraft's Marietta, Ga., plant and Douglas Aircraft's Tulsa, Okla., factory. Both Lockheed and Douglas are producing the B-47.

▶**Plant Layoffs**—J. E. Schaefer, Boeing vice president and general manager at Wichita, said the reduction would extend production from mid-1955 to late 1956 at his division. Several hundred employees would be laid off at the Wichita plant, he said, adding that "the full extent of the reduction necessary is still being studied."

D. J. Haughton, vice president and general manager of Lockheed's Georgia Division, told a mass meeting of employees at Marietta that cutbacks mean approximately 1,500 workers will lose their jobs.

Another 1,500 will be lost in normal labor turnover, he said, indicating the labor force reduction will total 3,000.

▶**Trainer Slashes**—Details of trainers eliminated from USAF's revised program confirmed AVIATION WEEK's earlier reports (June 8, p. 15) that trainer and helicopter programs were scheduled for reduction.

Cut were 141 Lockheed T-33 basic trainers and 66 Beech T-34 primary trainers. Ten Sikorsky H-19 helicopters also were slashed.

Engines in Present AF Planes

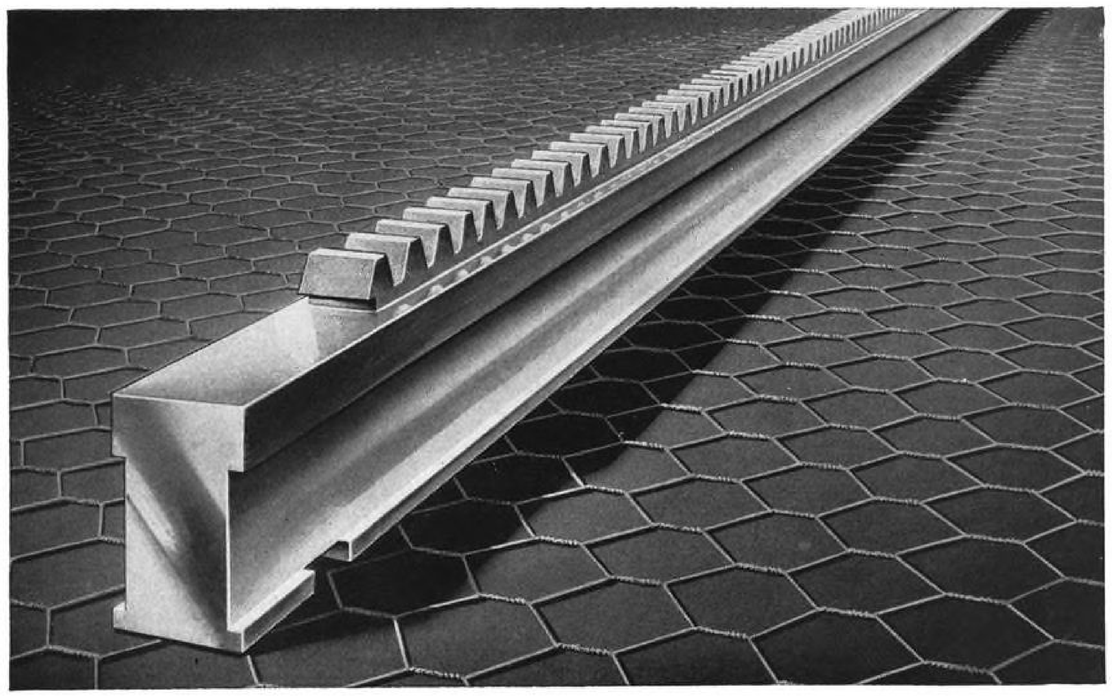
A complete listing of the type engines powering present Air Force fighters, bombers, trainers and helicopters was released by the Pentagon recently (AVIATION WEEK Sept. 7, p. 17). AVIATION WEEK publishes the list as a guide to the various models of engines being used.

Engine	Aircraft	Engine	Aircraft	Engine	Aircraft
J33-A-9	F-80	J65-W-1	F-84	R2800-97	T-29
J33-A-17	F-80	J65-W-3	F-84	R2800-99	T-29
J33-A-21	F-80	J65-W-5	B-57	R2800-85	C-82
J33-GE-11	F-80	J71-A-7	F-105	R2800-95	C-118
J33-A-23	F-80	J71-A-9	B-66	R-1300-1A	T-28
J33-A-35	F-80	J73-GE-3	F-86	R3350-34	RC-121
J33-A-33	F-94	O290-D	L-21	R3350-57	B-29
J33-A-35	T-33	O290-D2	L-21	R3350-57	TB-29
J35-A-9	B-45	O290-11	L-21	R3350-83	B-29
J35-A-1	B-45	R985-AN-1	L-20	R3350-83	TB-29
J35-A-13	F-84	R985-AN-3	L-20	R3350-75	C-121
J35-A-29	F-84	R985-AN-1	C-45	R3350-85	C-119
J35-A-33	F-89	R985-AN-3	C-45	R4360-20	C-119
J35-A-35	F-89	R985-AN-5	H-5	R4360-20	C-124
J35-A-21B	F-89	R1340-AN-1	T-6	R4360-35	B-50
J35-A-17C	F-84	R1340-AN-3	T-6	R4360-35	RB-50
J35-A-17D	F-84	R1340-55	H-12	R4360-35	TB-50
J47-GE-7	F-86	R1340-57	H-19	R4360-35	C-97
J47-GE-9	B-45	R1820-103	H-21	R4360-35	KC-97
J47-GE-11	B-47	R1830-92	C-47	R4360-41	B-36
J47-GE-13	B-45	R2000-4	C-54	R4360-41	RB-36
J47-GE-13	F-86	R2000-9	C-54	R4360-49	C-74
J47-GE-15	B-45	R2000-11	C-54	R4360-53	B-36
J47-GE-17	F-86	R2600-13	TB-25	R4360	RB-36
J47-GE-19	B-36	R2600-29	TB-25	R4360-63	C-124
J47-GE-23	B-47	R2800-51	C-46	T56-A-1	C-130
J47-GE-25	B-47	R2800-75	C-46	T56-A-3	T-29
J47-GE-27	F-86	R2800-71	B-26	R1820-76B	SA-16
J48-P-5	F-94	R2800-79	B-26	R1830-90D	C-47
J57-P-1	B-52	R2800-71	TB-26	R2800-52W	C-123
J57-P-7	F-100	R2800-79	TB-26	R2800-52W	C-118
J57-P-11	F-102	R2800-77	T-29	R4360-59B	KC-97
J57-P-13	F-101				

RCAF Sets Up New Weather Wire Photo

Royal Canadian Air Force has set up a wirephoto weather reporting network that transmits maps from the forecasting station at Montreal's Dorval Airport across Canada to Moncton, Toronto, Winnipeg, Edmonton and Vancouver.

RCAF is extending the Weatherfax service from coast to coast and to the Arctic region. Civil airlines will be tied into the network as soon as the military establishment is completed.



7-foot Graph-Mo® steel rack hardened without distortion

THIS long, slim gear rack, part of a new Wean Equipment Company hexagon netting machine, started out as a problem child.

With the first steels tried, case hardening caused extreme distortion. And the few racks that did harden straight enough to be useable did not wear well.

As soon as the manufacturer turned to Graph-Mo®, one of four graphitic steels developed by the Timken Company, the problem vanished. Because Graph-Mo responds uniformly to heat treatment, the racks hardened without distortion. Heat-treating scrap was completely eliminated.

In addition, the Graph-Mo racks gave exceptional wear. First, the free graphite in Graph-Mo's structure acts as a built-in lubricant—reduces friction between the rack and the gears it engages. Second, diamond-hard carbides in Graph-Mo give it great resistance to abrasion and wear.

On top of all this, there was a 30% saving in machining time—Graph-Mo being easier to machine than ordinary tool steels.

For helpful information on the use of Graph-Mo and other graphitic tool steels for machine parts, dies, punches and gages, write for the 10th edition of "Timken Graphitic Steel Data Book". The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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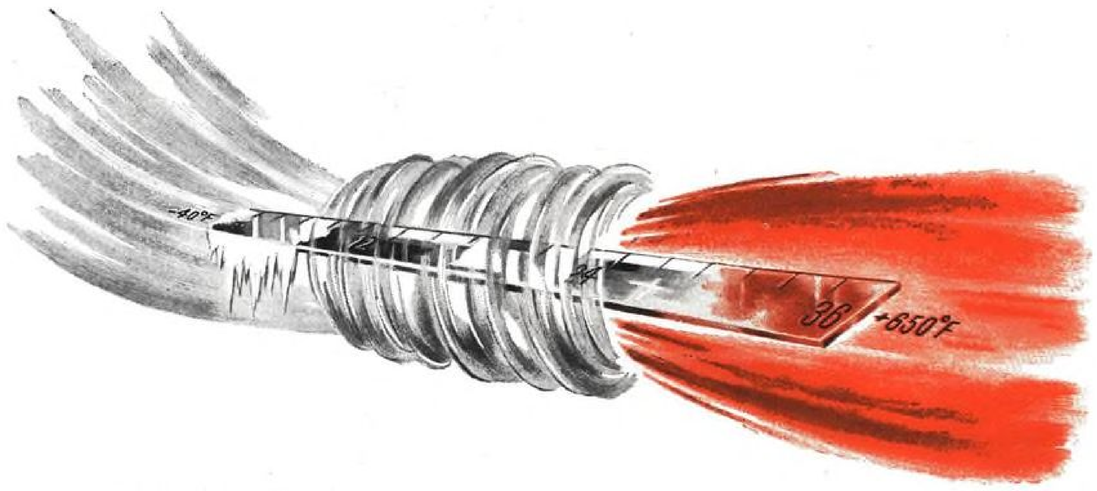

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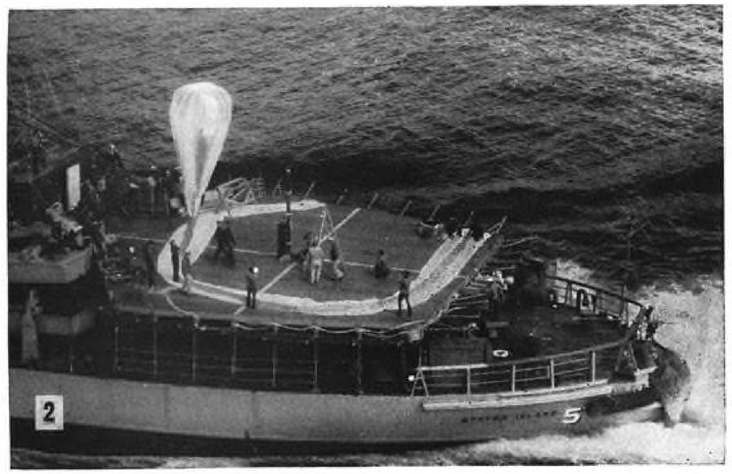
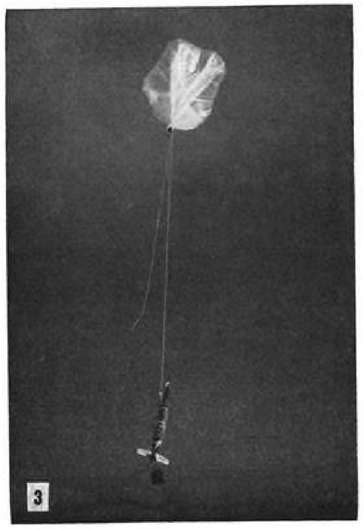
Rockets Aid Cosmic Ray Studies





Using Deacon rockets, a group of scientists working with the U. S. Navy at the North Geomagnetic Pole, have completed a series of high-altitude studies of cosmic radiation and pressure. Geiger counters and ionization chambers were carried aloft to approximately 70,000 ft. inside the Deacons attached to balloons and then fired upwards. During one test, a Deacon was lifted to 77,000 ft. and soared to 50-mi. height after launching. The tests were conducted from the Navy ice-breaker USS Staten Island. These photos show: 1. Personnel raising a Deacon (foreground) for attachment to plastic balloon (right), 2. Balloon is readied on after deck of the Staten Island preparatory to launching, and 3. 55-ft. balloon soars skyward carrying Deacon rocket suspended underneath. A firing mechanism below the rocket releases it from the balloon. Known as Project Mushrat, studies were under auspices of Office of Naval Research.

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MODEL 23B, left above, has same type movement as our aircraft pyrometers. Housed in flanged, 4" round, bakelite case for panel mounting.

MODEL 20B, right above, has same 3" steel case and same movement as our aircraft panel indicators. Both are fully cold-end compensated and available in standard ranges listed, with suitable thermocouple materials.

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TECHNICAL INFORMATION

Synchro—Available as Control Transformer, Transmitter, Resolver, Differential, for 26 or 115 volt 400 cycle operation. Maximum error tolerance is 7 minutes of arc. The hardened pinion shaft may be used as a spline. Terminals for convenient installation and replacement are provided. Other synchros for 60 cycle operation may be obtained. (Basic Type R500).

Servo Motor—The Servo Motor (Basic Type R119) features a very high torque-to-inertia ratio. Motor input is 3.5 watts per phase at 115 volt 400 cycle. Available with high-impedance control winding for operation directly in plate circuit of an Amplifier. Integral precision gear train can be provided. Many other models available including Servo Motors for 60 cycle duty. (Basic Type R303).

Servo Motor-Generator—The motor described above is available with an integral high performance damping generator, providing an output signal of 1/2 volt per 1000 RPM over a 5500 RPM speed range. (Basic Type 420400).

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Foreign Buying

- **Off-shore purchases of aircraft: $874 million.**
- **Britain gets additional $85 million for RAF.**

The U.S. will finance the purchase of approximately $874 million in aircraft and aircraft materiel for foreign nations with Mutual Security funds during the current 1954 fiscal year.

Foreign Operations Administration, headed by Harold Stassen, and Defense Department are now re-working the program at the $874 million level. A tentative program submitted to Congress in July had called for $944 million in aircraft and related purchases. Now this is being trimmed because of over-all cuts in foreign aid money made by Congress. But even $874 million will reflect a substantial increase over the estimated $682 million obligated for aircraft out of fiscal 1953 funds.

▶ **Highlights**—Here are some highlights of the program:

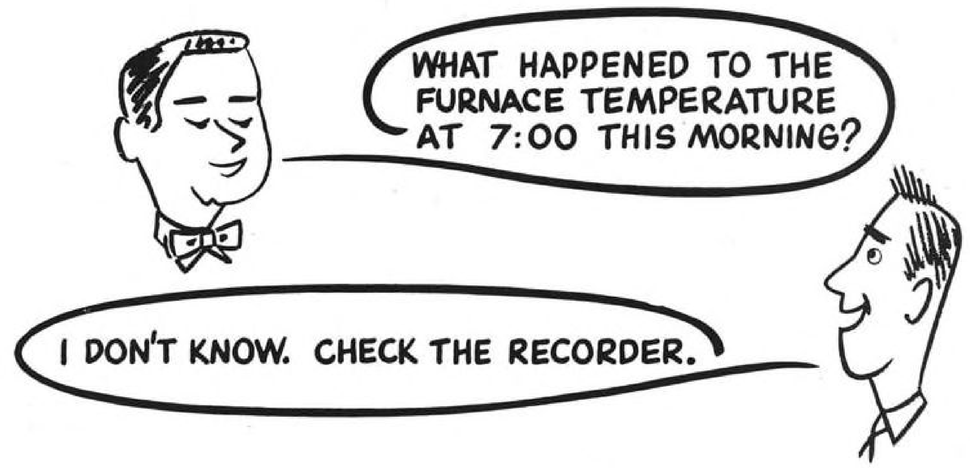
• **In addition** to the $874 million, the U.S. will give $85 million in "economic" aid to Great Britain, to be used for the purchase of aircraft for the Royal Air Force. The point of classifying the aid as "economic," instead of "defense," is to reduce Great Britain's burden in supporting RAF so that money can be used on other government programs. FOA asked for $100 million for RAF financing, but this was cut by Congress.

• **Bulk of defense aid** money, as in past years, will go to the European area—about $700 million. In fiscal 1953, an estimated $617 million was obligated for aircraft purchases for NATO countries.

• **Trend toward** off-shore procurement continues so a substantial amount of the $700 million will be used to buy European-produced aircraft and materiel. Off-shore procurement contracts for aircraft and spares mounted from $13.6 million in fiscal 1952 to $357 million in fiscal 1953.

• **The joint aircraft** program, aimed at spurring European production, as worked out so far, totals over $583 million for purchase of 1,725 planes. The U.S. is putting up $303 million (out of fiscal 1953 funds) or 52% of the total. The program originally drawn by the NATO international staff team called for $400 million, with the U.S. putting up $225 million, or 56% of the total.

• **There will be** a big increase in emphasis on the Asia-Pacific area. About $160 million is earmarked for aircraft purchases for countries in this



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That's one thing. Here's another: the pen arm is driven from a cam. This permits linear charts to be used for almost all measurements, despite the non-linearity of the sensitive element characteristics. When warped or expanded scales are desired, special cams can be supplied.

Furthermore, nylon drive gears are used to provide long life and quiet operation.

There are many other things. If you want to hear about them, let us know. We'll be glad to supply the information. Ask for Catalog No. 60 C.

Even if everything goes the way it should with any process where temperature is involved, sometimes it's important to *prove* everything went right. On the other hand, if something is wrong, if standards aren't met, then it's very important to *know* what went wrong in order to correct it. Was it temperature? Or some other process variable?

When an accurate temperature recorder is on hand, a quick check of the record will tell you if temperature was too high, or low, and for how long. If the temperature was off, your problem is pinpointed and you can work on it right away. If it wasn't, you can go on to other variables and find the troublemaker. Either way, a good recorder is a time-saver.

Thermo Electric makes a good recorder —it is accurate (±¼ of 1% of the range), sensitive (better than ±1/20 of 1%), durable, and can be used to record variations in temperature, humidity, solution conductivity, speed, pH, direct current, DC voltage, strain, or other variables. Both potentiometer pyrometer and resistance thermometer bridge types are available, depending on the application.

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This indicating-recorder, along with T-E's other pyrometric equipment, will be at the Instrument Society of America Exhibit, Sherman Hotel, Chicago, Ill., Sept. 21-25, Booth 59.

Thermo Electric Co., Inc.
FAIR LAWN NEW JERSEY

area, compared with only $22 million in fiscal 1953.

• **Air Force** will conduct a program of training foreign personnel, mainly in Europe, totaling around $100 million. The effort in the Asia-Pacific area will be doubled this year: $9 million is tentatively earmarked, compared with $4.2 million in fiscal 1953.

Area-wise, this is approximately how the $874 million for foreign aid aircraft and materiel is sliced: Europe, $700 million, compared with $617 million in fiscal 1953; Asia-Pacific, $160 million, compared with $22 million in fiscal 1953; Near East, $4 million, compared with $40 million in 1953, and American republics, $10 million, compared with $2.8 million in 1953.

► **What it Buys**—European aircraft production from U.S. off-shore contracts will not get into full swing until fiscal 1955, which starts next July 1. Expenditures on off-shore aircraft contracts, reflecting deliveries, are expected to rise from $8.5 million for 1952 and 1953 fiscal years to $67 million this year, and then climb to $286 million in fiscal 1955.

The $583 million joint aircraft program will finance the purchase of the following types:

• 920 Hawker Hunter Day fighters.
• 250 Vickers Supermarine Swifts.
• 112 Hawker Sea Hawk carrier-based jet fighters.
• 393 Dassault Mystere day fighters.
• 50 F-86D all-weather fighters to be assembled in Italy by Fiat under agreement with North American Aviation, Inc.

U.S. will determine the utilization in NATO forces of the aircraft financed with U.S. funds. They will not necessarily be turned over to the armed services of the country in which they are produced.

► **Projects**—The aircraft program is split into the following political projects:

• **U.S.-United Kingdom:** $223.3 million, with the U.S. putting up $152.9 million and Great Britain putting up $70.4 million. This will finance 824 planes—460 Hawker Hunters, 250 Vickers Swifts, and 112 Sea Hawks.
• **U.S.-France:** $177.5 million, with the U.S. putting up $86.5 million and France putting up $91 million, for a total purchase of 393 Mysteres.
• **U.S.-Belgium:** $88.5 million, with the U.S. putting up $24 million and Belgium, $64.5 million.
• **U.S.-Netherlands:** $70.5 million, with the U.S. putting up $18 million and The Netherlands $52.5 million.

The Belgium and Netherlands projects combined will finance the production of 460 Hawker Hunters.

• **U.S.-Italy:** $22.5 million, to be put up by the U.S. for assembling of 50 North American F-86Ds. Italy has given assurances that she will purchase F-86s.

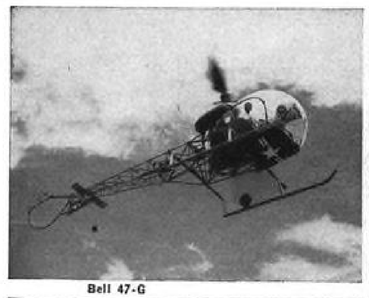
Congress has shown some skepticism toward the off-shore procurement program, but there is strong support for it in Defense Department and some talk of confining defense aid exclusively to off-shore contracting.

► **Objections**—Senate Appropriations Committee commented: "It is recognized that some consideration must be given to the distribution of contracts among the various nations of Europe. However, it appears to the committee that too much emphasis has been placed on awarding contracts in areas where political objectives are desired or where a balance-of-payments problem exists."

N. E. Halaby, Deputy Assistant Secretary of Defense for International Affairs, said the prices for European aircraft are lower than for similar U.S. types. He compared the $205,000 flyaway cost of the Hawker-Hunter to the $225,000 cost of the F-86F, to which he said the Hawker was "equivalent," and "superior in some respects."

However, U.S. industry observers pointed out that European aircraft cost figures do not include most of the vital equipment contained in U.S. aircraft, such as computing radar gunsights, all-weather electronic gear, etc.

Halaby's comparison between the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McCulloch MC-4


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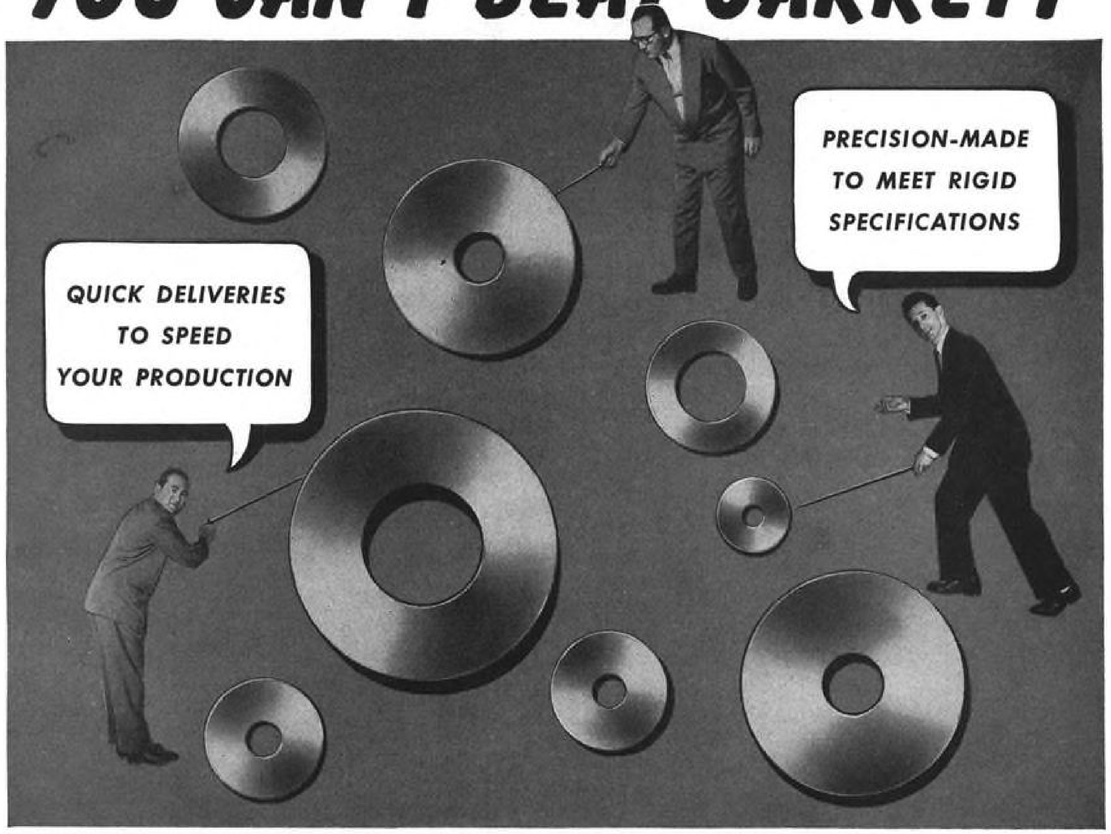

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F-86F and the Hunter was also challenged by industry observers on the grounds that the F-86F has been in production for some time and actually saw combat in Korea, while the Hunter is just beginning production and there is not yet a single RAF squadron equipped with them.

▶ **Comparisons**—A more apt comparison would match the Hunter with the North American F-100, which is now in about the same stage of production as the Hunter. Industry observers regard the F-100 as superior in every respect to the Hunter.

The American aircraft industry, which has been hit recently by Defense Department contract cancelations under the Republican economy regime, is bitterly opposed to financing the construction of 1,725 military aircraft abroad.

It feels that first priority for aircraft procurement funds should be given to the domestic aircraft industry.

▶ **10 Reasons**—Halaby presented these 10 reasons for supporting off-shore procurement to the congressional appropriations committees:

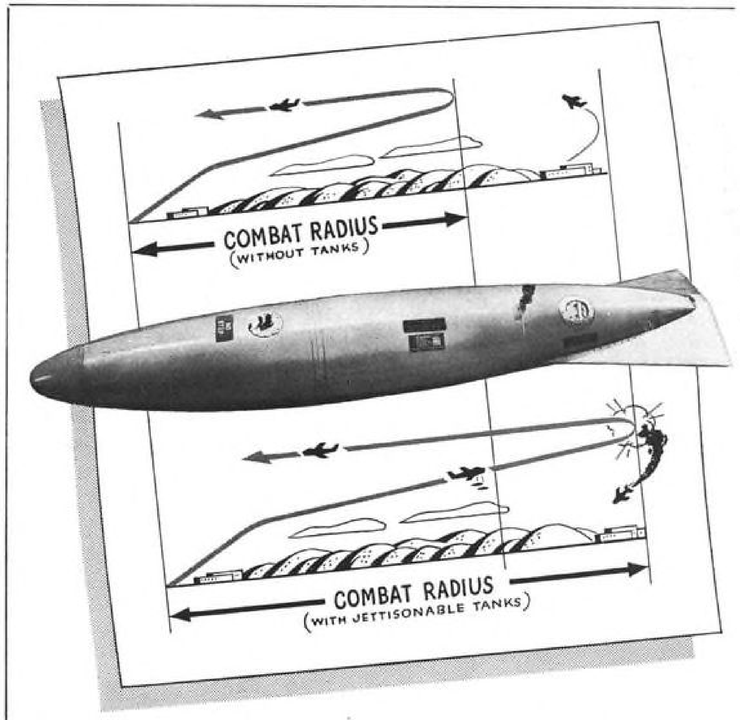
- It fills an "urgent" requirement for aircraft and other materiel for European forces.
- The production is on the spot where the equipment is going to be used and therefore the replacement problem is simplified.
- We create a "minimum" industrial mobilization base in Europe.
- The packing, handling, crating and transportation problem is simplified.
- Incidental to the program, the requirements for dollar aid are reduced.
- An impetus is given to self-supporting military production in Europe.
- There is a multiplier effect: For example, in the joint aircraft program, our funds combined with those of other countries get a total number of aircraft produced that is larger than would have otherwise been the case. One dollar put up by the U.S. is returning more than $1 worth of airplanes.
- Through combined planning, we are slowly moving toward standardization.
- The program creates improved technology and skilled labor pools in Europe.
- There is the morale improvement which comes from earning, rather than receiving what often seems like charity.

MACKAY TROPHY WINNER
Maj. Louis H. Carrington, USAF (center), has been awarded the 1952 Mackay Trophy for the first nonstop multi-jet bomber flight across the Pacific. Carrington made the flight last year with crewmates Capt. Wallace D. Yancey (left) and Maj. Frederic W. Shook in a North American RB-45C. The plane was refueled twice in the air by a Boeing KB-29M tanker during the 3,640-mi. hop from Alaska to Japan which took 9 hr. 50 min.

British Jet License

(McGraw-Hill World News)

Paris—French aircraft builder Marcel Dassault has signed a licensing agreement to build the British Armstrong Siddeley Viper 1,640-lb.-thrust jet engine. Dassault plans to use two of these engines in a new lightweight delta-wing interceptor scheduled to make its first flight next year.



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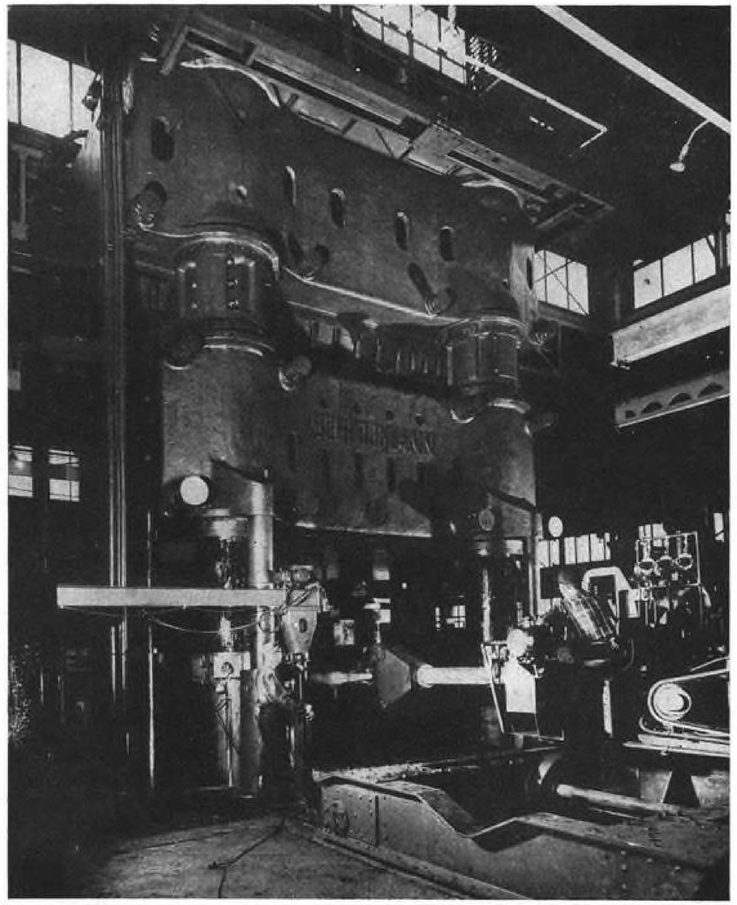
Alcoa Gets Set for Big Forge Presses

Production engineer tells what his company has learned from 16,500-tonner, and how it will smooth way for larger units.

An insight into the difficulties and advantages likely to be encountered in the approaching heavy press era has been detailed by A. E. Favre, chief production engineer of Aluminum Co. of America's Cleveland Works.

Speaking before the recent four-day semi-annual meeting of the American Society of Mechanical Engineers, in Los Angeles, he outlined the considerations affecting light alloy forging design and production.

Alcoa will operate big-pressure forge machines—50,000- and 35,000-ton units—under the revised heavy press program. Since March 1952, when it began operating a 16,500-ton Schloemann forger, Alcoa has piled up considerable experience and data in addition to that already amassed in previous operations on hammers and small forge presses.



MANIPULATOR pushes preheated stock into 16,500-ton Schloemann forging press.

▶ **Die Problem**—One of the more serious design problems for some time to come, in Favre's opinion, will be procurement of the steel for and the sinking of large dies.

Right now, Alcoa is having difficulty in obtaining sufficient die-inking sources for present requirements on the 16,500-ton hydraulic press. Die requirements for the 35,000- and the 50,000-ton hydraulic presses will be greater.

Some forging designs could conceivably require six months for the construction of a set of finisher dies only, assuming that a die-sinking machine is utilized 8 hr. a day for six days a week. If the complexity of the design is such that two or more blocking dies are required to produce the forgings, it would necessitate a large die-sinking machine for each operational die, and each machine would be needed for practically six months.

▶ **Delivery Stretchout**—With aircraft companies going to larger and closer-tolerance forgings, it is apparent that a number of large machines will have to be constructed so that necessary die-sinking capacities will be available, Favre points out. This, added to the procurement time of die blocks, will extend delivery of forgings far beyond anything which we have known.

The sooner dies can be designed and constructed for the large presses, the quicker experience will be obtained in fabricating large forgings. And, the sooner forgings are designed for the large presses, the sooner machine tool builders will design and construct machines for sinking large dies.

▶ **Block Quality**—Die block quality is another consideration. Forgings with deep ribs or deep locks that extend to the center of the die block reach a portion of the steel that is not as sound as the material within a few inches of the surface. Improvement in die block quality can minimize die breakage.

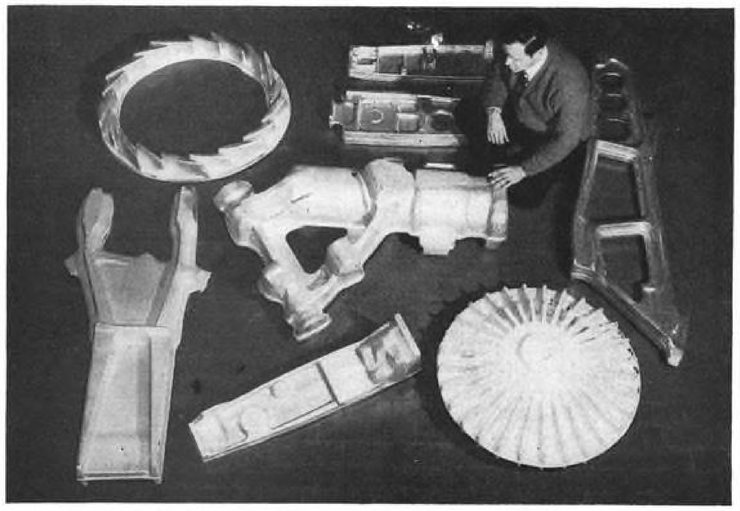
Favre reveals that Alcoa expects to place on order sets of cast dies with cavities cast in. As soon as they are received, Alcoa plans to evaluate the use of such cast steel and nodular iron dies, with the idea that it may result in another source for die material and possibly a reduction in die-sinking time.

▶ **Plus and Minus**—Examining Alcoa's press-forging experience, Favre points out that the company has had encouraging results in regard to surface quality, dimensional uniformity, reduction of draft angles, ability to produce thinner webs and ribs, and increased die life. There has been no improvement over hammer forging in mechanical properties or metallurgical quality, but none was expected, Favre says.

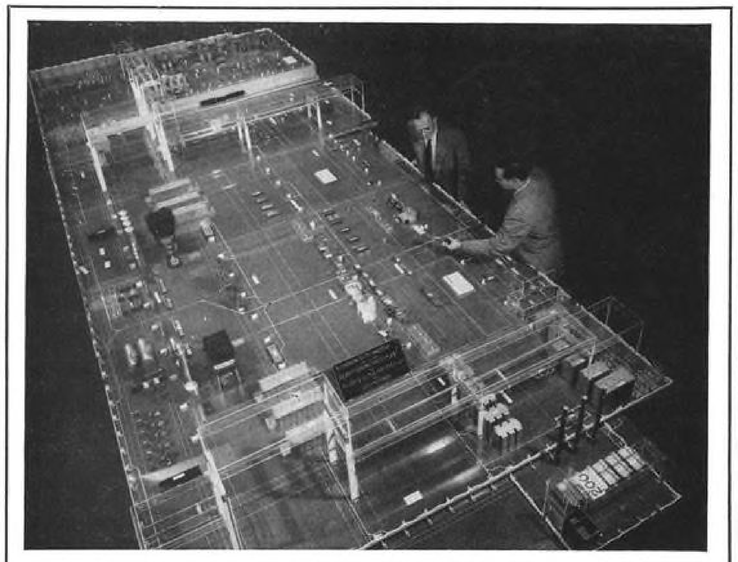
Considerable improvement in surface quality is evidenced by greater smoothness and freedom from lap, fold and other defects which have to be chipped out between hammer operations or ground out and polished in final inspection.

Favre attributes this result to the fact that the forging is blocked or finished in a single stroke of the press, avoiding small abrasions and slivers developed from repeated hammer blows (which never hit twice in exactly the same place).

▶ **Uniformity**—Dimensional uniformity from forging to forging has been better than expected. Although dies are designed to come together, this is not always achieved in hydraulic press operations. However, a high degree of uniformity in total pressure and unit pres-



TYPICAL ALUMINUM FORGINGS made at Alcoa's Cleveland Works: Diffuser and compressor wheel for Pratt & Whitney's J42, landing gear (center) for Cleveland Pneumatic, wing structure (right) for Boeing. Other forgings were made for Republic.



Air Force heavy press plant being built at Alcoa's Cleveland Works will have equipment spotted according to this scale model layout. Die shop area is located at rear, while at left center the giant 35,000- and 50,000-ton forge presses and associated billet heating furnaces and trim presses will be located. Finishing operations will be done at right center area. Heat treating department is shown in lower right of installation. Model scale is ¼ in. to 1 ft.

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sure does exist from forging to forging, and if temperatures, dwell and lubrication are accurately controlled, resultant dimensional uniformity should be good.

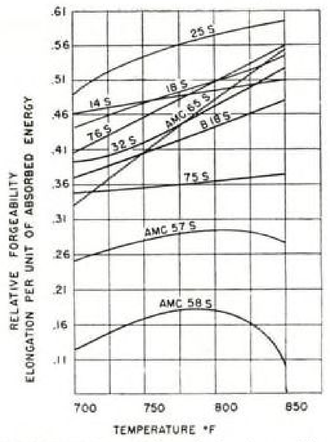
Control of these factors, however, is not always easy, Favre says, and requires constant refinement.

► **Die Life**—Die life at Alcoa during the past year has been outstanding on the 16,500-ton press, Favre reveals. But this may not be representative of what might be expected in the future. Since few new jobs have been produced in any substantial volume, the die mortality record cannot be taken as an index of future experience.

There have been no major die failures. Setups have been given meticulous attention, and this precaution has been reflected in the costs. If the setup looks difficult or hazardous, deflection measurements are taken under pressure to insure staying within safe limits.

Favre believes that deflection studies will be of major importance in the operation of the 35,000- and 50,000-ton presses, since the concentration of die stresses on these machines can easily reach such magnitudes that no material can avoid failure.

Usually, it will not be possible to provide spare die equipment for large complex forgings—time and money involved will be too great. Also, spares are not the answer to the problem; if the original can be broken, the spare can be broken—so in the end the cause must be found and eliminated. This can be done only through a knowledge of what is happening, Favre says.



RELATIVE forgeability of aluminum alloys.

► **Draft Angles**—Reduced draft angles are partially responsible for improvements in the thinning of webs and ribs. Standard at 7 deg and rarely less than 5 deg in hammer forging practice, draft angles can be reduced easily to 5 deg or 3 deg, or even less, in press forging, Favre claims.

The most important reason for this is the feasibility of incorporating knockouts in the dies—not practical in hammer dies.

► **Thinness Factors**—Aircraft designers want thin web sections with thin ribs. These seem to be definitely in the picture for press forgings, but perhaps not with the thinness the designer could use and would like to get.

In any case, they are the joint responsibility of the designer and the forging manufacturer.

Reduction and control of required unit forging pressures must be achieved to produce forgings of relatively large area incorporating thin web sections and narrow ribs to fairly precise dimensions.

Favre contends that very frequently far too much emphasis has been placed on press size or capacity in the belief that extremely high pressures will produce a complex forging in any size.

No amount of pressure will cause metal to flow if the conditions are not right, Favre says. No press, however powerful, will produce a thin web panel if the forging and the dies are improperly designed. The entire secret of such production, he says, lies first in proper forging design, secondly, in proper die design, and thirdly in proper production practices. In all three of these factors the objective is

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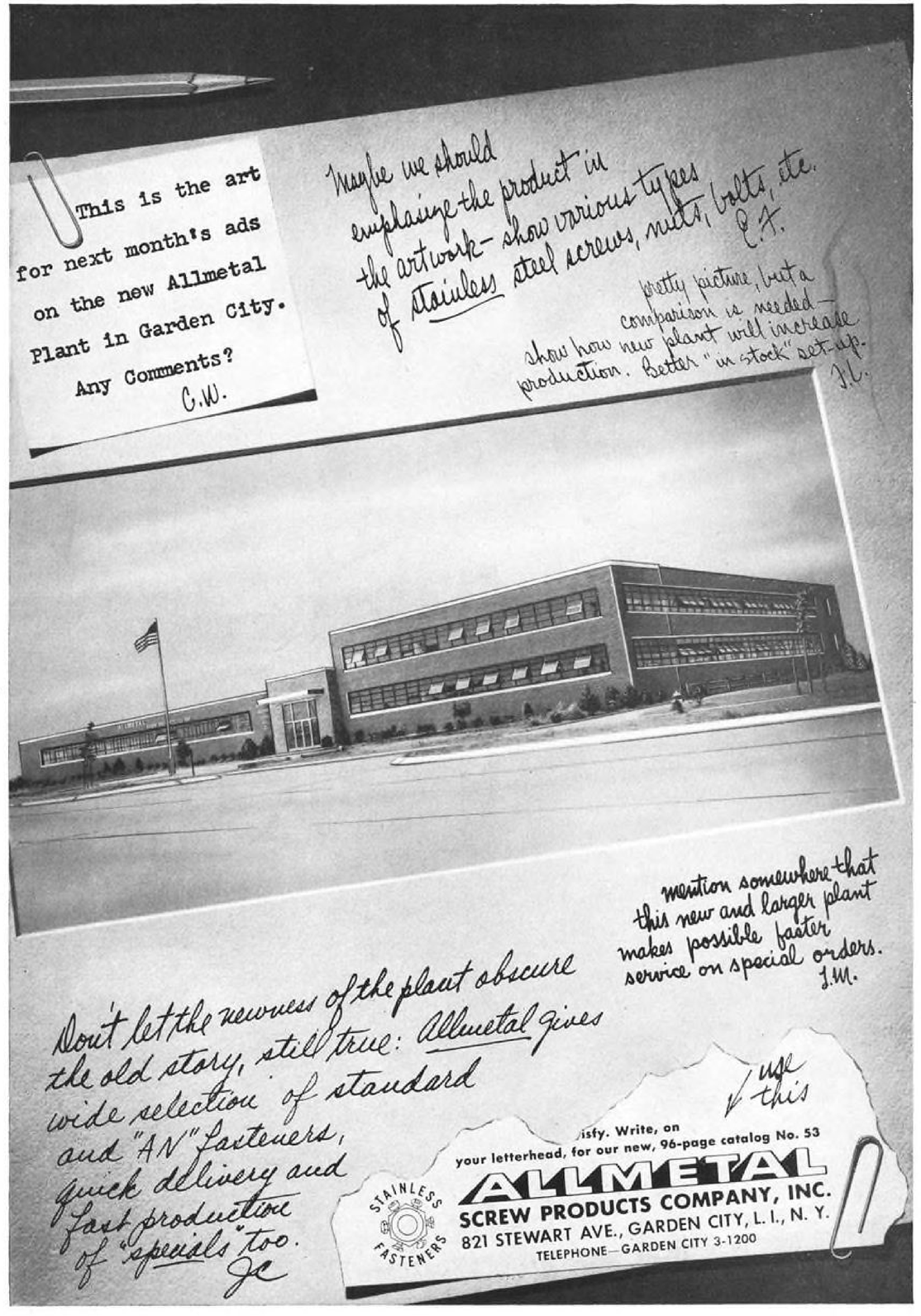

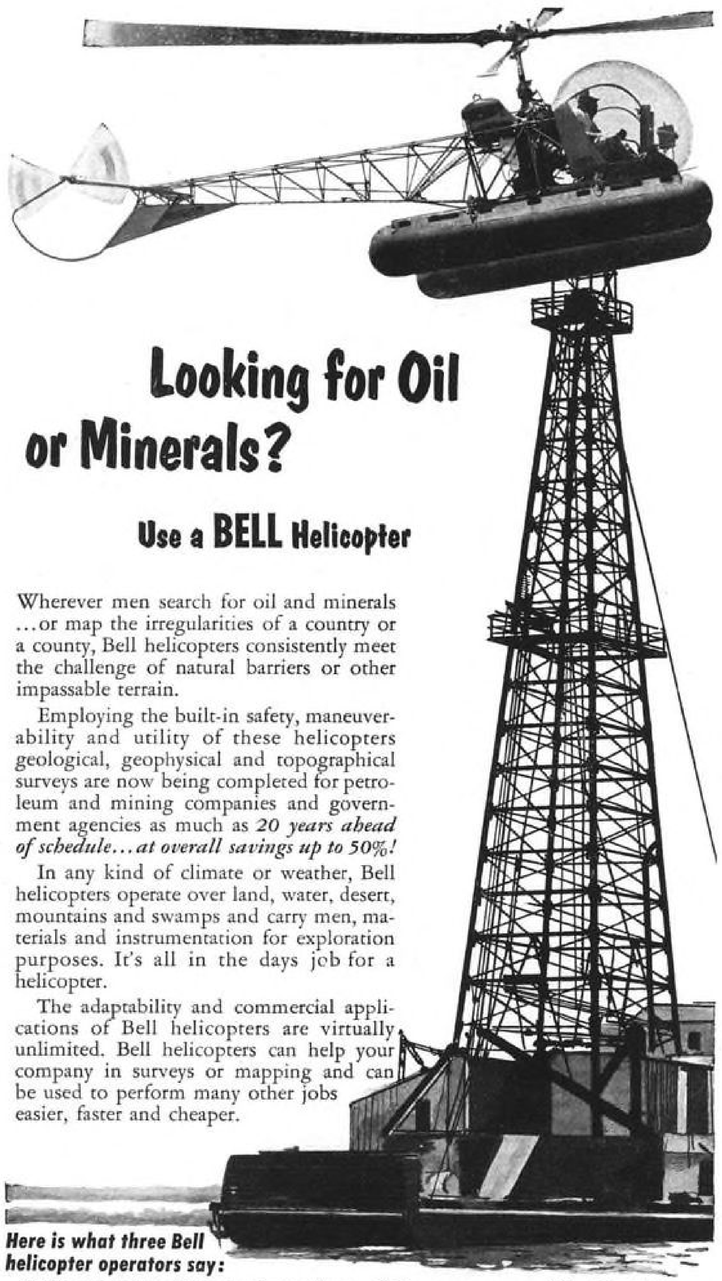

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the reduction of unit pressures to the absolute minimum required.

If a press has a capacity of 50,000 tons and a forging requires 40 tons/sq. in. to make, the machine can only produce a piece about 35 in. square. But, if by skillful design and fabricating practices, this required pressure can be reduced to 15 tons/sq. in., the press can fabricate a panel about 30×100 in., Favre points out.

Thus, a 50,000-ton press becomes equivalent to 150,000 tons; or from another viewpoint, it may be reduced in effectiveness to 15,000 tons.

▶ **Designer Assistance**—Favre examines some of the things the forging designer can do to assist in reducing the unit pressure required to produce his forging. Thin webs, he says, particularly in "boxed-in" sections, tend to "freeze" between the die surfaces and create enormous resistance to flow, with the consequent buildup of excessive die stresses.

If relief can be provided by punchouts, it gives some place for the excess metal to flow. This not only makes a thinner web possible, but greatly reduces the required pressure. Sometimes the designer cannot allow a punchout, but perhaps can arrange rib disposition to avoid completely boxed-in sections and trapped metal. Something can be done if the problem and the necessity are understood, Favre says.

For maximum weight reduction, a designer frequently will insist upon very small fillet radii between web sections and adjoining ribs. In doing this he often defeats his own purpose, because the resistance of metal flow into the ribs is so increased that greater web thickness is required, or at least, in production the web section always will tend to run over the drawing limits.

Favre mentions these as only typical examples of what is meant by forging design responsibility.

▶ **Die Design Details**—The forging-die designer has responsibilities, too, but all with the same general objective—to reduce required unit pressures. He must determine the number of blocking dies and design the impressions in each to provide minimum resistance to flow and most favorable distribution of metal for the succeeding operation. He must also determine the type of original stock or preformed shapes, and whether to use sawing, bending or perhaps handforging as a preliminary operation.

Other important considerations are gutter and flash design and flash removal. A large factor in reducing or increasing resistance to metal flow is the character of the die surface. Properly polished dies are very helpful. Even plating may be warranted where practical, Favre contends.

▶ **Production Stage**—In actual production, additional controls and practices

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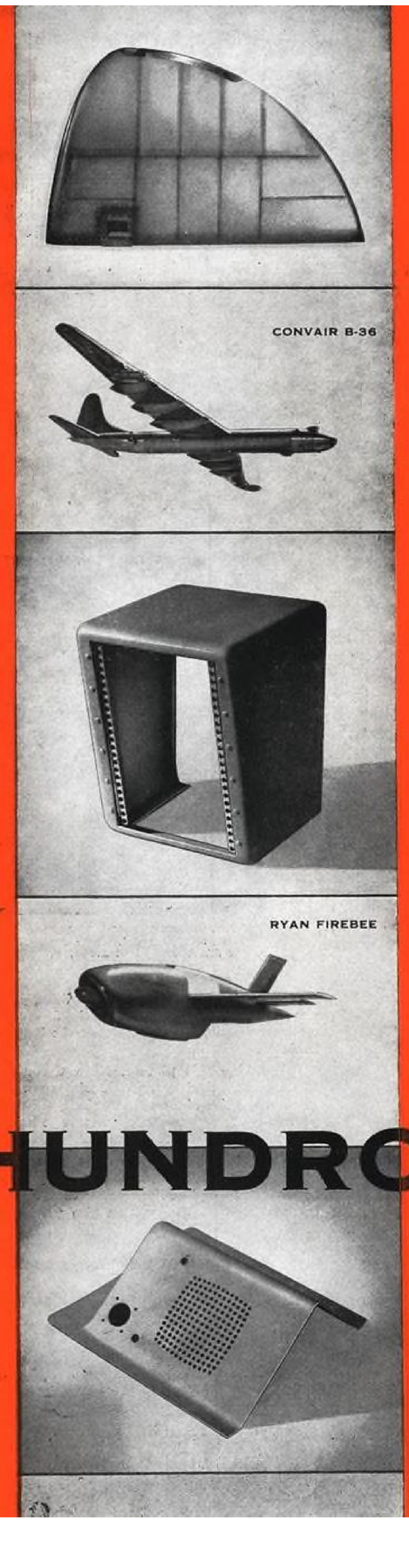

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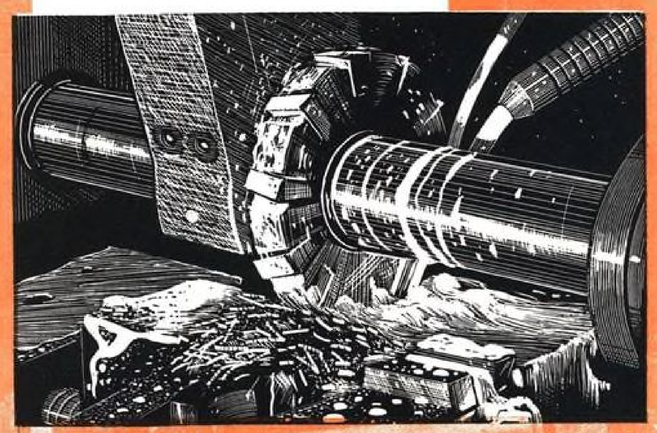

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must be observed—again with the overall aim of promoting smooth flow of metal and holding unit pressure requirements to a minimum. Temperature of stock and dies and lubrication of dies are major factors.

The hotter the dies, the lower will be the flow resistance, generally. But the hotter the dies, the greater is the problem of die lubrication and the holding of certain dimensional tolerances. In the end, this all adds up to a proper balance of many factors which can be determined only by experience.

Favre contends that it is not possible at this stage to set down definite standards giving practical design proportions and production tolerances, but he presents some Alcoa ideas.

He says it must be thoroughly understood that very thin sections, such as those contemplated for integrally stiffened wing panels, are not considered as being practicable, or even possible, as forged. Such sections—.060 in. to .120 in.—can only be achieved by subsequent machining, he says.

By "thin web sections as forged," Favre means sections from about .140 in. to .225 in. Alcoa has produced nothing as low as .140 in. as yet, but some .180-in. webs have been produced in rather heavily restricted sections without punchouts, up to about 100 sq. in. in area, the total area of the forging being, perhaps, 300-450 sq. in.

► **Tolerances**—With proper control of stock volume, stock and die temperature, and lubrication and surface condition of dies, the die-closure tolerance and length and width tolerances can be held to a minimum. Alcoa has set up controls to hold these factors to fairly narrow limits, with closer controls the aim.

Press bed and die deflection also will affect die closure, as well as length and width tolerances, hence deflection must be held to a minimum, not only to improve tolerances but to prevent die breakage and damage to equipment.

Forgings with thin webs and ribs along with small draft angles present definite problems in straightening. Warpage is likely to occur during forging and during heat treatment, and reliance upon die- or hand-straightening, or a combination of both, has made it difficult to hold these forgings to a very close straightness tolerance.

Ejection of thin web forgings with small draft angles from dies also can cause distortion, or even piercing of the parts. Small draft angle forgings may have to be removed from the straightening die with mechanical ejectors. This may cause a bow, which may require hand-straightening after die-straightening.

These problems will have to be worked out in the future. Perhaps with more experience, it will be possible to

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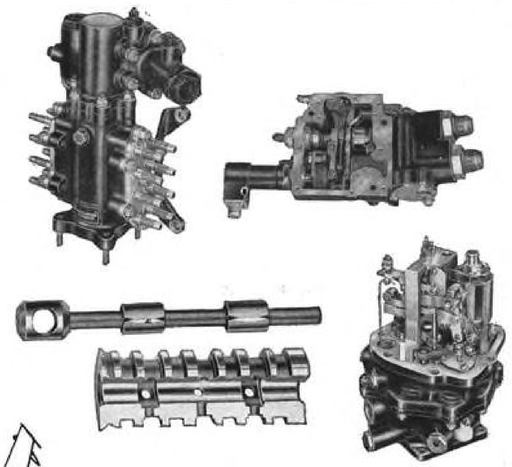

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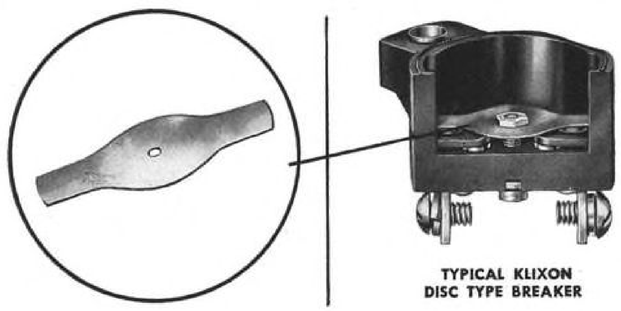

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produce forgings with thin webs and small draft angles within desired straightness tolerances without encountering the difficulties previously mentioned, Favre says.

► **Forgeability**—Relative forgeability of aluminum alloys is a production factor, hence is directly related to production cost. Favre compares several forging alloys and points out that the relative forgeability improves markedly with an increase in temperature. The normal forging temperature for most alloys is about 800F, with cracking or rupturing occurring if forging is done at substantially higher or lower values.

Forgeability of an alloy determines, to a large degree, the number of blocking operations required to attain a shape suitable for forging to size in a finishing die. This means that the more difficult an alloy is to forge, the greater the number of operations required to deform the forging stock to desired shape. The 25S alloy should require fewer operations and fewer dies than the same part in 75S, hence should have a direct influence on the cost of the finished forging.

Generally, the higher-strength forging alloys have poorer forgeability than do the lower strength alloys. Therefore, the forging designer should not specify an alloy of relatively difficult forgeability, unless he requires the higher mechanical properties for that particular application, Favre points out.

► **Machining**—Favre considers "in-process machining" as those intermediate operations which the forging producer uses to get his finished forging. He does not include in this category, for example, the reduction of web thicknesses down to dimensions of .060-.090 in.

As an example of in-process machining, Favre refers to those operations necessary to reduce massive sections to obtain effective heat treatment of 75S and 14S forgings to the T6 condition. He suggests the possibility of machining webs and fillets in boxed-in sections between forging operations in order to reduce unit pressures in producing forgings to desired size. This might be economical, particularly in short runs, he says.

► **Stresses, Distortion**—During the machining of aluminum alloy forgings, changes sometimes occur in dimensions. These changes, commonly referred to as distortion, may cause the airframe manufacturer trouble during extensive machining operations of large die forgings.

The dimensional changes may be due to localized over-heating during machining of the parts, redistribution or relief of residual stresses imposed during heat treatment and, most important, Favre says, by exceeding the yield strength of the part through use of

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

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

*Reg. U.S. Pat. Off.

JOHNS-MANVILLE PRODUCTS **Johns-Manville** PRODUCTS for the AVIATION INDUSTRY

improper chucking or machining fixtures.

Changes also can result through excessive loading of the part at the tool tip because of insufficient support.

The necessity of minimizing residual stresses caused by heat treatment is under continuous study at Alcoa. Investigations have shown that proper sequence of machining operations is a great aid in equalizing the relief of residual stresses. Compressive residual stresses, generally located at the surface of a forging, are balanced by tensile stresses in the interior. Removal of the compressive stresses by alternate machining on both sides of a forging will assist greatly in holding distortion to a minimum.

Favre observes that when unexpected changes during machining can be controlled, the aircraft companies may not demand as many close-tolerance, thin-web forgings as they now do. The machine shop, he says, may not object so much to extensive machining on a forging if the piece would remain stable during the machining operation.—IS

New Plastic Has High Impact Resistance

A new entry in the plastic sheet field —an extruded, high-impact material combining polystyrene and rubber—is seen offering possibilities aircraft industry applications for cargo compartment liners, instrument panels, interior trim, baggage racks, lavatory components, tote boxes and other components. In translucent form it could serve in dome lights.

Produced by Chicago Molded Products Corp.'s Campco Division, the material (Campco S-300) contains about 8-10% rubber, which may be increased to afford higher impact resistance, it is reported.

The sheet is available in any length, with widths varying from 26 to 58 in., and thicknesses ranging from .005 to .125 in. The material has a glossy finish; colors are unlimited.

► **Forming**—The sheet can be formed by conventional methods—in male and female molds, by manual stretch forming, or by vacuum methods.

Campco considers the vacuum forming technique as potentially the most important commercially. The sheet is warmed, locked in place over a mold and drawn into final shape by vacuum.

Campco reports it is equipped to produce 500,000 lb. of sheet per month in a new plant located at 2717 N. Normandy Ave., Chicago.

Plans are being studied for warehousing standard sizes of sheet and standard colors throughout the country to meet the broad commercial applications the material appears to fit.

Layout Models Lent For Plant Planning

A kit of machine tool scale models to facilitate making of shop layouts is offered on a free-loan basis by South Bend Lathe Works, South Bend, Ind.

Models are made to a scale of 1:16. Machine tools represented include six sizes of bench- and floor-model lathes, pedestal tool grinders, drill presses and bench shapers. Included in the kit are models of mechanics and floor plan layout sheets cross-ruled to the same scale as models.

The sets are available to any established organization that can use them for planning a new shop or rearranging present shop equipment. The borrower is expected to pay transportation costs both ways and return the models promptly.

South Bend has a descriptive bulletin (5301) available.

More 'New' Metal Tubing

Titanium and zirconium tubing up to 24 ft. long is scheduled for annealing in a new vacuum furnace now being installed at Superior Tube Co.'s Norristown, Pa., plant.

Superior is mass-producing titanium tubing in ⅜-in. to 1½-in. outside diameter sizes, and in wall thickness from .004 to .187 in. The heat- and corrosion-resistant tubing is produced in seamless and in what the company calls Weldrawn—welded and drawn—construction.

Because of limited availability of the raw material for commercial usage, only small experimental quantities of zirconium tubing is now being offered by Superior.

Safe landings on rain-slogged runways *with* WESTINGHOUSE DECELOSTAT® CONTROLLERS

● When you land a plane equipped with Westinghouse Decelostat Controllers, you can *safely* apply full braking effort on a wet runway.

Decelostat Controllers adjust the braking to the surface condition of the runway . . . ease up on the brakes at slippery spots . . . let the full braking effort work where it is dry. As a result, you get the most efficient braking pattern possible. You stop quickly and safely, and your wheels cannot lock and throw you into a dangerous skid.

What's more, Decelostat Controllers save you money. Efficient braking reduces tire wear, so casings last longer. The money you save on tires *more than pays* for the controllers.

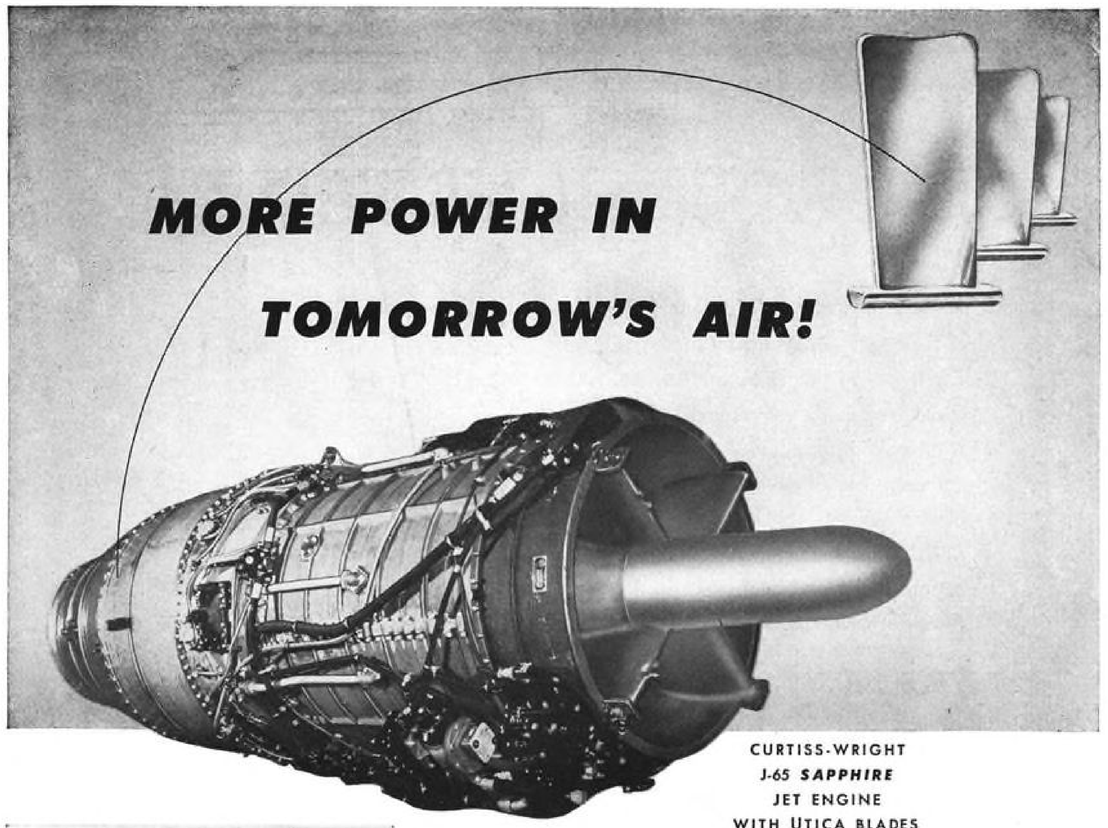
Write for complete information.

Westinghouse Air Brake COMPANY

INDUSTRIAL PRODUCTS DIVISION AIRCRAFT SECTION — WILMERDING, PENNSYLVANIA

FOREIGN AFTERBURNERS

Tail closeup photos of British Supermarine Swift F.4 (top) and French Dassault Mystere 2 (bottom) show different approaches in design of variable exit nozzles on these jet fighters. The "eyelid"-type nozzles can be opened and closed vertically on the Swift and horizontally on the Mystere. Tail designs of the two foreign sweptwing jet fighters also provide interesting comparison.



CURTISS-WRIGHT
J-65 SAPPHIRE
JET ENGINE
WITH UTICA BLADES

The Republic F-84-F Thunderstreak powered with Curtiss-Wright *Sapphire* outperforms any airplane in its class—in speed, range, hitting power . . . in every way.

Speed of a fighter plus a heavy bomb-load—that's the new Martin built B-57 twin jet bomber which will be powered with Curtiss-Wright *Sapphire* engines.

Twenty-five percent more powerful than jets it is replacing—that's the story on the great new *Sapphire* engine. And here's the *inside* story . . .

Deep down in the heart of this *Sapphire* engine are turbine blades forged and finished by UTICA. They're spinning like crazy in a thundering hurricane of swirling gases. These UTICA blades, precisely forged —accurate to a thousandth—harness this blast of gases into a giant propulsive power that drives some of the world's best high-performance aircraft!

We're very proud that Curtiss-Wright picked us to supply turbine and compressor blades for the *Sapphire* engine. UTICA jet blades are but one sample of the exacting precision forgings made possible by our 57 years of forging experience . . . teamed with finest modern equipment . . . backed by UTICA's continuous drive for ever finer quality.

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SOLAR PUT THE STINGER IN THE TAIL!

AMERICA'S NEWEST jet fighters have stingers in their tails—*Afterburners* to give blazing bursts of power in combat. They make possible shorter takeoffs and faster climbs by burning fuel in a jet stream spurting at cyclone speeds, and at heats that melt steel like butter. The Afterburner was pioneered* and perfected at Solar. We're proud to call the Afterburner . . .

ANOTHER SOLAR CONTRIBUTION

Lockheed F-94 interceptor with Allison J33 jet engine.

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exhaust manifolds, jet engine components, afterburners, small gas turbines, aircraft bellows and ducting systems, industrial expansion joints, fabricated parts of stainless steel and all high temperature alloys, ceramic coatings, stainless alloy castings and welding fluxes.

* **Every known Afterburner in the world today uses features originated by Solar Aircraft Company**

Spray-On Coating Is Heat Shield

A sprayable, quick-drying, high-heat-resistant insulating material has been developed at B. F. Goodrich Co. for use in the rocket and guided missile field.

Known as Pyrolock, a 1/16-in. coat of the insulation will protect metals for as long as 10 sec. against temperatures hotter than their melting points, it is reported. In one test, a treated steel panel was "unharmed" after 4½-sec. exposure to a 5,000F flame.

The material is reported to be non-toxic, non-explosive. It will adhere to clean metal surfaces without sandblasting or use of primer. It will bond itself to metal with a strength that withstands sharp impact short of actual deformation of the metal. It will also withstand "indefinite" temperature cycles from −60 to 165F. Resistant to most solvents and chemicals, the material can easily be modified for use anywhere that resistance to flame and high temperature is needed, a spokesman for the company said.

Pyrolock was developed at Defense Department request. Inventor of the material is Goodrich's general chemical laboratories manager, Donald V. Sarbach. It is manufactured by the company's Industrial Products Division.

West Coast Firms Build New Tunnels

New windtunnel facilities are being readied at two West Coast airframe companies—Lockheed-Burbank and Douglas-Santa Monica.

At Lockheed Aircraft Corp.'s site, work is underway to improve the company's existing tunnel so that it will be able to accommodate future jet engines up to 25 ft. long and developing up to 24,000 lb. thrust. First units scheduled to be checked will be military type engines, including turboprops for the Super Connie. Cost of the modification will be $281,000.

The facility will incorporate a 290-ft. tube fitted with 55-ft.-high silencing stacks at each end. Stack design will give a low outside sound level to permit 24-hr. operation.

At Douglas Aircraft Co.'s plant, a new lowspeed tunnel is being completed to supplement the company's other tunnel facilities. The new installation will be used for development work in aerodynamic, powerplant and air conditioning fields and for aircraft and missile studies.

Tunnel building is 40x80 ft. The tunnel itself measures 65 ft. long and 25 ft. wide. The section accommodating test parts is 3 ft. high, 4½ ft. wide and 10 ft. long.

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Cart Simplifies Compressor Assembly

A new assembly cart has simplified production of gas turbine compressors at Garrett Corp.'s AiResearch Mfg. Co., Phoenix, Ariz.

Designed by AiResearch's engineering department and built at the plant, the cart carries a compressor (part of an auxiliary pneumatic power system) through the assembly process, test lab, inspection and finally to the shipping room.

▶ **Advantages**—The cart is handled easily by one man, allows the worker to remain close to his tool bench and small-parts tray.

Benefits include:

- **Reduction** of operator fatigue.
- **Damage-free** transit of parts.
- **Ability** to pull a cart out of the line for special work without delaying assembly flow.

The initial subassembly compressor frame is loaded at the first station by two men. Only a slight pressure on the hand control is required to trigger a spring catch that drops a holding pin into a sprocket, where it locks in place, AiResearch says.

▶ **Cart Controls**—By hand control, a worker can rotate a unit on the cart vertically through 360 deg., in 15 deg. increments. Foot controls permit horizontal rotation through 360 deg., with stops wherever the operator chooses. The cart can be secured to the floor by a foot brake to guard against movement effects during torquing operations.

It is mounted on four rubber-tired wheels, the front two are fixed and the rear two swivel for close turning, company explains.

All facilities in the test cells are standardized to the height of the test carts.

Removable Inserts Cut Tube-Working Costs

Tube-processing operations now cost less at Temco Aircraft Corp., through use of a master clamp block that has interchangeable inserts.

Normally, separate blocks are required to hold different size tubes. But in the Temco scheme, inserts are substituted in the adjustable block that is designed for use with a Vaill No. 7 tube-end-forming machine.

Externally the master block duplicates the standard block, except that it is one-half inch longer to provide a shoulder. Internally the block is bored to a 3-in. diameter, except that the extra half inch

For aircraft engine tube assemblies

Machined accurately,

Bent accurately,

Brazed accurately

IT'S SPECIAL MACHINE TOOL ENGINEERING WORKS

These tube assemblies, which provide return oil lines in a famous-make aircraft engine, proved "too tough to handle" for several subcontractors. But SPECIAL Machine Tool Engineering Works has been able to meet both specifications and delivery dates.

SPECIAL combines the engineering ability, high-caliber workmanship, tight quality control and necessary equipment required to:

- *machine* fittings to close tolerances and smooth micro-finishes with perfect threads
- *braze* to withstand pressure test and X-Ray inspection
- *bend* tubing to rigid tolerances
- *design and produce* metal Acceptance Fixture Gages to check contour of tubing and location of fittings, thus eliminating assembly problems.

No wonder blue-chip companies in the aircraft and other industries have made a habit of calling in SPECIAL at the planning stage. You will find it profitable to do the same.

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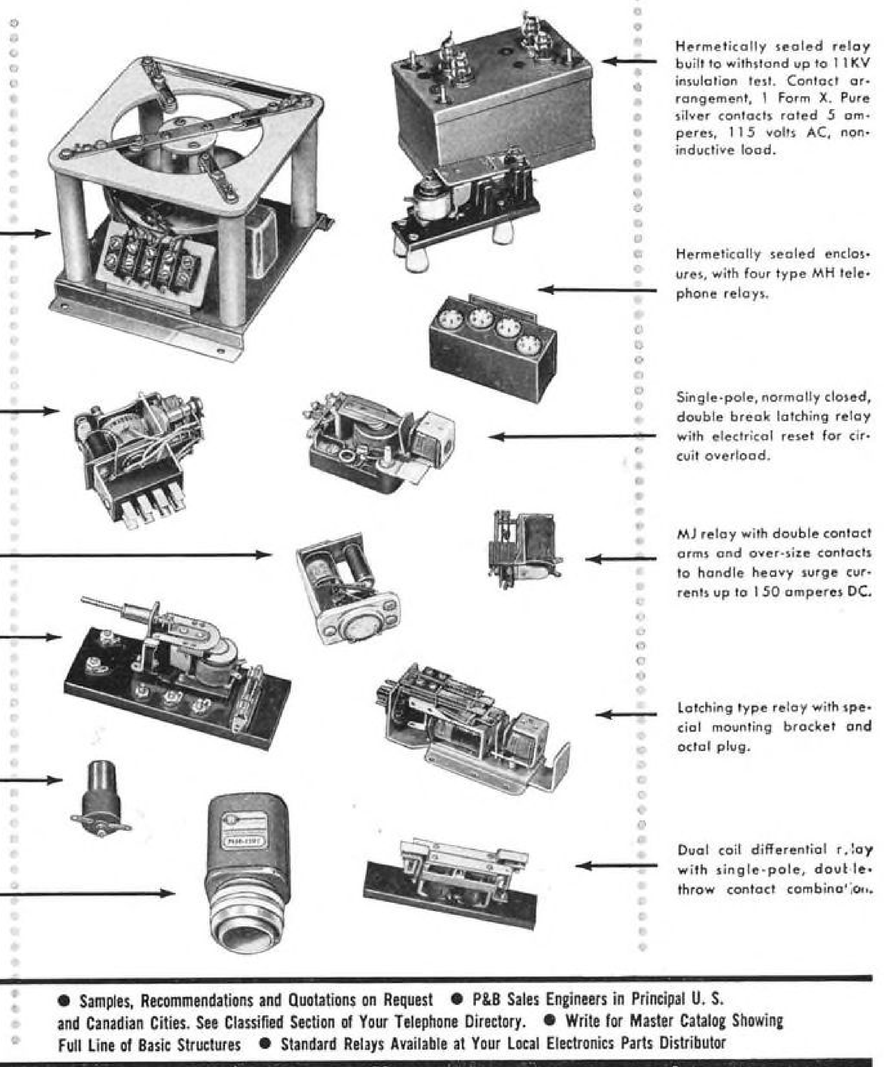

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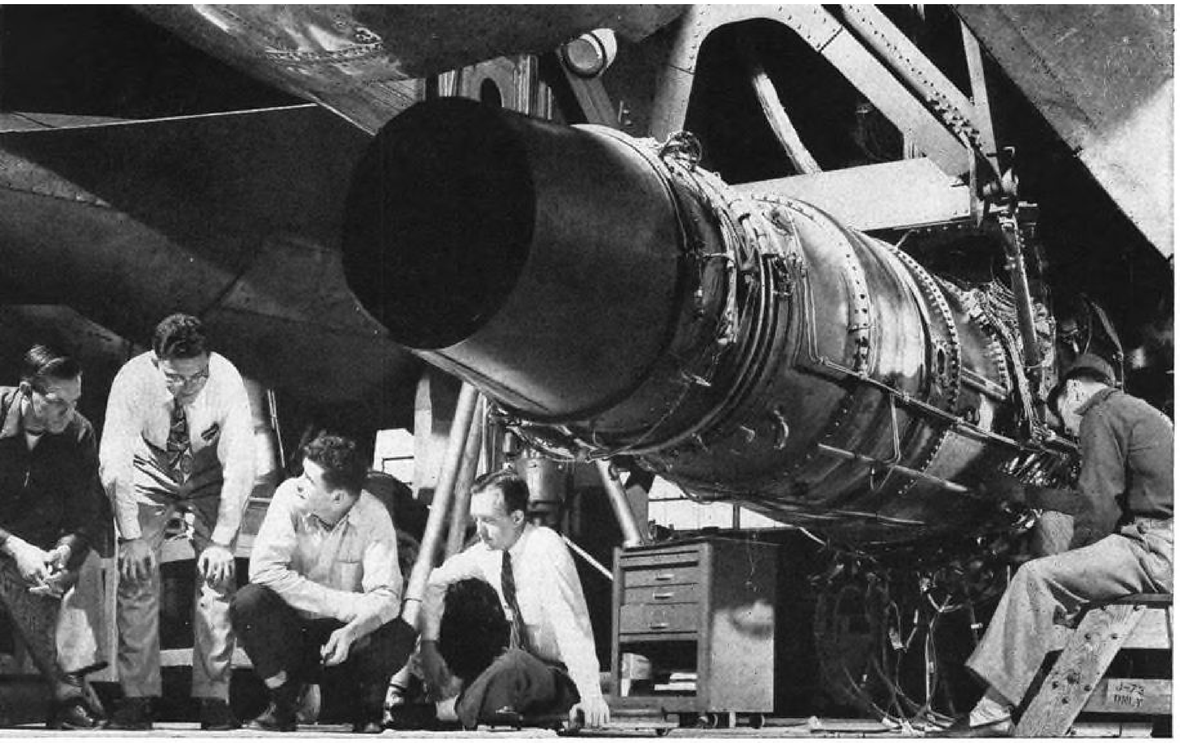


G-E JET ENGINEERS study plans of G.E.'s new engine at Flight Test Center in Schenectady, N. Y. The big powerplant is lowered from B-29 during flight. G.E. looks forward—soon—to completely *integrated* armament, engine, autopilot, and electrical system testing.

"Integrated Testing" Will Improve U. S. Flight Equipment, Save Time and Money

"X" EQUIPMENT gets frequent work-outs in hot planes like this F-86 Sabre, on bailment from Air Force. G-E armament, flight control experts are busy helping the Air Force develop co-ordinated Sunday punches for new U.S. jet planes.

PERISCOPE? No—part of a G-E radar-autopilot-armament system. The boom (installed in B-26) measures pitch and yaw signals for determination of system performance. Such devices help G-E engineers get pin-point accuracy in flight-testing new aviation gear

SCHENECTADY, N. Y.—A dramatic new type of equipment testing is taking shape at G.E.'s Flight Test Center. G-E engineers call it "integrated testing." What it adds up to, is this:

Instead of testing G-E aviation gear "piece-meal" (the old method), General Electric is now equipping planes that can evaluate, in the air, new G-E jet engines, new accessory turbines, autopilots, armament, and radar and electrical systems.

Integrated testing—the latest concept in modern aviation engineering—speeds G-E equipment development. Military and commercial customers will receive G-E products in less time . . . at less cost. The products will be better, too, because G-E engineers can know before delivery exactly how each item will affect the over-all performance of a new plane. Here's how the tests will work.

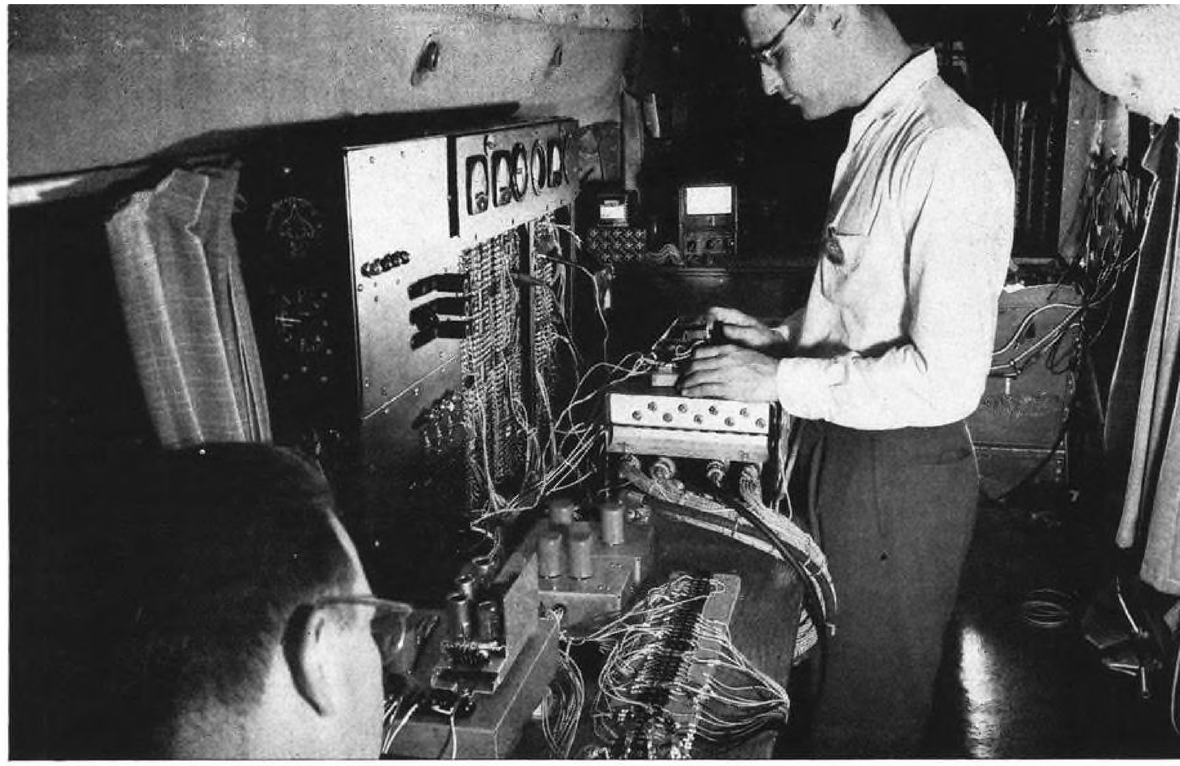
At Schenectady, N. Y., G.E. now maintains an 8-plane "test fleet" which in recent months has included a B-17, B-25, B-26, B-29, two B-45's, F-86's, F-94's, and an F3D. Some of G.E.'s current bailment-aircraft are modified to carry whole systems of test equipment. Jet engines are slung from bomb-bays . . . armament systems set up in the fuselage . . . autopilots and radar systems are mounted in the planes' noses.

Once in the air, G-E engineers "turn on" the test equipment to determine system-performance under flight conditions. Then while sensitive instruments measure responses, automatic recording equipment notes individual *component*-performance—later the results are passed to design engineers, who make whatever system-changes are needed to assure the best, over-all performance.

Procedures like these back up the G-E saying, "Progress is our most important product." The next time you need flight equipment, talk to G.E. first. For G-E equipment is built by men who know the needs of the aviation industry. *Section 210-79, General Electric, Schenectady 5, N. Y.*

GENERAL ELECTRIC

RADOME on tip of B-17 wing at Flight Test Center now carries special apparatus. But pods were originally designed for gunners and wing-tip observers.



AUTOMATIC FLIGHT SYSTEMS tests are a daily part of G-E Flight Test Center routine. Advanced model (above) gets final check before take-off. G-E flight control is now installed in Douglas F3D-2 Skynights, Grumman F9F-5P Panthers, and the new swept-wing Grumman F9F-6P Cougar.

of length is bored to 2¼-in. diameter to give a ¼-in. shoulder, against which the insert rests.

Each insert consists of two semi-circular sections, fitting together and narrowing the block bore to fit the tube size. Two Allen bolts hold inserts and block together in handling.

The first set of one master block and nine inserts for ½- to 2-in. tube sizes resulted in a saving of about 315 hours in fabrication time. The savings increase directly with the number of different size tubes processed.

The master block and insert scheme was devised by Temco's Elgene Pearce, tool and die department leadman.

Nose Rockets Boost New British Missile

Britain is testing novel booster-first layout as one of a family of anti-aircraft missiles now under development.

In a carefully phrased statement that gave little specific information and skirted the politically hot issue of where and when the missiles would become operational, Minister of Supply Duncan Sandys said "further remarkable advances" had been made during the past year.

▶**First in Service**—He singled out speed and guidance as two main problems that received the lion's share of attention.

Anti-aircraft missiles launched from ground, ships and aircraft will be the first brought into service use, said Sandys. They will be followed by other types for artillery and bombardment roles, he added.

▶**Unique Geometry**—Among the first fruits of the billion-dollar program involving more than 100 British firms (AVIATION WEEK Aug. 10, p. 34) is an unusual modification of a tail-first layout employed on one of the new missiles. (First pictures of the new British missile in action appeared in AVIATION WEEK Sept. 14, p. 21.)

Cruciform lifting surfaces are located about two-thirds of the way down the body. Behind them and in the same planes are a set of control surfaces of high-aspect ratio. At the nose of the missile is a set of small vanes that also appear to be control surfaces but are set at 45 deg. to the plane of the wings.

▶**Nose Boosters**—A cluster of eight rocket boosters in four packages furnishes the initial boost at launching. These boosters, in contrast to current American practice, are mounted around the forward portion of the missile body and blast their exhausts through the gaps between wings.

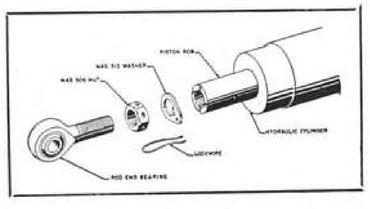
At separation, the boosters pull away radially, indicating the use of some thrust deflection built into the nozzles to produce clean separation.

This scheme was used on boosters for the German Schmetterling (Butterfly) anti-aircraft missile of late World War II vintage.

Sandys' statement was made before leaving on a trip to Woomera, Australian site of the British Commonwealth Firing Range. He said the purpose of the trip was to discuss development of missiles with the Australian government.

Cylinder Rod End Locker Gains Favor

A hydraulic piston rod end locking device developed recently as an airframe industry standard is gaining ready acceptance. A recent survey of the airframe industry has revealed that 15 major airframe manufacturers were either using the device or intended to use it on new aircraft designs. Drawings on the components were released about a year ago by the Aircraft Indus-



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CONVAIR-LINER 340

The power packages for this, newest of Convair commercial liners, are made by Rohr Aircraft Corporation, Chula Vista and Riverside, California – world's largest producer of ready-to-install power packages for airplanes. For the difficult fastening jobs on these power units, "Camloc Fasteners" are used.

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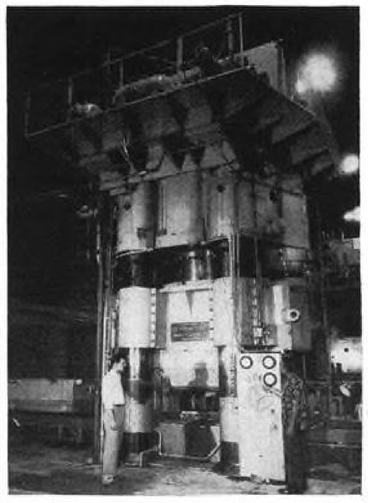
Because of the variety of locking devices in use and some unsatisfactory field reports, Navy Bureau of Aeronautics, supported by the USAF, requested NASC to develop an arrangement which would satisfy requirements. The locking device finally accepted employed the basic principles of proposed designs submitted by Douglas Aircraft's El Segundo Division and Chance Vought Aircraft.

Under the new standard, positive locking of the piston rod and the threaded rod end is accomplished simultaneously by a joggled tab on a lock washer (NAS513). The tab seats itself in one of four milled slots on the face of the piston rod shaft. It also penetrates the threaded rod end to a depth about equal to the thread height. The penetration does not significantly weaken the rod end, and the milled slots on the piston rod allow for 90-deg. adjustment.

A jam nut (NAS509) provides axial pressure against the lock washer and piston rod. Safety wire secures the washer to the nut.



CONVAIR'S BIG ONE

Convair-Fort Worth's largest piece of equipment—a new 7,000-ton hydraulic press has been readied for production. Operating on the Hidraw principle developed by Convair, the machine will be used to produce parts larger than were possible before on this type of machine, Convair says. Other benefits cited include a higher level of quality, with more speed and economy. Built by Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, the machine stretches 42 ft. from its reinforced concrete footing and is 24 ft. wide. Two motors developing a total of 400 hp. operate it. Cost of the press was about $430,000. It is reported to be the first of its kind to be installed.

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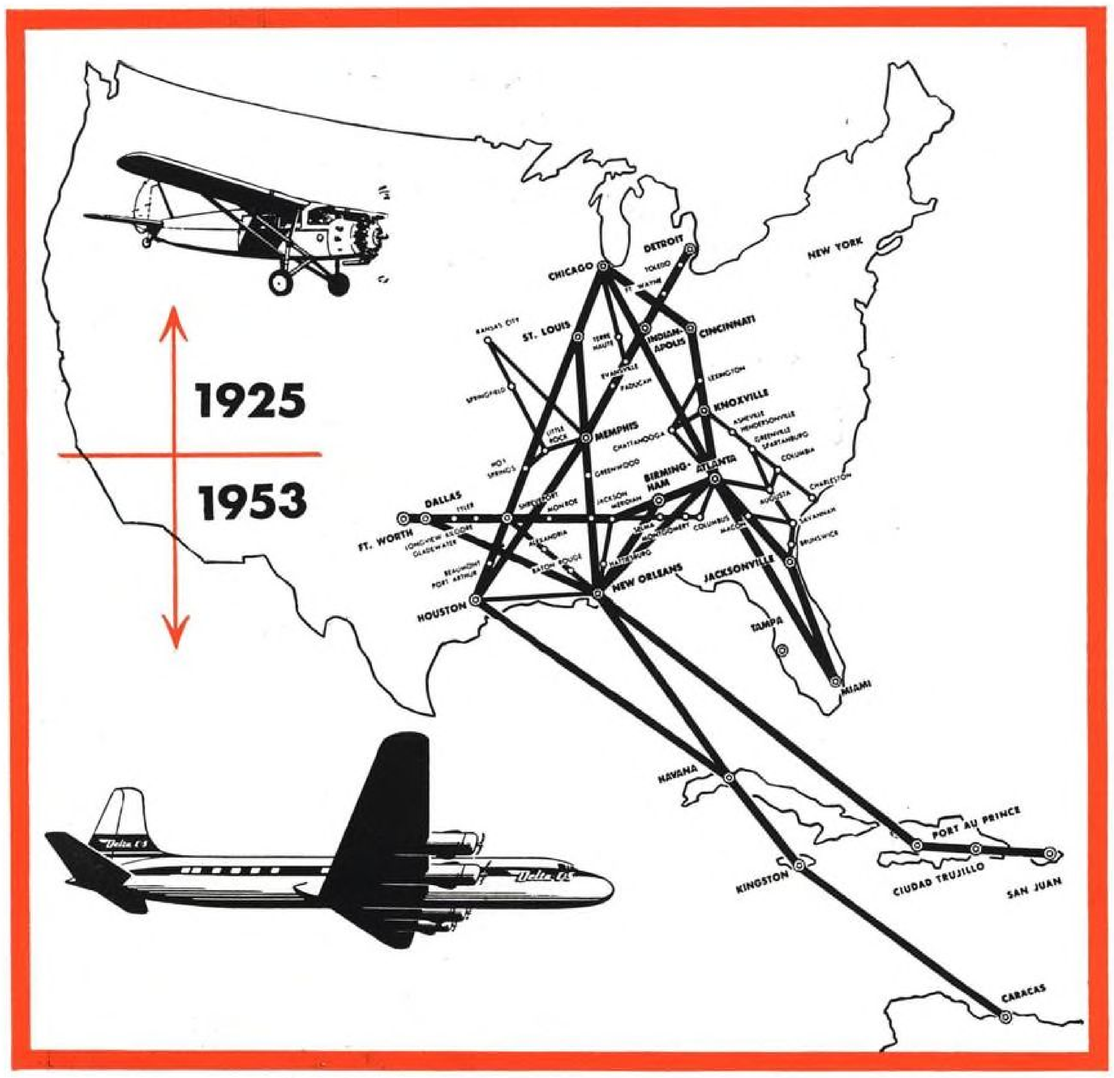

Delta-C&S...two famous names...one fine future

Commercial aviation was a young industry when Esso began serving Delta in 1925. In those times flights between Dallas and Atlanta required the whole day. Now Delta-C&S DC-6s complete this flight in about three hours as a small segment of a system which has grown to be the nation's fifth largest air carrier. Delta management has consistently promoted progressive policies that have been to the highest credit of the air transport industry. One result is the new company which now serves 61 cities in the U.S.A. and Caribbean area with routes totaling 9,508 miles.

We've been making progress too. Over the years our research and development programs have produced new and better aviation petroleum products – some of which contributed largely to the progress of air transport, and we hope to Delta.

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We are happy because of past associations and look forward to future opportunities to serve...HAPPY FLYING, DELTA-C&S!

Martin Tests T-Tail On P5M-2 Marlin

Glenn L. Martin Co. is flight testing a new T-tail for seaplanes, now installed on a prototype Martin P5M-2 Marlin anti-submarine seaplane (pictures in AVIATION WEEK Sept. 7, p. 9), and plans to convert the entire production of Marlins to the new configuration as soon as the trials are completed.

Martin engineers favor the new arrangement—with all movable horizontal surfaces mounted at the top of the vertical fin—because of these factors:

- **Less tail area is required.** Structural weight and aerodynamic drag is decreased, and overall height of the plane is reduced six feet.
- **Efficiency is increased** because of the endplate effect of the horizontal tail, improving flow around the vertical fin, and because of a lift distribution carryover on the hull below the tail, not found when the conventional horizontal tail is used at the base of vertical fin.
- **Higher position** of the horizontal tail is superior because it is affected less by wing downwash and propeller slipstream, eliminating the problem of sea spray damage.

The T-tail already has been proved on other Martin aircraft, including the XB-51 three-jet bomber and the B-61 jet-powered Matador pilotless bomber. It is being used on some other airplanes, notably the Russian MiG-15. However, the Marlin installation is believed to be the first of this design on a seaplane.

Other changes in the P5M-2 that replaces the current P5M-1 on the production line include: lowering the bow chine line, thus reducing bow spray height; installation of Turbo-Cyclone Wright R3350-32W engines with increased power for greater range and heavier load, and changes in interior crew arrangements and armament of the plane.

Propeller Shipments Total $89.2 Million

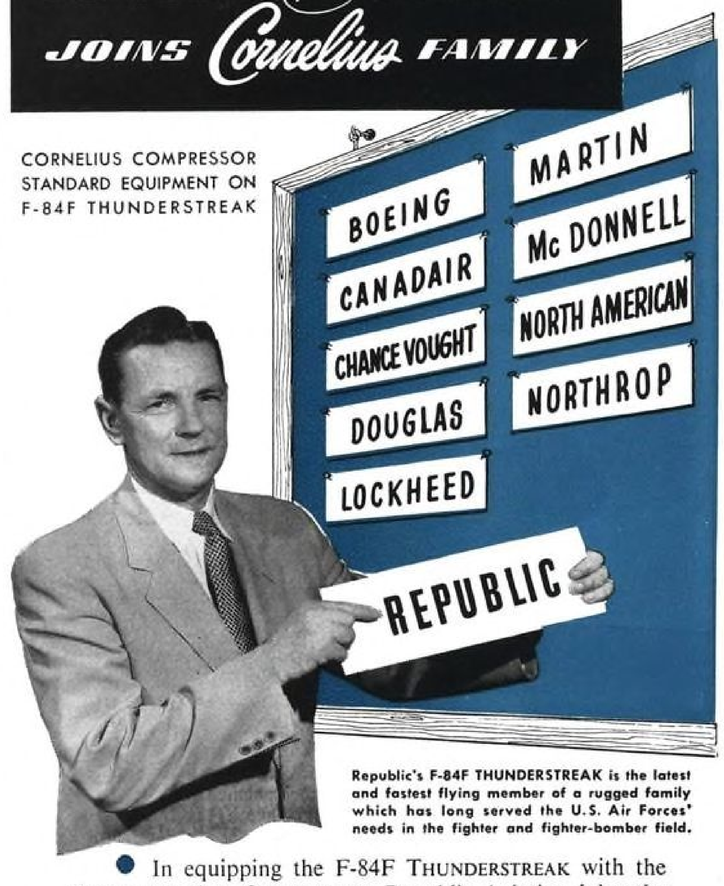
Aircraft industry shipped $89.2 million worth of propellers and parts during the first half of 1953.

A joint report of the Census Bureau and Civil Aeronautics Administration indicates this was a 32% increase over shipments made during the corresponding period of 1952 and 24% higher than in the last half of 1952.

The military received shipments totaling $79.7 million during the six-month period, 38% more than it did in the first half of 1952.

Propellers and parts for civilian aircraft amounted to $9.4 million, a 4% decrease from last year.

REPUBLIC AVIATION JOINS Cornelius FAMILY



CORNELIUS COMPRESSOR STANDARD EQUIPMENT ON F-84F THUNDERSTREAK

Republic's F-84F THUNDERSTREAK is the latest and fastest flying member of a rugged family which has long served the U.S. Air Forces' needs in the fighter and fighter-bomber field.

● In equipping the F-84F THUNDERSTREAK with the CORNELIUS AIR COMPRESSOR Republic Aviation joins the CORNELIUS family of famous names in aviation... Boeing, Canadair, Chance Vought, Douglas, Lockheed, Martin, McDonnell, North American, Northrop.

CORNELIUS is proud of this recognition... developed from long experience building dependable pneumatic equipment for the Air Force, Navy and leading aircraft manufacturers. Profit from our experience... write to us about your pneumatic equipment requirements.

CORNELIUS COMPRESSOR
4CFM... 3000 PSI
Powered by integral hydraulic motor. Other models available with various pumping capacities. All compressors can be furnished with either hydraulic motors, DC electric motors or AC 400 cycle motors.

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MINNEAPOLIS 21, MINNESOTA

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AIRCRAFT PNEUMATIC SYSTEMS

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Ever see a cageable gyro up close?

With the cover removed you can see it is a precision instrument . . . containing hundreds of accurately designed and fabricated parts.

You can work on such interesting automatic control projects — if you join Honeywell now.

We have several openings for experienced engineers.

Duties of the jobs. Supervise the tooling, processing and planning necessary to transform blueprints into finished products.

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Atmosphere. A company which is growing rapidly, steadily and soundly. The challenge of production is ever present.

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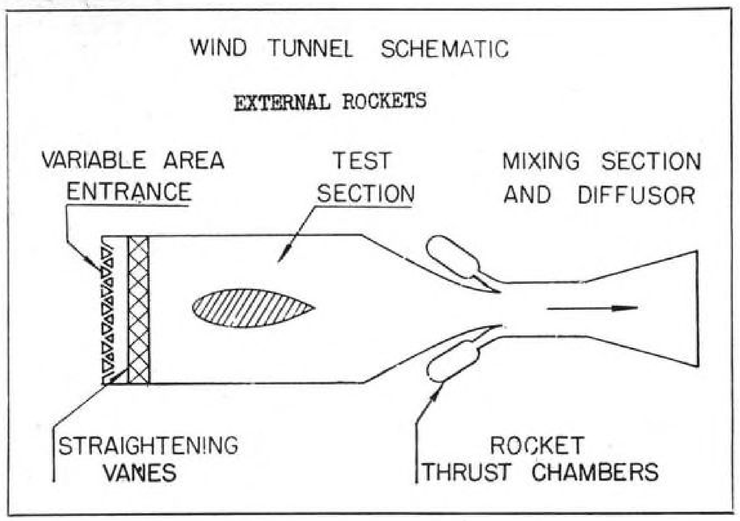
MINNEAPOLIS **Honeywell**

First in Controls



Rocket Motors for Windtunnels?

Proposed facility features simple design, would cut construction and operating cost.

A new use for rocket motors—powering a windtunnel capable of high subsonic speeds—has been suggested by three scientists from the University of California.

Six motors, rated at 5,000 lb. thrust, would be used as the primary jet in an ejector scheme. The resulting tunnel would have a 4 x 6-ft. test section, a 400-mph. speed and an altitude capability from 5,000 ft. to 60,000 ft.

Maximum estimated cost for the facility is $250,000; the proposal states this figure is only a small fraction of the investment required for a more conventional tunnel of similar performance.

▶ **Conventional Is Costly**—Main reason for the proposed rocket ejector drive is expense: The proposal points out that first cost and operating expenses for a conventional windtunnel are high. In contrast, it cites the simple design, low maintenance cost and elimination of large quantities of electrical power for the rocket drive.

The ejector idea is not new; it has been an integral part of steam-generating units for many years. Steam-jet-driven tunnels have been designed and one has been built at the university.

But the cost of steam capacity for a large tunnel is prohibitive, says the proposal, and that led to the consideration of the rocket.

The physical arrangement is determined largely by the amount of air the tunnel must handle. For the particular example chosen in the proposal, external motors feeding into the tunnel were the only possibility.

Test section and foundation of the tunnel are identical to those designed for conventional tunnels. The entrance section is designed with a conical plug so that the intake air can be throttled. Heating the intake air is done with electrical strip heaters in straightening vanes just downstream of the inlet.

▶ **Cost Analysis**—The proposal states that the material cost for the ¼-in.-thick steel shell should not top $2,000. Thrust chambers, supply systems and controls should not cost more than $200,000, assuming that an off-the-shelf motor can be used, and that no big development program would be required for the motor.

Operating cost is largely determined by propellant consumption. The most expensive operating condition—simulating 20,000 ft. at 400 mph.—would cost about $400 per minute. For 60,000 ft., the figure would drop to about $150 per minute.

Two additional advantages are cited in the proposal:

- **Transients can be tested more easily** in such a tunnel because of the flexibility of the drive system.
- **Mach numbers up to 1.5 appear feasible** by modification of basic design.

▶ **Work Reported**—Rocket ejector drives have been studied by a group at the General Electric Co.'s Research Laboratory, and carried to the point of model work. However, this particular design report by F. Kreith, P. B. Stewart and E. S. Starkman of U. of C. is the first general publication of the idea.

Lear

Advancing the Frontiers of Flight

UNSEEN HANDS ABOARD THE FAIRCHILD C-119

From nose to tail, the famous Fairchild "Flying Boxcar" is manned by unseen hands—4 different types of Lear Products, performing a dozen different tasks. Included are such precision-engineered electro-mechanical products as Linear and Rotary Actuators, Flexible Shafting and Screw Jacks.

Operating cowl flaps, trim tabs, air exit flap, main gear up-lock, paratainer door—helping regulate and control the flow of air to engine, cockpit, and cargo—performing many other exacting and varied tasks, Lear electro-mechanical components and systems are making essential contributions to the vital service rendered by the C-119.

In the field of electro-mechanical actuation and controls, twenty-one years of engineering development, design, and precision manufacturing have earned for Lear a position of recognized leadership in flight control.

GRAND RAPIDS *Division*

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Lear-Romec Division, Elyria, Ohio
LearCal Division, Los Angeles, California
Lear, Incorporated, Grand Rapids 2, Michigan

LEAR LINEAR ACTUATOR Series 401— precision engineered, installed in military and commercial aircraft, is typical of the Lear electro-mechanical actuators designed to meet the exacting requirements of the C-119.

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POWER UNITS

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SCREW JACKS

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Electronic Temperature and Positioning Controls • Magnetic Clutches • Sub-Miniature Motor Generators • Motor-Driven Precision Gear Mechanisms • Servo Motors

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5105 Denison Ave. Cleveland 2, Ohio

Manufacturers of electrically heated aircraft parts since 1925.

638 for 1

The new Douglas DC-7 transport draws on some 638 suppliers for raw and finished materials, Douglas Aircraft Co. says. Each DC-7 contains:

- 16 mi. of electrical wiring.
- 4 mi. of control cable.
- 33,500 lb. of aluminum.
- 350 lb. of titanium.
- 1,007 lb. of plastics.
- 1,485 lb. of Fiberglas sheet.
- 1,117 sq .ft. of Fiberglas cloth.
- 95 instruments, including flight, engine, hydraulic, etc., of which 85 are in the cockpit.

Basic blueprints to get the DC-7 into production would cover an area of 400 acres.

Electrical output of the DC-7 is 48,000 watts, sufficient to operate five average five-room houses.

PRODUCTION BRIEFING

► **Continental Aviation & Engineering Corp.** is planning to erect two new buildings, adding approximately 50,000 sq. ft. to its existing facilities in Detroit. Cost is expected to be some $750,000 and completion is expected this year.

► **Cyril Bath Co.** has opened a new $2-million plant in Solon, Ohio, approximately 20 mi. southeast of Cleveland. The facility comprises 50,000 sq. ft.

► **Decker Aviation Corp.,** Philadelphia 25, has been granted approval to perform overhaul, modification and repair of flight, navigation and engine instruments of all models of the F-86 Sabre jet fighter.

► **H. N. Bailey & Associates,** Los Angeles, has been formed to represent aircraft component makers. The service includes representation at Dayton and Washington, D. C.

► **Douglas Aircraft Co.** has established a new all-time safety record at its Santa Monica Division—more than 4 million manhours without a disabling injury.

► **General Controls Co.** is building a new plant for its Appliance Controls Div. in Burbank, Calif. The firm has concluded a lease arrangement for 5.2 acres of additional land between the new plant and the present facility.

► **Lockheed Aircraft Service,** Burbank, Calif., completed over 30% more work in the first half of this year than in

Aeroquip

REG. TRADE MARK

"little gem" FITTINGS

aeroquip did it again!
Another Important Development in Detachable, Reusable Hose Fittings!

KNIFE-LIKE SPUR separates hose inner tube and reinforcing wire braid during assembly.

CLAMPING ACTION, between nipple and socket, is exerted on reinforcing wire braid only.

POSITIVE LIP SEAL is formed by end of inner tube in annular chamber.

Here's another great Aeroquip first . . . **"little gem"** Fittings with radically new features never before seen in the industry! These amazing new fittings were especially designed to prolong the life of certain types of hose made of rubber or rubber-like materials, and plastics. Under extreme compression these materials tend to take a definite set and flow away from the zone of compression. This action is accelerated by heat. Through advanced research, development, and engineering, Aeroquip was able to provide the answer to this problem. **"little gem"** Fittings are now in production for Anti-Icing Hose Lines used on aircraft jet engines, and Steam Hose Lines in the industrial field.

"little gem" is an Aeroquip Trade Mark

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"Home Office" comfort in Your Executive Aircraft

If you're looking for Something Very Special in Executive aircraft seating—look to Burns Aero Seat Company!

Good, sound engineering principles plus the deft touch of Burns craftsmen have created the world's outstanding executive aircraft interiors.

Special Designs . . . Custom Built! The Burns Aero-Line of seats includes Divans, Swivels, Berthable, Folding, Adjustable Leg-Rest units for airborne executives who want the best.

Write for details! The Burns Aero-Line includes airline, military passenger and crew seats.

Twin Areo-Rest

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same period in 1952. Work was done on 225 civil and military planes and 2,296,900 work hours were accomplished. Hours for all of last year totaled 3,470,100.

Caution: Will Explode When Scratched

North American Aviation tests show that special care must be exercised in handling titanium-magnesium alloys corroded by red fuming nitric acid (presumably in rocket applications), an NAA safety note reveals.

Spongy residue of the alloys, formed after prolonged exposure to the acid, can be exploded by scratching the surface or by heating the material, NAA reports.

The safety note urges extreme caution in handling all titanium alloys that have been exposed to the acid, pending further investigation.

USAF Contracts

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

Abrams Instrument Corp., 600 Shiawassee St., Lansing, Mich., B-9A intervalometer, 1,488 ea., B-8A intervalometer, 1,471 ea., $1,872,449.

Airborne Accessories Corp., 25 Montgomery St., Hillside, N. J., actuator assy., 56 ea., 5 ea., 159 ea., $191,589.

Aircraft Mechanics, Inc., 3200 North Nevada Ave., Colorado Springs, Colo., seat, long range, pilot, 41 ea., spring, vert. lift, seat, 840 ea., support, cushion, seat, 146 ea., $48,658.

American LaFrance Foamite Corp., 100 E. LaFrance St., Elmira, N. Y., modification kits, $56,101.

Bachman Wholesale Co., Box 237, Rochester, N. Y., station assy., 24 ea., box assy., 24 ea., $34,800.

Baldwin Lima Hamilton Corp., Philadelphia, diesel power facilities, 26 ea., $2,956,424.

Barber Colman Co., Rockford, Ill., actuators, control boxes, $96,245.

Bardwell & McAlister, Inc., 2950 Ontario St., Burbank, Calif., light bracket, 8,486 ea., 1,664 ea., 1,137 ea., $60,508.

Bell & Howell Co., 7100 McCormick Rd., Chicago, printer, motion picture, 32 ea., $124,473; motion picture projector, 20 ea., 15 ea., 38 ea., $42,454; camera, PH-431 MP, 275 ea., camera, MP, bare unit, 100 ea., $155,300; box assy., 316 ea., filter, 1,956 ea., 1,036 ea., $65,979.

Bendix Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, Hollywood, Calif., spare parts for electrical equip., $57,037.

Bendix Products Div., Bendix Aviation Corp., South Bend 20, Ind., valve assy., 22 ea., 152 ea., 698 ea., $29,700.

Boyt Harness Co., 303 New York Ave., Des Moines, belt, lap, safety, 10,000 ea., $64,900.

Camfield Mfg. Co., 7th & Grand River, Grand Haven, Mich., antenna AT-234, 172 ea., 3 ea., 774 ea., $53,013.

Chicago Aerial Survey Co., 332 South Michigan Ave., Chicago, amplifiers, H-1, 300 ea., controls, master, 300 ea., amplifier, 1,531 ea., $666,787.

Collins Radio Co., Cedar Rapids, radio set, 4,218 ea., $6,376,476.

Columbus Engineering Co., 480 West Broad St., Columbus, Ohio, bracket, 6,024 ea., pin for bracket, 342 ea., spring for bracket, 444 ea., $30,990.

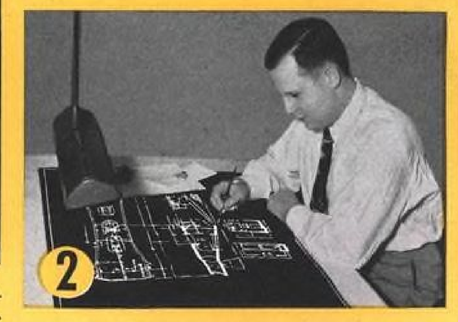
Compco Corp., 2251 West St., Paul Ave., Chicago, control, exposure, frequency, 2,791

Simple 1-2-3 operation beats the five o'clock deadline

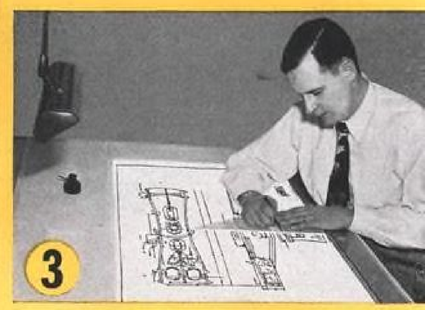
At the Symington-Gould Corporation, Depew, N. Y., extensive revisions are made on drawings of railway specialty equipment . . . and prints are ready for mailing to customers—hours, even days, ahead of the old schedule.

See how it's done—all so easily—with Kodagraph Repro-Negative Paper . . . another versatile photographic material in the famous Kodagraph line.

A basic drawing—which must be revised to meet the customer's specifications—is exposed on Repro-Negative Paper in a standard print-making machine; then the print is processed in standard photographic solutions. *An easy room light operation* that produces a negative photographic intermediate from the original drawing.



The draftsman obliterates the unwanted detail on the Kodagraph Repro-Negative print by simply applying opaquing ink. The way Symington-Gould figures it, when large areas must be revised . . . or many small scattered changes must be made, this is easier, faster than altering a positive print.



A positive Repro-Negative print is made from the corrected negative . . . on this the draftsman adds the new design . . . and a master is ready to produce the required number of prints. *Ready* in a fraction of the time required previously when the unchanged design was retraced in full.

These Kodagraph Materials also save Symington-Gould time and dollars

- Kodagraph Autopositive Paper is used to reclaim old, soiled drawings; to produce intermediates from customer-drawings on opaque stock.
- Kodagraph Contact Cloth is used to reproduce corrected negative prints when durable, inklike cloth intermediates are desired.
- Kodagraph Autopositive Cloth is used to reproduce new pencil drawings directly, which helps eliminate costly ink tracing.

NOTE: Kodagraph Autopositive Paper and Cloth are processed in the same easy manner as Repro-Negative Paper, but produce positives *directly* from the originals.

Kodagraph Reproduction Materials

"THE BIG NEW PLUS" in engineering drawing reproduction.

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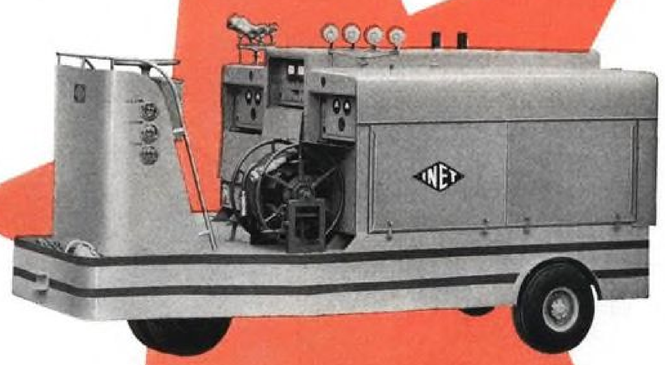

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These efficient, compact, rugged and economical Electric Self-Propelled Engine Generators contribute to the efficiency of busy airports.

INET has the reputation . . . gained through experience . . . for the reliability of its ground power equipment . . . engineered to meet or surpass the highest standards of the aircraft industry.

Units embody the famous DUPY* Load Sensitive Governor which saves up to 30% of fuel required by fixed-speed equipment. All electrical components are the best obtainable.

GENERATOR RATINGS: 22.5 to 60 KW; 750 to 2000 AMPS; 28.5 VDC. Trailer types are also available.

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ea., 10 ea., $646,301.

Converto Mfg. Co., Cambridge City, Ind., communications vans, 25 ea., cryptographic vans, 25 ea., $1,624,163.

Cramer Posture Chair Co., Inc., 1205 Charlotte St., Kansas City, Mo., seat assy., $43 ea., $27,962.

DeVry Corp., 1111 Armitage Ave., Chicago, projector, motion picture, $494,181.

Diaphlex Div., Cook Electric Co., 2700 Southport Ave., Chicago, switch assemblies, 125 ea., 639 ea., switch differential, 437 ea., $70,081.

Eastman Kodak, Recordak Corp., 1350 Madison Ave., New York, Micro-Filmer, 305 ea., $220,418.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., transmitter, fuel flow, 349 ea., 1,776 ea., $700,254; M-3 generators, 380 ea., $91,374; rotor assy., hairspring, 977 ea., shaft, vane, 2,244 ea., tube assy., 148 ea., $31,048; indicator, multipurpose, 813 ea., $47,131; transmitter, fuel flow, 176 ea., 52 ea., $144,337.

Thomas A. Edison, Inc., West Orange, N. J., relay panel, 4-circuit, 53 ea., fire detector, thermocouple, 36,500 ea., $70,119.

Eicor, Inc., 1501 W. Congress St., Chicago, inverter, 812 ea., 82 ea., 588 ea., $573,419.

Fairchild Engine Div., Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y., D-2 powerplant, 26 ea., 26 ea., $299,546.

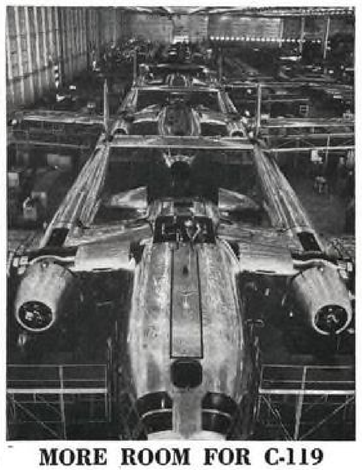
Federal Motor Truck Div., 5780 Federal St., Detroit, coleman towing tractor, 26 ea., $554,059.

Federal Telephone & Radio Corp., 100 Kingland Rd., Clifton, N. J., spare parts for electrical equip., $197,403.

Fenwal, Inc., 113 Pleasant St., Ashland, Mass., switches for electrical equip., $156,723.

General Electric Co., 1 River Rd., Schenectady, N. Y., indicator, electric tachometer, 1,268 ea., $126,269; key-shaft, 1,478 ea., rotor, 1,730 ea., plate and stud, 834 ea., $25,513; voltage regulator, 213 ea., exciter, 10 ea., $75,695; spare parts, $80,675; regulator, voltage, 8,100 ea., $255,474.

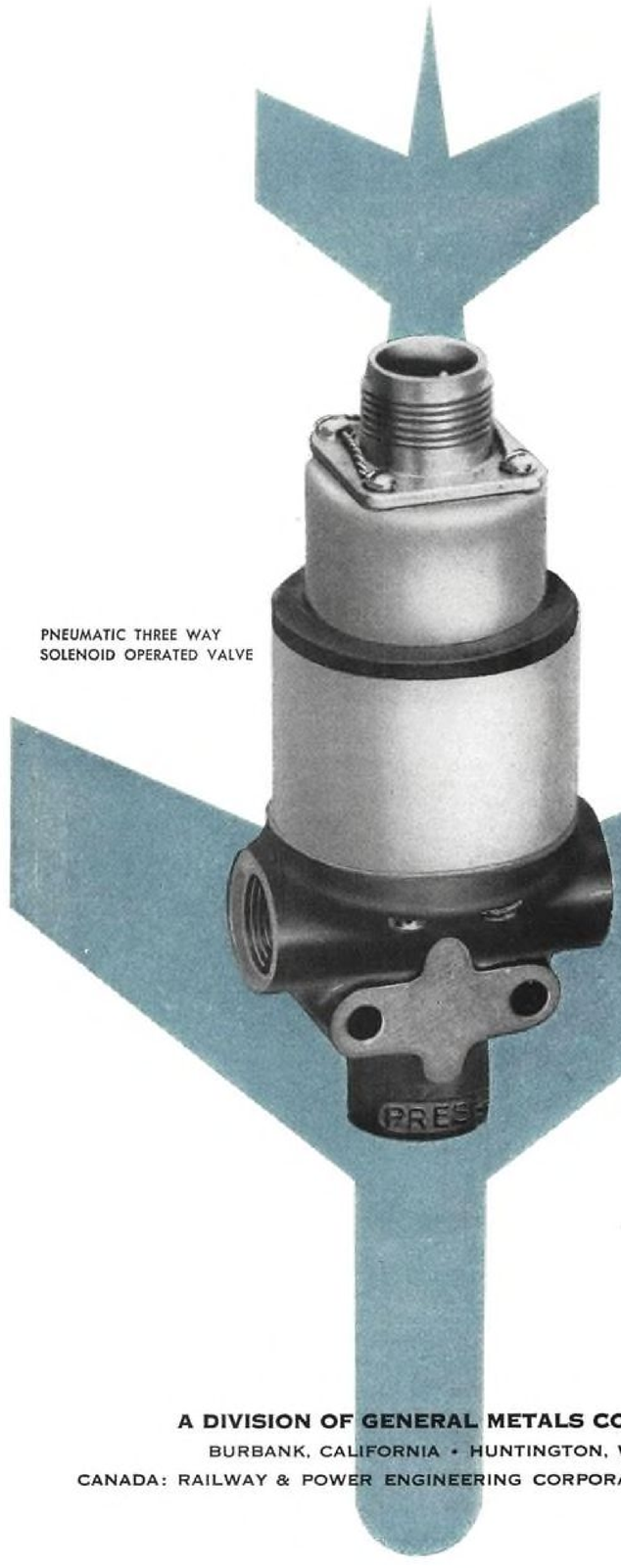
General Electric Co., X-Ray Div., Mil-



MORE ROOM FOR C-119

Fairchild Aircraft Div. has moved its C-119 cargo transport production into newly completed facilities in its Hagerstown, Md., plant as its $9-million plant expansion program nears completion. Photos show the new Flying Boxcar production line and an external view of the new production bay (left center). Bay is 765 ft. long and 200 ft. wide; roof of the new bay is supported by six external bowstring trusses with welded joints, making possible a saving of 15% in structural steel in the project. Expansion, carried on without interrupting C-119 production schedules, gives the Hagerstown facility a total of 1.4 million sq. ft. of space.

PNEUMATIC THREE WAY
SOLENOID OPERATED VALVE



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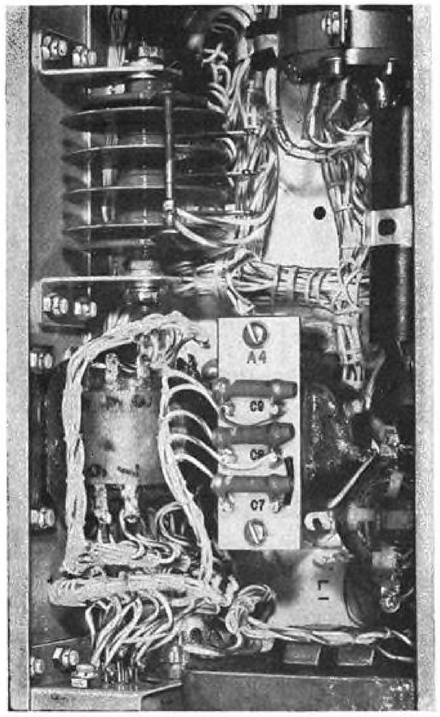
CANADA: RAILWAY & POWER ENGINEERING CORPORATION, LIMITED

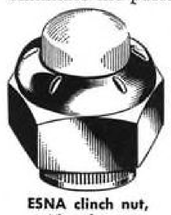
ADEL

FASTENER PROBLEM



How a single fastener solved several design problems

Raytheon Manufacturing Company, Waltham, Mass., designed this AN/APN 22 radar altimeter for the Navy Bureau of Aeronautics. The importance of holding weight to a minimum imposed space and clearance limits that made fastening methods particularly important. Ready fastener accessibility was a "must" to meet both producibility and field maintenance requirements. Protection of components against loosening due to aircraft vibration was necessary. And it was desirable to eliminate the possibility of protruding bolt ends chafing vital wiring.



ESNA clinch nut, with nylon cap

Clinch type ELASTIC STOP® nuts, with nylon caps, are now used by Raytheon. They are simply installed and permanently positioned for easy assembly or dis-assembly by a simple clinching operation. Particularly designed for use in thin section sheet metal components, they are manufactured in a series of shank lengths permitting installation in sheets from .020 to .163 inches thick.

Mail our coupon for design information on a variety of ESNA® cap nuts and other types of self-locking, vibration-proof fasteners.

Dept. N44-925, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, New Jersey

Please send me the following free fastening information:

☐ Bulletin on Clinch, Cap and other ELASTIC STOP nuts

☐ Here is a drawing of our product. What self-locking fastener would you suggest?

Name_____ Title_____

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New DH Rato

A new rocket assist takeoff motor, the 4,000-lb.-thrust Super Sprite, is being tested by de Havilland Engine Co. for application in military aircraft.

The powerplant weighs 600 lb. and has a duration of approximately 40 sec. Total impulse is given as 120,000 lb./sec.

The DH Super Sprite uses hydrogen peroxide with kerosene or gasoline injection and burns a solid catalyst instead of liquid potassium permanganate, used by the earlier Sprite.

Injection of kerosene or gasoline increases the rocket motor's thrust or duration. The fuel is taken from the plane's main tanks. The solid catalyst permits design simplification and easier handling.

The Super Sprite, says de Havilland, is "completely smokeless."

waukee, camera, aircraft, 1,230 ea., $2,090,-919.

General Tire & Rubber Co., 1708 Englewood Ave., Akron, Ohio, wheel assy., nose, 430 ea., wheel assy., aux., 888 ea., $82,915.

Gill Electric Mfg. Corp., Redland, Calif., aircraft batteries, 14 ea., 31 ea., 5 ea., $149,295.

Goodyear Aircraft Corp., 1210 Massillon Rd., Akron, spare parts, $40,756; bearing, 10,000 ea., spring, 8,000 ea., bracket, 2,000 ea., $117,832.

Goodyear Tire & Rubber Co., 1144 East Market St., Akron, brake assy., 129 ea., 120 ea., 200 ea., $314,416.

Graflex, Inc., 154 Clarissa St., Rochester, N. Y., camera equip., PH-104, 2,252 ea., $629,676.

Harco Industries, Inc., 20 Curtice St., Rochester, N. Y., lamination equip., 136 ea., $107,394.

Hycon Mfg. Co., 2961 E. Colorado St., Pasadena, Calif., aerial camera, 61 ea., 150 ea., $755,435.

Ingersoll-Rand Co., 224 E. Ninth St., Cincinnati, reciprocating compressor, $86,100.

Insuline Corp. of America Bldg., 36-02 35th Ave., Long Island City, N. Y., cable assy., 20,013 ea., 5,165 ea., 5,165 ea., $112,-075.

Jack & Heintz, Inc., Cleveland, 400-amp. generators, 52 ea., $28,048.

Bell & Howell Co., 7100 McCormick Rd., Chicago, N-9 gun cameras, 1,970 ea., $643,-210.

Caterpillar Tractor Co., Peoria, Ill., 100-kw. diesel units, 62 ea., $820,628.

Fonda Corp., 500 W. Colorado St., Glendale, Calif., machine, comb. 16-mm. & 35-mm.; processing, 1 ea., machine, 16-mm, positive, processing, 1 ea., $83,140.

General Electric Co., 1 River Rd., Schenectady, N. Y., spare parts, $2,000,000.

North American Aviation, Inc., Los Angeles Intl. Airport, Los Angeles, procurement of long lead-time items, $1,658,000.

Red Bank Div., Bendix Aviation Corp., Eatontown, N. J., 750-va. inverters, 903 ea., 14 ea., 83 ea., $609,944.

Remler Co., Ltd., 2101 Bryant St., San Francisco, radio receiver, 4,000 ea., $280,-159.

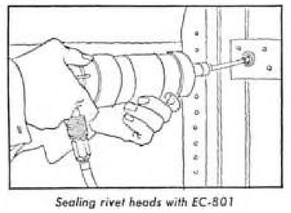
Union Switch & Signal Div., Westinghouse Air Brake Co., Swissvale, Pa., F-101 flight simulator, 1 ea., $1,900,000.

Westinghouse Air Brake Co., 401 Liberty Ave., Pittsburgh 22, flight simulator, 1 ea., $1,195,824.

Consolidated Vultee Aircraft Corp., San Diego 12, Calif., one set of dies, 10 forgings, $107,378.

Photo Courtesy of Consolidated Vultee Aircraft Corporation

Making a wing carry a load



Sealing rivet heads with EC-801

Today, aircraft wings do considerably more than just give planes a lift. They're expected to carry their share of fuel, too.

Responsible to a large extent for this new assignment is a 3M sealer that makes the built-in fuel tank idea possible—and practical! It's a product that seals the corners, the seams, the gaps, the spaces . . . forming leak-proof tanks within structural wing members.

Leading aircraft manufacturers, like Convair, specify 3M's EC-801 for this all-important job. This liquid synthetic compound cures chemically to a tough, rubber-like solid upon the addition of an accelerator. Heat, pressure, or accessibility to air is not necessary to effect a cure, making it a simple matter to fit EC-801 into existing production procedures.

See what adhesives can do for you . . .

EC-801 is another of many examples which show how 3M experience and "know-how" can pay off for you. For other instances dealing specifically with aviation, write today for your free copy of our Aircraft Booklet. Address: 3M, Dept. 119, 417 Piquette Ave., Detroit 2, Michigan.

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FOR *HIGH-SPEED* AIRCRAFT

RELIABLE SERVICE is paramount in pressure switch design. That's why rugged, precision-built Manning, Maxwell & Moore pressure switches are installed on many aircraft of all types today. They conform strictly to aeronautical engineering performance standards and pass exacting USAF specifications. The wide selection available includes these basic designs in single pole, double throw types:

FOR JET ENGINES — *High Static* pressure gauge or differential pressure switches.

FOR AIRFRAMES — *Low Static* pressure gauge or differential pressure switches.

FOR ROCKETS — *Hermetically-Sealed High Static* pressure gauge pressure switches.

All our pressure switches provide *flexibility of design* that permits adaptation to specific needs. We believe our unique design technique, years of experience in developing aircraft instrumentation, and extensive manufacturing facilities can be of real service to you. We are fully equipped to run exhaustive environmental and vibration tests in complete accord with the requirements for high-speed aircraft. Let us know your pressure switch application problems. Our engineering counsel is yours on request.

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OUR AIRCRAFT PRODUCTS INCLUDE: TURBOJET ENGINE TEMPERATURE CONTROL AMPLIFIERS • ELECTRONIC AMPLIFIERS
PRESSURE SWITCHES FOR ROCKETS, JET ENGINE AND AIRFRAME APPLICATIONS • PRESSURE GAUGES
THERMOCOUPLES • HYDRAULIC VALVES • JET ENGINE AFTERBURNER CONTROL SYSTEMS.

Lockheed Aircraft Corp., Burbank, Calif., repair of govt.-owned F-94C airplane, $51,138.

Sperry Gyroscope Co. Div., Sperry Corp., Great Neck, L. I., N. Y. amplifier, 1,232 ea., $298,791.

ACF-Brill Motors Co., 62nd & Woodland Ave., Philadelphia, generator sets, 255 ea., $1,120,315.

Aircraft Engine Div., Ford Motor Co., 3000 Schaefer Rd., Dearborn, Mich., spare parts, engines, $5,237,113.

American Industrial Sales Corp., 3240 N. W. 27th Ave., Miami, Fla., stator, 1,261 ea., 96 ea., brush, 71,385 ea., $240,760.

Aro Equipment Corp., 1941 Erie Ave., Bryan, Ohio, regulator, 2,273 ea., 4,669 ea., 3,691 ea., $582,375.

Bar-Ray Products, Inc., 209 25th St., Brooklyn, N. Y., dryer, 105 ea., spares, $136,080.

Bendix Radio Div., Bendix Aviation Corp., Baltimore, tuning unit, 369 ea., can assy., unit, 250 ea., 634 ea., $68,623.

Charles Beseler Co., 60 Badger Ave., Newark 8, N. J., projectors and spares, 1,557 ea., $372,745.

Bogue Electric Mfg. Co., 52 Iowa Ave., Paterson, N. J., motor generator sets, 112 ea., $398,720.

Chicago Aerial Survey Co., 332 South Michigan Ave., Chicago, magazines, spares, tools, 686 ea., $2,000,402.

Continental Motors Corp., Muskegon, Mich., engine, 255 ea., $505,193.

Dravo Corp., 4810 Prospect Ave., Cleveland, blowers, centrifugal, 1 ea., $220,757.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., control, roll and pitch, vert. gyro, 142 ea., $142,345; fuel flow transmitter, 282 ea., $58,938.

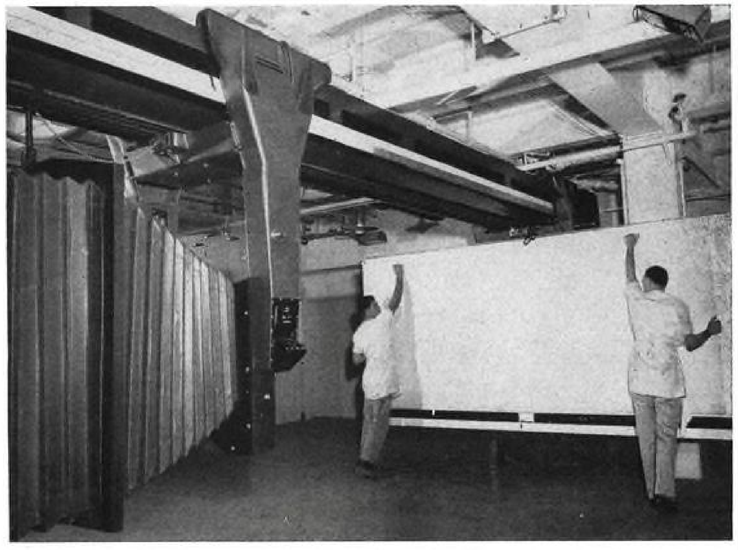
Thomas A. Edison, Inc., West Orange, N. J., panel assy., 326 ea., 21 ea., relay, 186 ea., $51,847.

Electrical Eng. & Mfg. Corp., 4612 W. Jefferson Blvd., Los Angeles, motor-clutch, 154 ea., rotor, 39 ea., starter assy., 112 ea. $33,531.

Electronics Div., Curtiss-Wright Corp., Carlstadt, N. J., trainers, 4 ea., instrument flying handbook, O&S revision, $250,213.

Elwood Pattern Works, Inc., 125 N. East St., Indianapolis, processing equipment, related equipment, $231,925.

General Electric Co., 600 Main St., Johnson City, N. Y., spare parts, $677,529.



Big Camera Speeds Convair Deltas

Delta-wing engineering and tooling jobs go faster with a huge template camera at Consolidated Vultee Aircraft Corp.'s San Diego Division. Right now the big camera is being used to speed work on supersonic delta-wing interceptors, Convair says, but it is adaptable to other types of aircraft.

The new unit stretches 29 ft. and uses a metal copy board 12x5 ft. It will produce enlargements up to four times and reductions down to 13.

▶ **Uses**—The camera has been put to work for making full-size reproductions of airframe structure for mockups on plywood. It is also slicing time in the making of shrink reproductions by providing any shrink scale from one layout. It will facilitate the building of precision models to different scales, without redrawing the master.

When parts are subcontracted to other firms, the new equipment has been useful in recording working information. It reduces large charts to desired scale, will photograph small-scale models of machines superimposed on plant layout drawings.

The equipment will handle continuous tone reproductions and line work.

The unit also is used for production of silk screens, multilith plates, negatives for Ozalid and blueprint reproductions, and other jobs.

▶ **Copy Holding**—Copyboard and lens board are suspended from machined rails and a motor moves these heavy assemblies for focusing. Vacuum is used to hold the copy, and valves on the back of the board allow the copy to be secured in any position. Copyboard face is white so that translucent paper and glass cloth drawings can be accommodated.

The camera is fitted for three lenses—24, 36 and 42 inches.

Hartwell Flush Latches

available for over 300 COMBINATIONS of door and frame thicknesses

Hartwell Trigger-action Flush Latches are produced in over 300 stock combinations of bolt and trigger offsets. We can supply a latch for any door of any thickness to be latched in a frame of any thickness to your specifications. No altering of panels and frames is necessary when Hartwell Flush Latches are installed. Offsets of bolt and trigger are stamped on each part for rapid and accurate selection of the correct latch for each installation. All Hartwell Flush Latches and Hinges are the result of over a decade of continuous specialized design and manufacture.

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1915 Working with the U.S. Navy, Sperry developed first aerial torpedo whose course could be pre-set and held during prolonged flight with Sperry instruments. In early experiments, Lawrence Sperry (above), piloted torpedo to landings. Later models were radio controlled.

PILOTLESS FLIGHT...

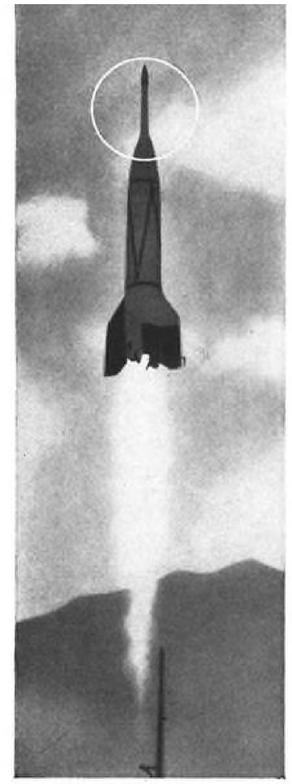
another Sperry first... 1915

There's little physical resemblance between the first automatic aerial torpedo of World War I and the guided missiles of today. Yet both were made possible by the gyroscopic principles developed by Sperry.

When the automatic flying torpedo took to the air, it was kept on its predetermined course with a Sperry Automatic Pilot. Today, combined with radio, principles of those early flights are incorporated in the compact, sensitive Sperry controls that form the brains of supersonic rockets, experimental drone aircraft and guided missiles.

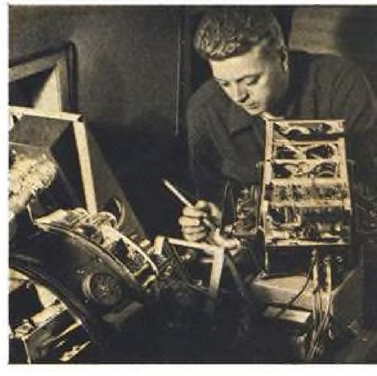
What new developments lie ahead in the field of pilotless flight? No one knows. But you can be sure of this—as improvement follows improvement, Sperry engineers will be applying the "know how" and experience acquired during more than 40 years of leadership in aviation.

1946 The WAC CORPORAL (in circle), developed by American military scientists for launching from a V-2 rocket, first used compact Sperry control mechanism to guide it.



1951 Sperry E-4 Automatic Pilot converted Lockheed jet fighter to automatically controlled drone, permitting command from ground or from EDT-33 Director plane. Such robots served as targets in evaluating missiles and gathered data by penetrating atomic blasts.

1953 Guided missiles, such as the Navy's Regulus, designed by Chance Vought, are directed in flight by Sperry controls combined with highly developed radio. From controls and guidance systems to complete "birds," Sperry is designing and producing missiles for the national defense.



19?? For as long as there is a need, Sperry's engineering, research, and manufacturing facilities are at the command of the Armed Forces. And through licensing arrangements, Sperry has been proud to share its developments with others – to give the Services more Sperry-designed equipment in the shortest possible time.

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PROGRESS 50TH ANNIVERSARY OF POWERED FLIGHT SECURITY

One of a Series of Advertisements Commemorating the 50th Anniversary of Powered Flight.

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The hand pump shown above is a typical example of Warner's ability to mass produce precision hydraulic equipment. This pump is used in connection with a special ordnance application requiring high volumetric efficiencies and must be produced to very close tolerances.

Warner is qualified by experience and facilities for the design and production of hydraulic equipment for a wide range of uses.

Warner engineers will welcome an opportunity to assist you in the development of special hydraulic equipment to meet your particular requirements.

Send for your copy of an illustrated folder describing typical examples of Warner Hydraulic Equipment.

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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 recently 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 writeoff. Fast writeoff permits property to be depreciated in five years.

- **G. T. K. Corp.,** East Hartford, Conn., aircraft parts, $1,405, 70%.
- **Barridon Oil Burner Corp.,** Hartford, Conn., aircraft parts, $11,949, 70%.
- **Sterling Engineering Corp.,** Winsted, Conn., special tooling for aircraft prod., $153,615, 65%.
- **Fairchild Engine & Airplane Corp.,** Bay Shore, L. I., N. Y., aircraft parts, $66,542, 65%.
- **Aviation Engineering Corp.,** Woodside, N. Y., scientific and technical equipment for defense, $17,183, 65%.
- **All American Engineering Co.,** Georgetown, Del., research and development for aircraft, $67,615, 55%.
- **Turbine Products, Inc.,** Boca Raton, Fla., aircraft parts, $29,446, 70%.
- **The Oliver Corp.,** Battle Creek, Mich., aircraft parts, $39,720, 40%, $48,307, 65%.
- **Haas Machine Co., Inc.,** Akron, aircraft parts, $10,000, 45%.
- **Thompson Products, Inc.,** Cleveland, aircraft parts, $864,473, 65%.
- **Fries Tool & Mach. Works,** Fort Wayne, Ind., aircraft parts, $19,308, 70%.
- **Derby Oil Co.,** Wichita, aviation alkylate, $1,600,000, 100%; $595,000, 65%; $481,850, 45%; $17,500, 15%.
- **Ritepoint Co.,** St. Louis, ordnance and aircraft parts, $427,420, 40%.
- **Crandall Engineering & Mfg. Co.,** Dallas, Tex., aircraft parts, $34,682, 70%.
- **Warren Petroleum Corp.,** Greggton, Tex., isobutane for aviation gasoline, $142,234, 100%.
- **Cosden Petroleum Corp.,** Big Springs, Tex., aviation alkylate, $2,029,040, 100%; $135,000, 65%; $823,360, 45%.
- **Clark & Eleanor M. Hartwell,** dba Hartwell Aviation Supply Co., Los Angeles, aircraft parts, $35,000, 45%.
- **Hartwell Aviation Supply Co.,** Los Angeles, aircraft parts, $30,586, 70%; $11,823, 45%.
- **Cooper Precision Products,** Los Angeles, precision fasteners for aircraft, $20,000, 45%.
- **Lockheed Aircraft Corp.,** Burbank, Calif., aircraft and aircraft parts, $43,120, 65%; $80,970, 60%.
- **Food Machinery & Chemical Corp.,** San Jose, Calif., research and development for aircraft, $75,000, 60%.
- **Schulz Tool & Mfg. Co.,** San Gabriel, Calif., aircraft parts, $27,731, 70%.
- **Solar Aircraft Co.,** San Diego, Calif., aircraft components, $277,232, 55%.
- **Bendix Aviation Corp.,** Skinner Purifiers Div., Oakland Co., Calif., aircraft components, $1,014,000, 30%.
- **Douglas Aircraft Co., Inc.,** Santa Monica, Calif., aircraft and aircraft parts, $83,134, 65%; El Segundo, Calif., aircraft and aircraft parts, $135,809, 65%.
- **Decoto Brothers,** Yakima, Wash., aircraft parts, $74,000, 45%.
- **Curtiss-Wright Corp.,** Caldwell Township, N. J., aircraft parts, $284,288, 65%.
- **Curtiss-Wright Corp.,** Buffalo, N. Y., aircraft parts, $129,178, 55%.
- **Sperry Corp.,** Long Island City, N. Y., aircraft instruments and controls, $103,803, 65%.
- **Aluminum Co. of America,** Pittsburgh, aluminum extrusions, $376,000, 50%.
- **Osborn Machine Co.,** DuBois, Pa., machining of defense items, $95,000, 65%.
- **Meco, Inc.,** Paris, Ill., aircraft parts, $8,600, 45%.
- **John Riggle Mach. Co.,** Peru, Ind., jet

Revere INSTRUMENTS HAVE A RECORD OF TOP PERFORMANCE IN TOP AIRCRAFT

Revere control instruments have shared the responsibility and achievements of the aircraft industry since 1939 with years of dependable performance under all types of weather conditions. Today Revere is recognized as one of the foremost producers of precision instruments. You'll find them installed in many world-famous airplanes.

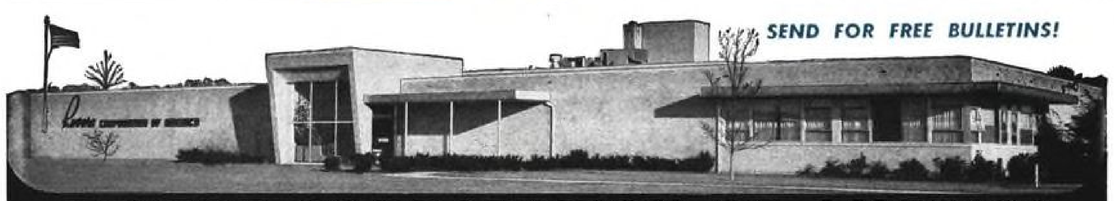
Extensive research and development facilities coupled with precision production methods contribute immeasurably to Revere's reputation for highest quality control instruments. Contact Revere's field engineering department today. Let qualified engineers assist you with your liquid or electro-mechanical control problems . . .

FUEL FLOW SWITCH
Specially designed by Revere for use in the auxiliary fuel line of the McDonnell F2H-3 twin-jet, carrier-based fighter. This instrument transmits a warning signal whenever fuel flow falls below a pre-determined value. *Send for Bulletin No. 1400*

FUEL FLOW TRANSMITTER
The Revere Fuel Flow Totalizer is an integral part of the fuel system. It records the rate of fuel flow in the T-33's jet engines. The flow totalizer can be used on piston engines, diesels or test stand operations. *Send for Bulletin No. 1300*

LIQUID LEVEL SWITCH
Republic's F-84G Thunderjet, first USAF fighter-bomber to refuel in mid air, has Revere's Liquid Level Switches installed in their fuel tanks. This hermetically-sealed, magnetically actuated switch presents a new standard of safety. *Send for Bulletin No. 1100*

FLOAT SWITCH
Boeing's B-47 Stratojets have Revere Float switches installed in all fuel tanks to maintain high-level fuel control. These switches can be furnished with single or dual float systems with levels set at the factory. *Send for Bulletin No. 1200*



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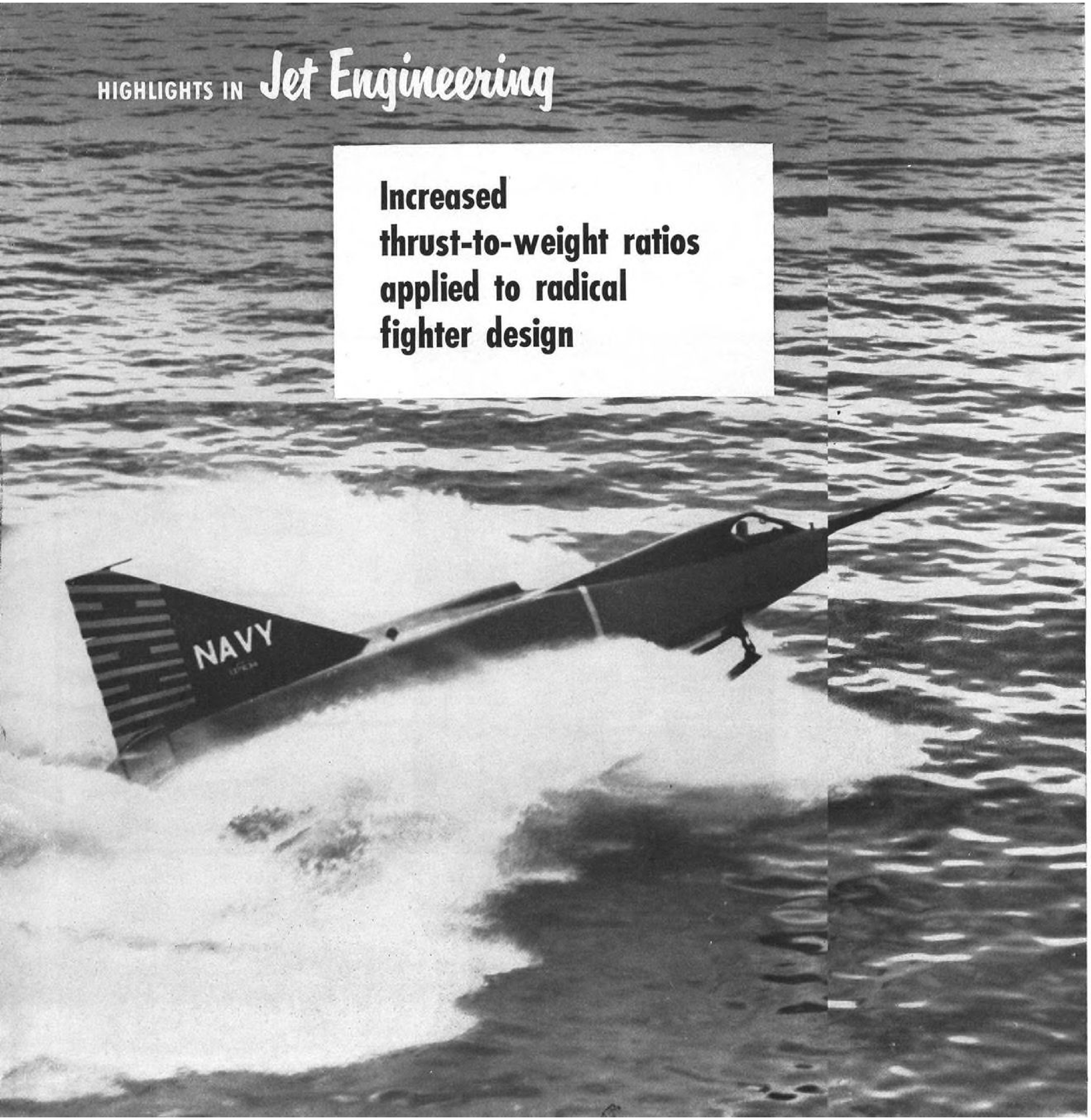

New aircraft designs and fighter concepts are demanding jet engines having greatly increased thrust with less weight —typified by the Westinghouse powered Convair XF2Y-1 "Sea Dart". This jet seaplane—as all other Westinghouse powered aircraft—takes advantage of the lightest weight engine in its power class to attain high speed, high altitude performance.

Westinghouse first met this challenge over ten years ago with the original axial-flow jet engine. Since then, continual engine thrust increases, coupled with a weight reduction program, have resulted in ever-increasing thrust-to-weight ratios. Research has also led to improved durability, reliability and performance with such engineering developments as . . . first application of titanium and its alloys, fabrication of components to replace solid castings and development of the step wall liner.

This pioneering by Westinghouse is paying off in more advanced, high-performance aircraft by making it possible for engines to meet designers' demands for maximum thrust-to-weight ratios. Thus, Westinghouse Aviation Gas Turbine Division contributes to continued pace setting by American aircraft. Westinghouse Electric Corporation, Lester Branch P. O., Philadelphia 13, Penna. J-54029

The Convair XF2Y-1 "Sea Dart", experimental U. S. Navy jet seaplane, is one of the latest in a long line of Westinghouse powered, high-performance fighters. It is the world's first delta wing seaplane and the first known combat craft to use hydro skis.

YOU CAN BE SURE...IF IT'S
Westinghouse

Photo Courtesy Dalmo-Victor

Miniaturized Antenna Motor Filter

Eliminates Interference . . . Fits Existing Mounting Bracket

PROBLEM—A large radar antenna manufacturer wanted to use a certain motor to train radar antennas. However, the motor brushes caused serious radio interference as the equipment was pulsed.

SOLUTION—The motor manufacturer's engineers contacted Sprague's Radio Noise Suppression Laboratories in Culver City to design a noise filter to meet a tight deadline. The unit would have to (1) reduce the interference to meet the requirements of MIL-I-6181, (2) fit the existing mounting bracket on the motor. The solution, outstanding for its superior attenuation characteristics, is shown in the photo.

RESULT—Production motors for this application are now supplied with the Sprague filter attached.

PRODUCTION SCHEDULES for such filters designed by Sprague's California labs are regularly met by Sprague's extensive pilot plant and mass-manufacturing facilities, the former for those sizzling rush orders, the latter for volume needs. For help with your radio noise filter applications, write, wire, or phone Sprague Electric Co., 11325 Washington Blvd., Culver City, Calif. (TExas 0-7491) or North Adams, Mass. (North Adams 423).

Sprague on request will provide you with complete application engineering service for optimum results in the use of radio noise filters.

YOU CAN DEPEND ON

SPRAGUE

motor parts, $16,408, 65%.
- **Neo-Ray Products Co., Inc.,** Des Moines, aircraft parts, $167,406, 70%.
- **Bell Aircraft Corp.,** Fort Worth, aircraft, $46,249, 65%.
- **Vard, Inc.,** Pasadena, Calif., aircraft parts, $71,405, 55%.
- **Aero-Coupling Corp.,** Burbank, Calif., aircraft components, $54,750, 35%.
- **United Aircraft Corp.,** Windsor Locks, Conn., aircraft components, $261,200, 60%.
- **Niles-Bement-Pond Co.,** Warwick, R. I., aircraft engine accessories, $111,271, 65%.
- **Parsons Tool Co.,** Berlin, Conn., aircraft parts, $15,147, 70%.
- **Bock Mfg. Co.,** Farmingdale, N. Y., aircraft parts, $8,305, 70%.
- **Johns-Manville Corp.,** Manville, N. J., aircraft parts, $160,205, 65%.
- **Curtiss-Wright Corp.,** Wood-Ridge, N. J., aircraft & engines, $22,513, 65%.
- **Glenview Metal Products Co.,** Delanco, N. J., machining of aircraft & ordnance parts, $44,748, 70%.
- **Ronson Art Metal Works, Inc.,** Newark, N. J., aircraft components, $31,359, 65%.
- **Zul Machine Works, Inc.,** Lindenhurst, N. Y., aircraft components, $8,522, 70%.
- **Economy Screw Mach. & Metal Products Mfg. Co.,** New York, N. Y., machining of aircraft parts, $10,250, 70%.
- **Fairchild Engine & Airplane Corp.,** Farmingdale, L. I., N. Y., aircraft parts, $12,850, 65%.
- **J. S. Thorn Co., Holmesburg, Pa.,** aircraft landing mats, $105,916, 70%.
- **General Metals Corp.,** Huntington, W. Va., aircraft parts, $2,000,000, 65%.
- **Glenn L. Martin Co.,** Baltimore, aircraft, $18,781, 65%.
- **Lear, Inc.,** Grand Rapids, Mich., aircraft parts, $12,689, 65%.
- **Alpha Tool Works,** Detroit, Mich., aircraft parts, $9,795, 70%.
- **National Pressure Cooker Co.,** Minneapolis, Minn., aircraft parts, $25,420, 65%.
- **Cessma Aircraft Co.,** Wichita, Kansas, aircraft & parts, $69,722, 60%.
- **Westholt Mfg. Inc.,** Wichita, Kans., aircraft parts, $11,370, 45%.
- **Boeing Airplane Co.,** Wichita, Kans., aircraft, $12,979, 65%.

WHAT'S NEW

New Publication

Jeppesen Radio Air-Route Guide is a one-volume flight reference designed for easy handling in cockpit by private and business aircraft pilots.

Included are enroute charts showing altitudes, mileages, radio frequencies, reporting points, omni and low-frequency airways, control areas and danger areas; area charts; flight planning chart; general radio facilities; meteorological data; airway traffic control procedures and air traffic rules.

Jeppesen and Co., Stapleton Airfield, Denver 7, Colo.

Telling the Market

Purchasing guide providing names and addresses of 2,800 Connecticut manufacturers, including aviation firms, is being distributed by the State of Connecticut Development Commission, Commerce Division, State Office Building, Hartford, Conn. . . . **Aircraft Metals Stock List,** 1953 edition, covers most-used aircraft materials and gives specification, hardness, finish and size. Write

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National Aircraft Standards Committee, Aircraft Industries Assn., 610 Shoreham Building, Washington 5, D. C. . . . Booklet intended as a teaching aid for youngsters and their parents on **how a modern air terminal operates** has been issued by Lockheed Air Terminal, Burbank, Calif. Write Gordon Stanton, public relations director. . . . Brochure describing the **airfreight terminal facilities** at Logan International Airport, East Boston, Mass., is being distributed by Massachusetts State Airport Development Board, Logan International Airport, East Boston 28.

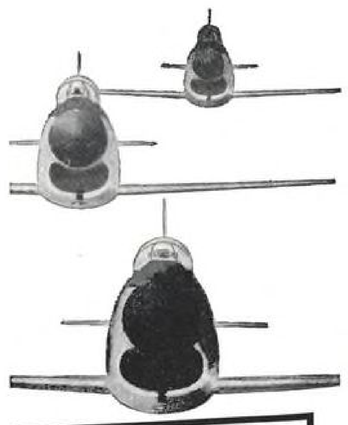
Beryllium products, including the pure metal, oxide and alloys are described in a 20-page product directory available from Beryllium Corp., Reading, Pa. . . . Preliminary formulas and applications for **liquid polymer-epoxy resin** combinations for use in potting, adhesive and coating fields are contained in a portfolio available from Thiokol Chemical Corp., Dept. E, Trenton 7, N. J. . . . Prices and tolerances of **standard thread gages** made by Detroit Tap & Tool Co. are listed in 20 page Bulletin SG-53. Write the firm at 8615 East 8 Mile Road, Base Line, Mich.

Engineering Journal is a General Motors publication containing information on engineering problems and techniques in the product and production fields. It is being issued by the Educational Relations Section of GM's department of public relations. Write the company at General Motors Building, 3044 West Grand Blvd., Detroit 2, Mich. . . . Data on more than 115 laboratory and production-line **measuring and testing devices** are contained in 64-page Catalog GEC-1016A available from General Electric Co., Schenectady 5, N. Y.

New Courses

Courses for training ground school instructors, aircraft dispatchers, air traffic controllers and commercial pilots are being offered during the 1953-1954 fall term at Department of Vocational Education, New York University's School of Education. Registration will be held Sept. 14-19. Classes are after 6:00 p.m. For further information write Prof. Roland H. Spaulding, Barney Building, 34 Stuyvesant St., New York 3.

Two courses giving management and executive trainees specialized collegiate training in aviation have been established by the University of Florida in conjunction with Embry-Riddle School of Aviation. Write L. D. Carlton, Dean of Admissions, Embry-Riddle, Aviation Building, 27th Ave., Miami, Fla.



Engineers —
PICK A WINNER

The Engineering Department which designed the **Sabre** and other headline-making military airplanes has openings for engineers—experienced in aircraft, recent engineering grads, or men from other fields with adaptable experience. Long-term military projects and twenty-five years of continuous expansion underwrite your future at North American. Current openings in:

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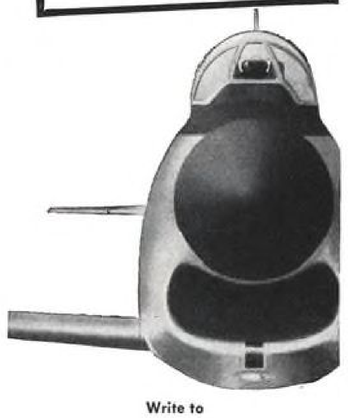

Write to

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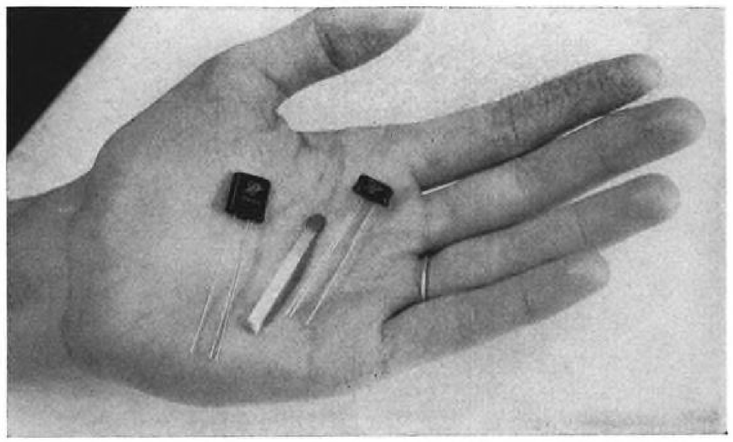
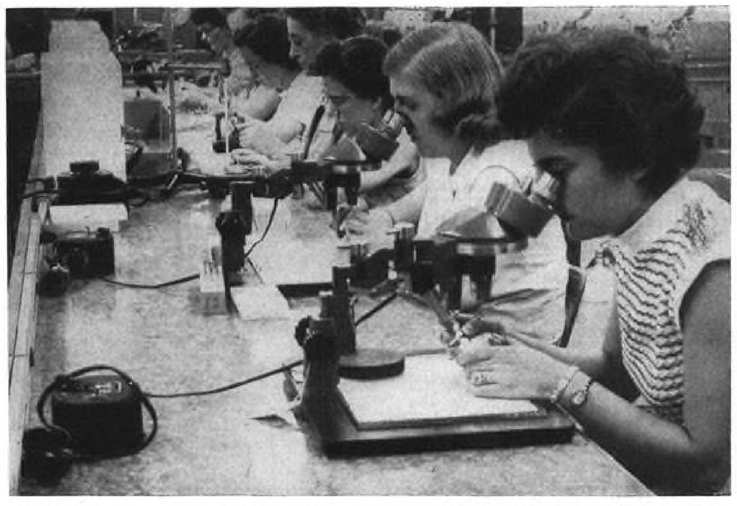


IN HAND—Hermetic seal solves one problem in manufacture of transistors but . . .



NEED for microscope in assembly work represents a block to mass production.

New and Improved . . .

Even as Donald Fink was taking a critical look at transistor progress, General Electric gave evidence that transistor manufacturers are taking steps to correct earlier deficiencies of their product.

GE announced that it is in production on a new all-welded, hermetically sealed junction transistor which has "essentially infinite life expectancy." The new transistor construction allows power ratings up to three times higher than those of any previously announced units, GE says. (When two of the new transistors are operated in a Class B push-pull circuit, they reportedly can handle almost one watt.)

GE says its new transistors will operate at temperatures up to 100C, but company doesn't indicate how much de-rating is required at higher temperatures.

Another noteworthy feature of the new transistor is that it is designed to permit automatic mass production and that an automatic factory is now being developed. Company spokesman says some basic transistor production machines are already in use and that total mechanization will be an evolutionary process.

Sample quantities of the new transistor are slated to be available this month. GE's plant at Clyde, N. Y. is being tooled to produce several million units yearly, company says.

Are Better Transistors At Hand?

Lab developments indicate they are, as experiments point to future high-power, high-temperature units.

Although the tiny transistor has proven a disappointment in its first five years to those who expected it quickly to become a full-scale competitor to the vacuum tube, developments now in the laboratory stage appear to justify great new expectations for the transistor in the next five years.

This is the opinion expressed by Donald G. Fink in a talk given before the recent Western Electronic Convention in San Francisco. Fink is director of research (radio, television & appliances) for the Philco Corp., and was formerly the editor of Electronics magazine.

"From the application point of view, the transistor is indeed surrounded by disappointments," Fink says. Of the many commercial transistor applications foreseen in 1948, only two have come to pass, he noted. One is the use of transistors in telephone exchanges; the other in hearing aids.

"The armed services, in their eagerness to support the new (transistor) art, have purchased large quantities of early-model transistors. No one of them has an operational military use. So there they sit, on the military shelf, quietly going bad," Fink says.

▶ **Great Expectations**—When the transistor was first announced by Bell Telephone Labs in July 1948, its many potential advantages fired the imagination. Some of these features:

- **Long life,** compared to electron tubes.
- **One voltage source,** instead of two or more required for tubes.
- **No warm-up time required.**
- **Small size.**

Another advantage, attractive to the aviation industry, is the transistor's very low power consumption. This not only reduces the amount of electrical power which an airplane must generate,

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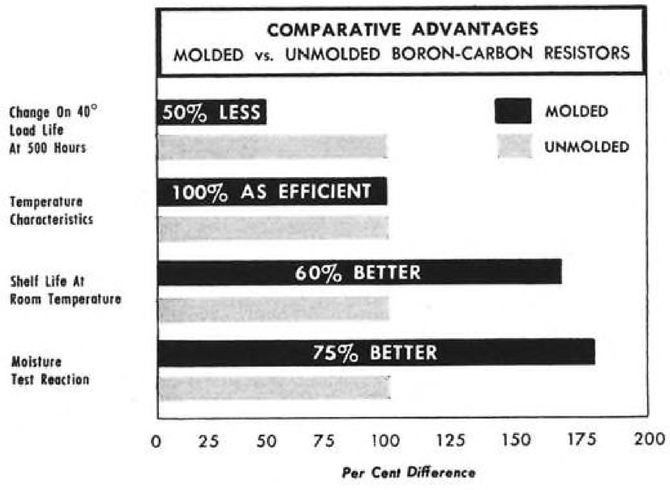

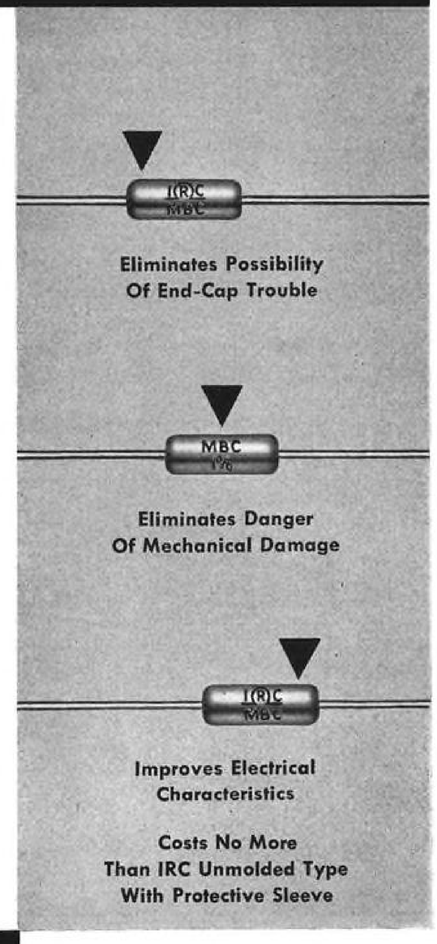

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but also reduces the large amount of heat which is generated by avionic equipment.

▶ **A Bad Guess**—Fink was one of the many observers who in 1948 predicted that the transistor would prove to have unlimited life and thus could "be soldered into the circuit like a resistor." Even the conservative Bell Telephone Labs went on record to predict a probable transistor life of 70,000 hours (which would mean eight years of continuous operation).

These predictions seemed logical at the time. The principal mechanisms which limit the life of vacuum tubes, notably loss of vacuum and loss of electron emission, didn't exist in the transistor, Fink said.

"Sufficient time has now passed to show that long life is not a natural attribute of transistors as we now know how to build them," Fink reports. "Moisture is a virulent poison to the transistor . . . Most authorities (now) recommend hermetic sealing," Fink notes, adding, "If this practice proves in fact to be essential, the transistor will have journeyed a long way back to the construction (requirements) of the vacuum tube."

▶ **Other Hazards**—Keeping moisture out of transistors is not enough to assure long life, however. Mechanical breakage of the wires away from the germanium often occurs for no clearly assignable cause, even in units quietly resting in cotton wool, Fink reports. Then, the physical and chemical instability in the crystal structure of germanium, causes changes in transistor characteristics.

The result is that "no one today knows for sure how to make a transistor having a guaranteed shelf-life of 10,000 hours, let alone an operating life of 70,000 hours," Fink says.

▶ **Optimism and Caution**—Despite this, Fink says that today there is more justification for expecting long, possibly unlimited transistor life.

"We know much more about the causes of early failures in transistors that we did two years ago," he says, and predicts that "in another five years we should have this problem behind us."

However, life histories must be accumulated on tens of thousands of transistors, each continuously subjected to the environment in which it will be used before we can definitely establish that transistors do have long life, Fink points out.

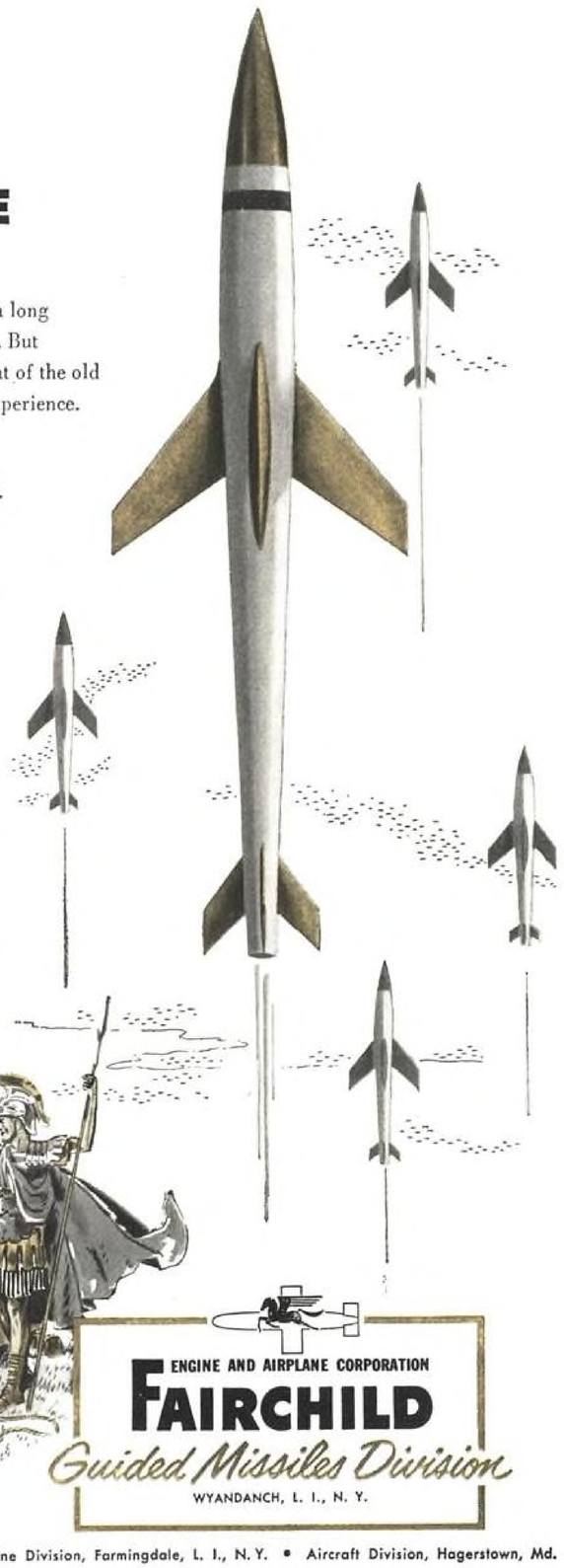
▶ **Inferior Performance**—From a performance standpoint, the only present claim to superiority that transistors can make over electron tubes is their efficiency in amplifying weak signals. For example, a hearing aid using vacuum tubes requires five times more power

PROPULSION FOR A MISSILE

The art of propelling a missile has progressed a long way since the era of the rock-throwing Roman catapult. But the design of a modern missile, like that of the old stone catapult, is best done by those with missile experience.

Engineers at Fairchild's Guided Missiles Division are among the most experienced in their field. Beginning with one of the Armed Services' very first missiles projects, Guided Missiles Division engineers have played an important role in the design and development of complete modern missile weapons systems. Fairchild missile projects have included both rocket and turbo-jet powered missiles.

Fairchild's broad experience encompasses all phases of missiles weapons systems, including propulsion, airframe, guidance and such intricate associated equipment as ground and shipboard radar.



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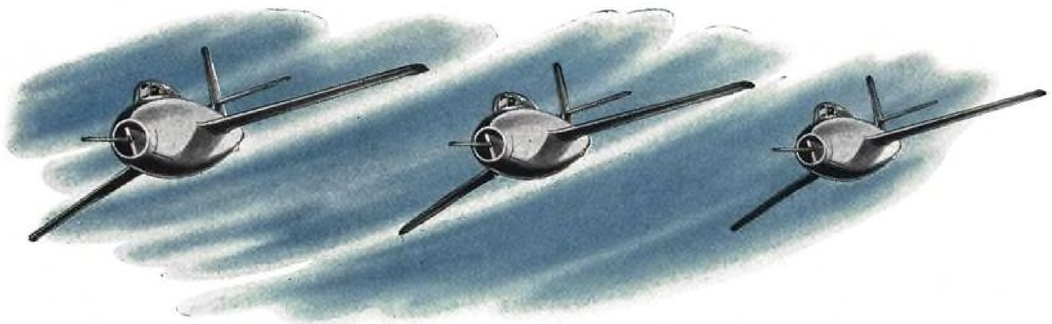
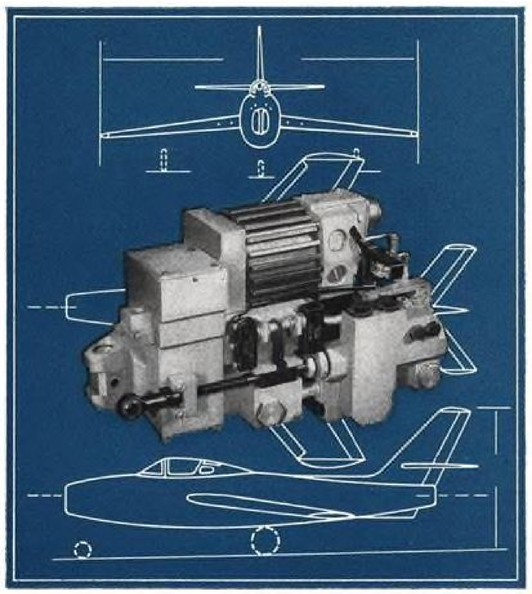


AEROPRODUCTS ACTUATORS CONTROL "FLYABLE TAIL"

Self-locking features aid Republic's new F84F



Typical Aeroproducts Actuator

The broad adaptability of Aeroproducts actuators has helped to solve problems encountered in the design of the "flyable tail" of the new Republic F84F jet fighter. The application of these actuators permits instantaneous adjustment of a variable surface to any position within its design range. The self-locking feature of Aeroproducts actuators secures the adjustment until it is changed by the pilot.

Any combination of systems—hydraulic, pneumatic, electric or manual—can serve as the primary power source for Aeroproducts actuators. They can be synchronized readily in tandem or in series to provide coordinated control of related movements.

Announced uses of Aeroproducts actuators include those for the control of the "flyable tail" of the Republic F84F, the horizontal stabilizer on another high-speed jet fighter and the afterburner nozzle in a jet engine. Additional applications include control of wing flaps, dive brakes, bomb bay or cargo doors, gun turrets, variable wing sweep and incidence, wing fold and canopy slides.

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Aeroproducts

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than one using alloy junction transistors, Fink said.

In other respects, commercially available transistors run a very poor second to tubes, Fink said, citing these examples:

• **Noise.** At audio frequencies the best commercial transistor has a noise figure of 22 db., almost 20 times noisier than any "respectable" vacuum tube operating in similar conditions.

• **Operating frequency.** The best commercial transistor amplifies as a bandpass radio-frequency amplifier to about 2 mc.; the 6BQ7 tube will operate to 300 mc.

• **Bandwidth.** Commercial junction transistors have a maximum bandpass width of less than 0.5 mc.; point contact transistors have a useful bandwidth of about 2 mc. The 6CB6 tube covers a range 10 times as wide as the junction transistor and nearly three times that of the point-contact unit.

• **Power rating.** The best commercial transistor has an allowable power dissipation of 0.2 watt; the 6CD6 tube will handle 75 times more power.

• **Operating temperature.** Performance of most commercial transistors falls off beyond temperatures of 50C (122F) and exposure to temperatures above 200F can permanently damage transistors. Tubes have no such temperature limitations, Fink says.

► **Improvement on the Way**—If Fink takes a pessimistic view of past progress, he is much more optimistic about the future, based on experimental transistors now in existence.

One experimental unit he says, has an output power of 2 watts at 30 mc. Another lower-power transistor has oscillated at frequencies as high as 425 mc., Fink reports. Philco's research labs have an experimental transistor "which combines, in a single unit, many times higher frequency of operation and wider gain-bandwidth product than are available in all the commercial junction transistors taken as a group," according to Fink.

Scientists are fast learning more about the principles underlying improvements in transistor performance, Fink notes. For example, high-frequency performance in the junction transistor is now known to depend on rigid control of the small dimensions; the junctions between the three elements of transistor must be extremely flat and the middle element must be very thin, Fink says.

Transistor noise reduction depends upon getting high-purity germanium initially and then carefully controlling the amount of impurity added. Increased transistor power ratings require equal distribution of heat over larger areas of the junction to prevent hot-spots, as well as construction techniques which will rapidly conduct heat away

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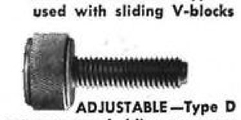

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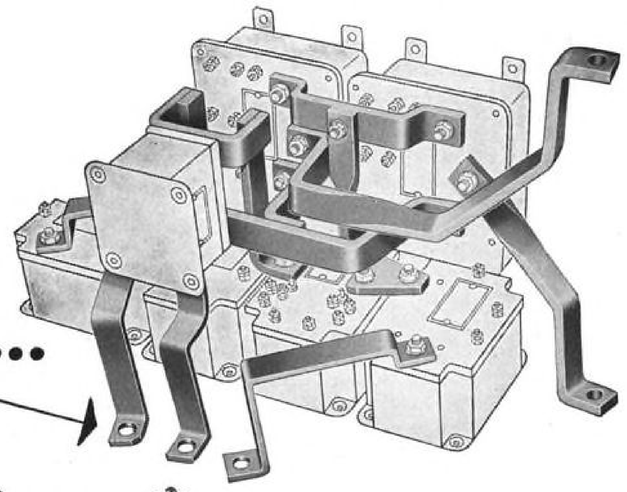
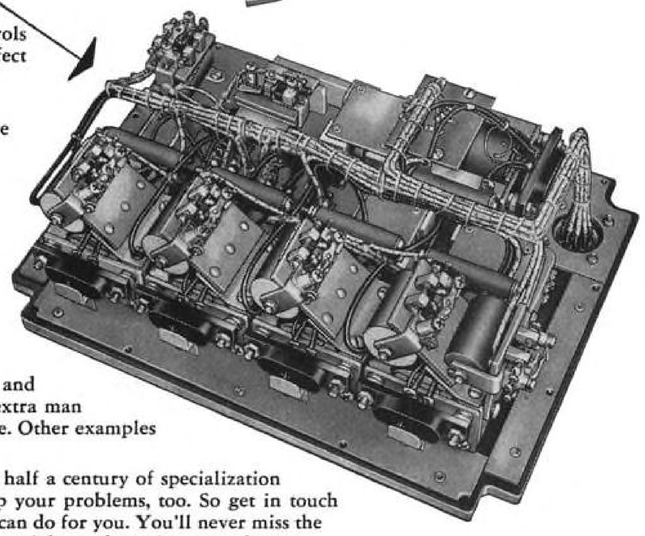


*H*artman *Unitized* Controls — multiple controls centralized in one compact package — effect significant economies in space, wiring, assembly time, and weight.

For example, a large manufacturer, faced with the difficulty of installing 7 separate control units with 28 mounting screws, and interconnecting the controls with 10 heavy bus bars and 18 lead wires *(above)*, turned the problem over to Hartman engineers for analysis.

Result? Hartman designed a single, easy-to-install *Unitized* control *(at right)*. This design cut the number of buses from 10 to 4, the control terminals from 18 to a single AN connector with eight pins.



Gone is the extra cubage . . . the extra weight and complexity of a complicated bus system . . . the extra man hours of installation, assembly and inspection time. Other examples of Hartman *Unitized* Controls are shown below.

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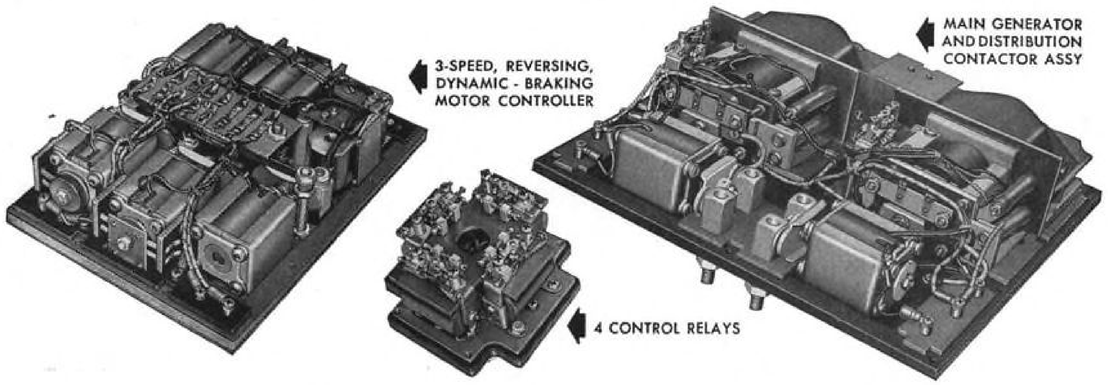

the Hartman Electrical Mfg. co.

"DC and AC CONTROL HEADQUARTERS"

MANSFIELD, OHIO

from the junctions (AVIATION WEEK May 4, 1953, p. 42).

► **Higher Power and Temperature**—"Really high-power, high-temperature operation still awaits the development of a non-germanium transistor, probably one made of silicon," Fink says. Silicon has been considered a likely transistor material for some time, but it is extremely difficult to obtain in the pure monocrystalline form needed for transistors.

However, Fink expects this problem to be solved soon, resulting in a new family of transistors which would combine effectively much higher power capabilities and no important temperature limitations.

► **Production Line Needed**—To obtain high-frequency performance in some of the new experimental transistors requires building dozens or hundreds to get one unit with the desired characteristics, Fink reports. Other new experimental transistors will require extremely precise hand fabrication techniques.

What is needed is a new family of transistors which not only have the desired improvements in performance but which can also be manufactured reliably on automatic machinery. Some of the new experimental transistors show promise in this respect; they are the ones to watch, Fink says.

For this reason, he concludes that the future of the transistor depends not only on the solid-state physicist and chemist, but on the development engineer who can apply their basic knowledge to a transistor design which can be mass-produced by automatic machines.

—Philip Klass

Avionics Research Group Reorganized

The Stanford Research Institute, Stanford, Calif., has expanded and regrouped its avionic activities into a newly formed section called the Radio Systems Laboratory, headed by Dr. John V. N. Granger, assistant chairman of SRT's engineering division.

The new lab replaces the Aircraft Radiation Systems lab. It consists of five technical groups:

- **Communications,** (formerly a separate section which was called Single-Sideband Communications, under John F. Honey.
- **Antenna Research,** under Dr. John T. Bolljahn, who is also assistant head of the Radio Systems lab.
- **Antenna Development,** under Allen Ellis.
- **Airborne Applications,** under Dr. Donald R. Scheuch.
- **Microwave,** under Dr. Seymour Cohn.

The new lab will continue develop-

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Valve Talk

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by Marvin Miles,
Senior Member, Aviation Writers Assn.

Because Whittaker is proud of its reputation, and because that reputation stems primarily from the efficiency of its valves, the company is extending its service visits far afield . . . to Europe and Alaska.

Vice-President Glenn Whitaker, who recently returned from a seven-week survey of NATO countries, explained it this way:

"Our coordination with customers in the continental United States is well established. With off-shore procurement expanding and with American aircraft operating from distant bases in greater numbers, we feel that periodic visits by our people may solve many a problem before it arises.

"If these visits bring about a better understanding of our products by maintenance and overhaul people abroad they'll save our distant valve users time and money and perhaps even prevent a situation from reaching the panic button stage.

"In addition, such visits will help our own understanding of the troubles in these far-flung operational areas and enable us to form more workable plans and policies here at home.

"The idea of service calls by equipment manufacturers will be more welcomed by Air Force authorities overseas as the need grows and the values are realized," Glenn said. "In time, I'm sure, the integration will be as complete as our relationships with the Air Force in this country."

In general, Glenn found that wing operations felt that maintenance and overhaul could be handled much faster if conducted at their level, rather than through the long supply lines to Burtonwood in England or Chateauroux in France. He found, too, that NATO nations generally shy away from the efficiency of international cooperation in maintenance and overhaul and prefer to do the complete work themselves at more cost and slower pace.

And he learned that visits by Whittaker experts could not only help catch maintenance troubles before they get out of hand, but also assist in surveys of valve spares needed at the various bases, for in some cases there were too many on hand, and in others not enough.

While Glenn was in Europe, **Norm Sarchin,** field engineer assigned to Boeing in Seattle, visited Air Force bases in Alaska. His findings, in many cases, paralleled those Glenn brought back from the NATO countries:

"Not too many problems right now, but there will be problems in the future as more and more new aircraft arrive. Summer flying conditions in the north are ideal, with perhaps 20 hours of daylight. The real test is in winter."

One of the biggest problems in military maintenance, both men agreed, is the constant change in personnel. New men must be constantly trained in handling myriad pieces of equipment such as aircraft valves. Due to the nature of the military service, the turnover in manpower cannot be avoided. So Whittaker feels that scheduled contacts at these far bases will help both the service and itself.

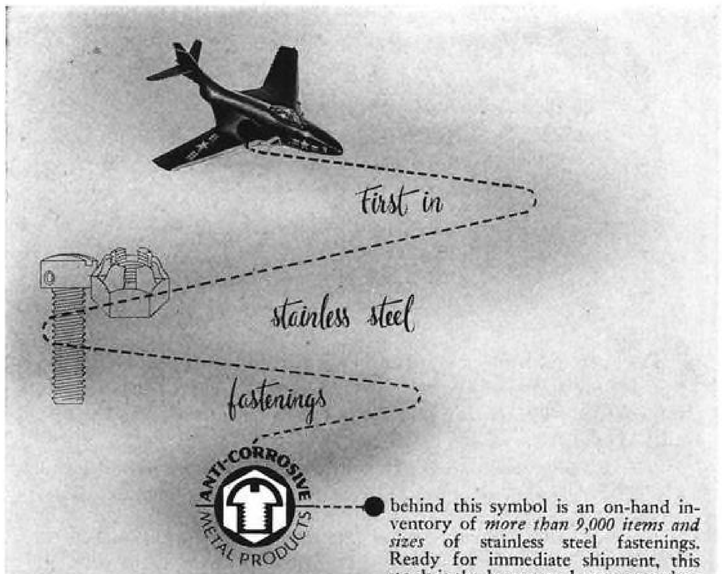
If, for instance, a mechanic in Alaska is not familiar with a certain valve type, he may determine erroneously that a malfunction is the result of a manufacturing defect and turn in an unsatisfactory report. A "UR," in this case, would mean that the valve would have to be shipped back to the States—to the AF Oklahoma City depot—for analysis and rework.

On the other hand, if the same mechanic had a chance to talk with a Whittaker engineer now and then, he would be more familiar with the unit and know that a minor adjustment, perhaps, was all that was needed.

"The mere replacement of seals can take care of an awful lot of rework in most cases," Sarchin said. "With a little special know-how and the proper equipment, many a valve could be readjusted to efficiency without going all the way back through the long line of supply."

These first exploratory surveys have given the Whittaker company a picture of the foreign and distant-base situation as it is now and an idea of what it will be in the future.

The Southern California valve concern, first of the smaller suppliers to realize the potential values of service far afield—not only to the military but to commercial customers as well—is readying itself to meet it.



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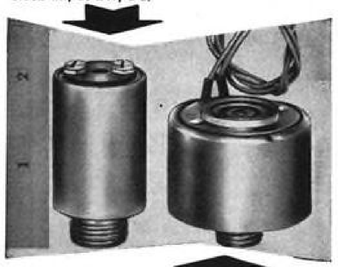

The push type solenoid, **Model SD-73,** pushes 20 lbs., 0.025 in., at 24v, d-c. This unit is useful for actuating valves and for other applications requiring short strokes. A threaded plunger adjusts stroke to an accuracy of plus or minus 0.002 in. The plunger can also be re-postioned up to 0.125 in. from normal position.

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ment of flush aircraft antennas, multiplexing devices, and navigational and communication equipment. One program now underway involves single-sideband equipment for airborne use, with future studies pointed toward reducing equipment size and weight, SRI says.

The new lab also has facilities for radar antenna development, radome studies, and research on microwave components.

Flight Data Recorder Uses No Electronics

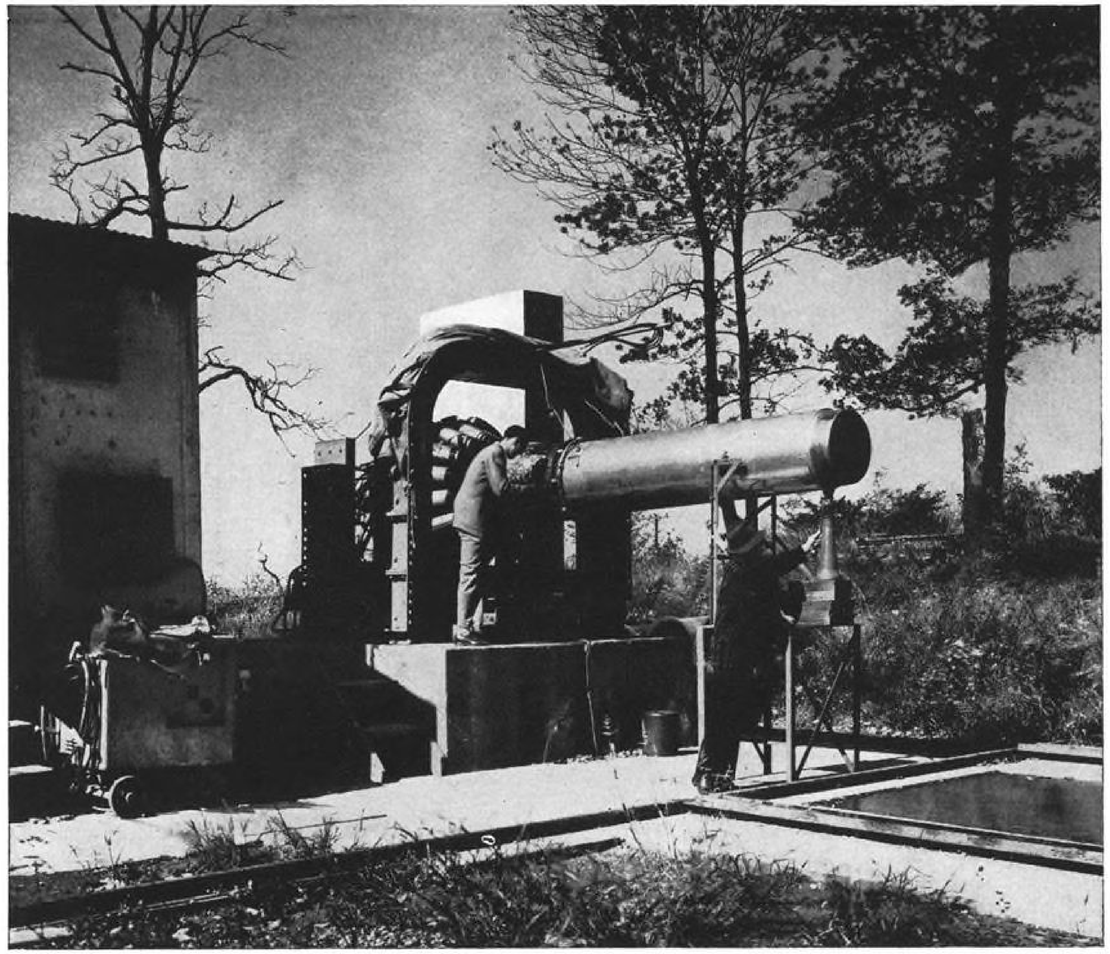
A flight recorder which will make a continuous record of airplane altitude, airspeed, vertical acceleration, and heading on a thin metal foil tape capable of withstanding temperatures of 2,000F for 30 minutes without destruction of the record, has been announced by the Mechanical Division of General Mills, Inc., Minneapolis.

The recorder is available with a chart speed of 3½ to 5½ in./hr. and a chart supply sufficient for 300 hours operation without reloading. The chart is driven by a motor through an escapement mechanism to assure constant speed.

The drive mechanism and the altitude, airspeed, and acceleration sensors will continue to operate for 10 minutes after a complete airplane power failure has taken place, the company says.

Recording accuracy is reported to be ± 2% of full scale for altitude and airspeed: ± 0.2G for acceleration, and ± 3 deg. for heading. The acceleration measuring element response is flat to 2 cps, General Mills says. The entire recorder weighs 16½ lb. in a fireproof case; 12 lb. when placed in a conventional case.

The recorder uses no vacuum tubes and is self-contained except for connections to the airplane's static-pitot lines and gyro compass.



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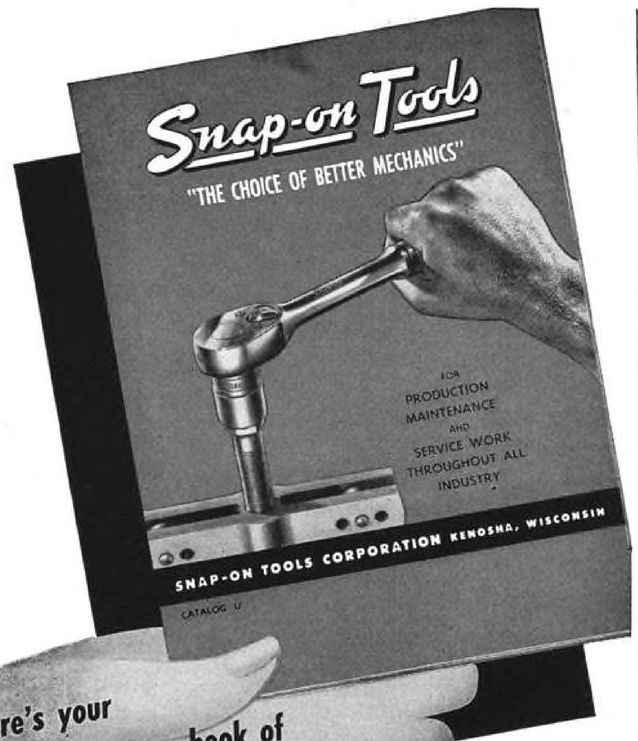

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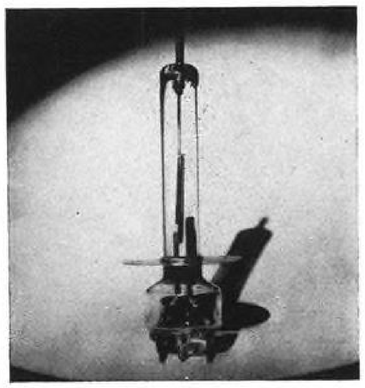
Small Components

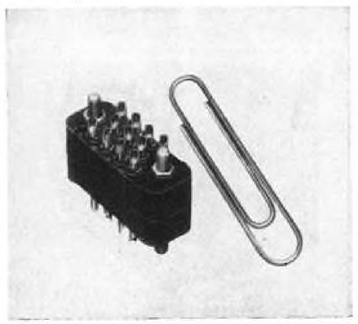
Newly announced components designed to help engineers reduce the size and weight of avionics equipment include:

• **High-voltage relay** of the high-vacuum type designed for switching radar pulse-forming networks in partial oil immersion applications is available with 300-amp. peak pulse current rating and a pulse duration of 3 microseconds.



Lower portion of new PS-32 relay can be hermetically sealed into pulse network case, according to manufacturer, the Pioneer Electronics Corp., Santa Monica, Calif.

• **Subminiature connectors,** available with 11, 14, 20, or 34 contacts for use with No. 20 AWG wire, are 30% smaller than their predecessors without any reduction in contact pin diameter, according to manufacturer. New series



SM-20 uses phosphor bronze contacts rated at 5 amp., 1,400 v. rms. and weighs only ¼ oz. DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City, N. Y.

• **Servo motor-generator,** for operation from 26 v., 400 cps. combines a two-phase a.c. motor and rate generator, in a unit less than one inch in diameter and weighing 4 oz., according to its manufacturer, Transicoil Corp. Motor has a stall torque of 0.3 in oz. and

have you heard this one

about TURBINE WHEEL BROACHING ?

Here's an instance where **LAPOINTE** engineering resulted in the saving of time and money, tools and machines, because of an *interchangeable fixture.*

TWO TURBINE WHEELS
with different diameters, with 8-branch and 4-branch "pine tree" slots, were **BROACHED WITH THE SAME BROACH!**

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Bulletin AW-20 describes Lapointe Broaching Machines, Tools, and Fixtures that will help to eliminate production bottlenecks in your plant.

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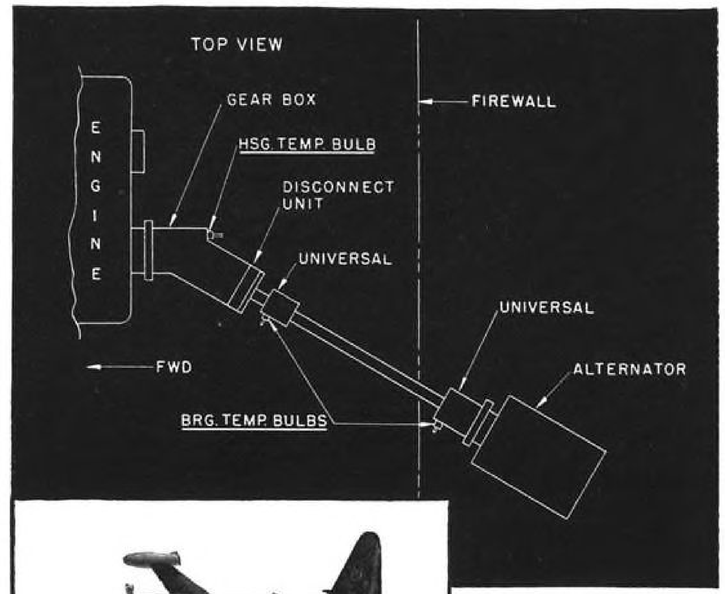
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Lockheed Neptune Gets New

Temperature Warning System



Newest version of the U.S. Navy's Neptune is this P2V-5, developed jointly by the Navy and Lockheed for use in anti-submarine warfare. Above shows a diagram of the points protected by the Edison alarm system.

A NEW EDISON Temperature Alarm System keeps its sensitive "fingers" on three spots in the alternator drive system. Should the temperature at any or all spots rise to 150°C, an alarm automatically signals in the flight compartment. The alternator drive system is so designed that it can be immediately disengaged before serious damage can happen.

THREE STANDARD resistance bulbs, a small control assembly (wgt. 1.5 lbs.), and a panel light make up the system. The bulbs are installed as shown in the diagram. Each bulb continuously "feels" the temperature at each point. When the temperature reaches its critical level, the alarm comes on, and, if the temperature returns to normal, automatically shuts off.

THE SYSTEM can be adapted to any number of circuits and still retains its basic simplicity. For information concerning specific applications, write to—

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SENSITIVE electronic equipment for airline transmitting and receiving must give continuously accurate results. For instance, note this "inside" view of the Collins Transceiver, mounted on Lord Temproof Mountings which isolate it from vibration and shock. Lord Temproof Mountings function efficiently throughout operational ranges of temperature from —80° to +250°F. The Collins Transceiver with automatically tuned elements for maximum flexibility and high power output delivers maximum performance in any weather, completely protected from vibration, shock and excessive equipment motion at resonant frequencies by Lord Temproof Mountings.

May we give you further details on this Lord application or help you solve your specific mounting requirement?

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SAE NATIONAL AERONAUTIC MEETING
HOTEL STATLER—BOOTH NO. 21
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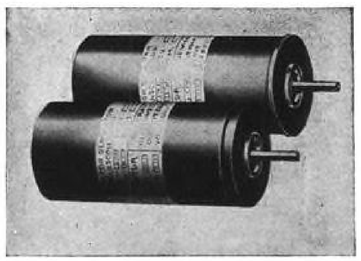
SEPT. 29-OCT. 3, 1953



rate generator has output of 0.34 v./1,000 rpm., according to maker. Address: Transicoil Corp., 107 Grand St., New York 13, N. Y.

FILTER CENTER

► **CAA Issues TSOs on HF**—The Civil Aeronautics Administration has issued Technical Standard Order (TSO) numbers C-31 and C-32 effective July 15, covering minimum performance standards for high-frequency radio transmitters and receivers. Performance requirements are those established by Radio Technical Commission for Aeronautics papers 14-53/DO-48 and 15-53/DO-49 dated Jan. 26, 1953.

► **M-H Gets Record Order**—Minneapolis-Honeywell has received a $17-million order from the Air Force for its new E-11 autopilot for use on the Northrop F-89D (Scorpion). M-H says the E-11 can be tied in with a radar fire-control system to direct an interceptor into firing position automatically. Total E-11 orders now are nearly $20-million, the company says.

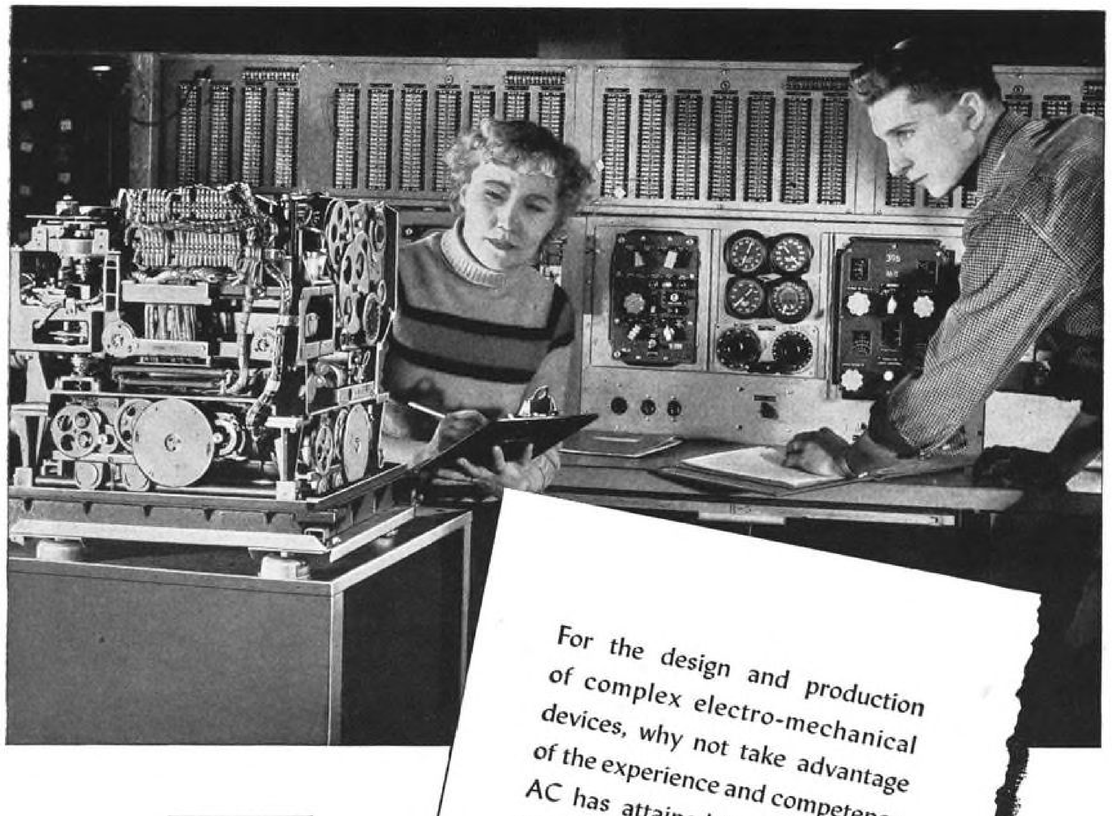
► **British Fighters Get Radar**—British jet day fighters are being equipped with a range-radar, similar to that developed by General Electric for use with computing gunsights in U.S. fighters. The British radar was developed by E. K. Cole of England and reportedly occupies about one cubic foot of space.

► **Low-Cost Waveguides**—Sightmaster Corp., Santee, Calif., says it has developed a molding process for fabricating waveguides that will reduce tooling to one-tenth their previous cost. Company says that simple foundry facilities and low-cost metal patterns replace expensive dies now required.

► **R&D Fund Cuts**—Navy BuAer contract for the development of an advanced autopilot which was slated to go to Minneapolis-Honeywell (AVIATION WEEK May 11, p. 74.), had to be abandoned after Defense Department ordered a 25% reduction in spending of last year's R&D funds.

—PK

★ PRODUCING FOR DEFENSE ★



For the design and production of complex electro-mechanical devices, why not take advantage of the experience and competence AC has attained in the development and manufacture of such highly technical equipment.

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Now producing a number of complex, high precision electro-mechanical devices for the Armed Forces such as . . . A-series Gun-Bomb-Rocket sights, A-1A Bombing Navigational Computers and T-38 Skysweeper Fire Control Systems.

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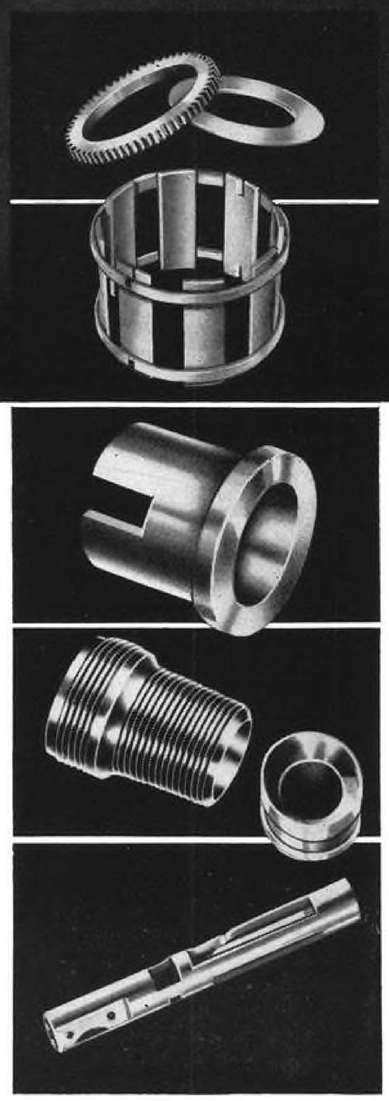

When you use Shelby Seamless Mechanical Tubing for hollow cylindrical parts, the basic shape—the tube—is already made.

You pick up the job where Shelby leaves off, and you find that it requires much less cutting or boring than solid bar stock or forgings would.

You fashion the most complex of parts, yet you produce them faster and at lower cost than identical parts machined from solid bar stock.

You turn out a far better precision product, yet fewer operations are involved, man and machine hours are reduced, rejects are fewer, and over-all parts production is speeded up.

In some instances, the use of Shelby Seamless Tubing has increased production to such a degree that savings of 50 percent have resulted.

Shelby offers you the high strength, the uniformity, the dependability that only *seamless* tubing can give. And it's available in a complete range of diameters, wall thicknesses, and analyses to meet the most exacting requirements. If you're interested in cutting production costs—and who isn't?—while turning out a superior product, send for our free Bulletin Number 17. And feel perfectly free to call on our engineers if you need help in applying Shelby Seamless Steel Mechanical Tubing to your product.

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FINANCIAL

Airliner Leases Prove Expensive

And despite several recent contracts, a widespread trend among carriers is considered unlikely.

Aircraft equipment leases appear to have little chance of developing into a widespread trend among airlines, despite contracts negotiated in recent months.

The Flying Tiger Line recently leased four DC-6-type aircraft to Northwest Orient Airlines. It is known that the cargo carrier is interested in attempting additional similar leases to other airlines. However, it is doubtful that the economics and conditions of the operation will encourage this activity.

► **FTL Ingenuity**—This leasing approach has a collateral significance in that it represents a marked departure from the basic cargo operations conducted by the Flying Tigers. It also is typical of the ingenuity which has characterized the Tiger management from its inception.

Lease arrangement with Northwest provides for the rental of four DC-6As (to be converted to DC-6Bs) for a total of $8,800,000 for seven years. On a per plane basis, this amounts to a monthly rental of $26,071 during the first seven years. NWA has an option to renew the lease an additional three years at a monthly rental per plane of $10,000.

► **Northwest Benefits**—A major attraction of this arrangement to Northwest is that it will get delivery of three airplanes this fall and a fourth early next year. Further, it relieves the carrier of the task of raising additional capital at this time.

The fact remains, however, that acquiring airplanes in this manner is costly and not as desirable as an outright purchase. And the economics at play discourage widespread leasing arrangements of a similar nature in the industry at the present time.

A simple illustration: Assuming a unit cost of $1.1 million per DC-6B type (higher than the price paid by Flying Tigers), four aircraft will entail a total capital expenditure of some $4.4 million. Assuming further that the cost of capital would average 5%, interest expense would aggregate $220,000 per year or $1,540,000 for the seven-year period.

► **Increasing Equity**—Accordingly, at the extreme, the total cost and capital charges for this equipment would amount to slightly less than $6 million. Equally important, the purchasing carrier would be building up an increasing equity in this equipment through its depreciation charges instead of losing the lease charges.

Actually, however, the total interest cost would be materially less as the debt would be reduced through repayments from cash throwoffs created by depreciation charges. Equity money could provide material funds to dispose of all debt at the outset.

With interest charges representing an allowable cost, there would be a reduction in the tax burden—thus creating additional savings.

This all would serve to bring the total acquisition cost materially below the indicated $6-million estimate.

► **High-Priced Lease**—Another aircraft leasing arrangement was established earlier this year by Seaboard & Western Airlines through Aviation Equipment Corp., a company created especially for this purpose. This was a far more involved deal and was surrounded with various other elements.

There is no doubt, however, that Sea-

the BIG NAME
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Pressure Switches • Regulators • Warning Controls
In-Flight Refueling Systems • Pressure Valves

Gorn Aircraft Controls Company are specialists in designing and mass producing accurate, sensitive, pressure-actuated devices that are compact, light in weight and simple in operation. Our reputation is based on the dependability of our products in service — plus our engineering ability to meet every specification in performance, delivery and price. The Republic F-84 is but one of the numerous modern planes equipped with Gorn Aircraft Control devices.

We can save you engineering and production time by applying our specialized knowledge, test equipment, model and manufacturing facilities to the development of pressure-fluid controls of any type.

If it's Fluid Pressure Controls
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WEST COAST REPRESENTATIVES: *Western Aircraft Supply Co., 8845 West Olympic Blvd., Beverly Hills, California*

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Each fastener is important in its particular Job. There is also a "WHALE" of a difference in the finished product as well, depending on Manufacturing Know How, Equipment, etc.

The rivet shown is used on Jet after-burners where they must withstand extremely high temperatures. We manufacture them in a variety of sizes from AN 123151 through 132262 of number 347 stainless steel.

actual size of AN 123168

Lockheed special 725400

This Lockheed special No. 725400 is a special High heat treat cold headed bolt with P.S.I. of 180,000 to 200,000, with a diameter of 1 7/8" at the shoulder and 1 1/8" dia. at the threaded section. The head is 12 point. The radius under the head and the threads are rolled after Heat Treat to control grain flow for strength. This bolt has a very high fatigue percentage. Ground before Heat Treat because of no decarburization, thereby eliminating surface strain.

We manufacture large bolts from NAS 464 thru sixteen Dia. AN 9 thru 16 . . . AN 179 thru 186 etc.

We specialize in the manufacture of Aircraft Rivets and Bolts to AN-NAS and MS standards.

BRILES MANUFACTURING COMPANY

COLD HEADED RIVETS AND BOLTS
3/32" to 1 1/2" Dia.
EL SEGUNDO, CALIFORNIA

board & Western agreed to a relatively high price to obtain equipment under a lease arrangement.

In this instance, S&W entered into a 10-year lease with Aviation Equipment for three Super Constellations and spare parts. The capital cost of each airplane and attendant spares is indicated at approximately $2 million.

The monthly rental is to be $33,500 per airplane and $18,000 for the necessary spares during the first year. The second year, the monthly rental drops to $32,000 per plane and to $30,500 the third year. The fourth and fifth years specify monthly payments of $29,000.

Seaboard has deposited $1 million with the leasing company as security for performance. Of this amount, $640,000 is to be returned during the fifth year and the remaining $360,000 in the last year.

► **$4-Million Rental**—During this initial five-year period, Seaboard will have paid a total of about $4 million in lease rentals for the three airplanes and spares. At the end of that period, the company has an option to purchase these planes at a stated formula that may give Aviation Equipment a material profit.

If these planes are not purchased by Seaboard, it may lease them for an additional five-year period at a monthly rental of $8,400 per airplane and $4,800 for the spares.

If Seaboard & Western were able to finance this equipment purchase directly at the outset, the overall costs would work out substantially lower.

► **Ambitious Program**—Leasing proposals for aircraft have been approached and even advanced by other groups in past years.

But none of the plans received favorable response.

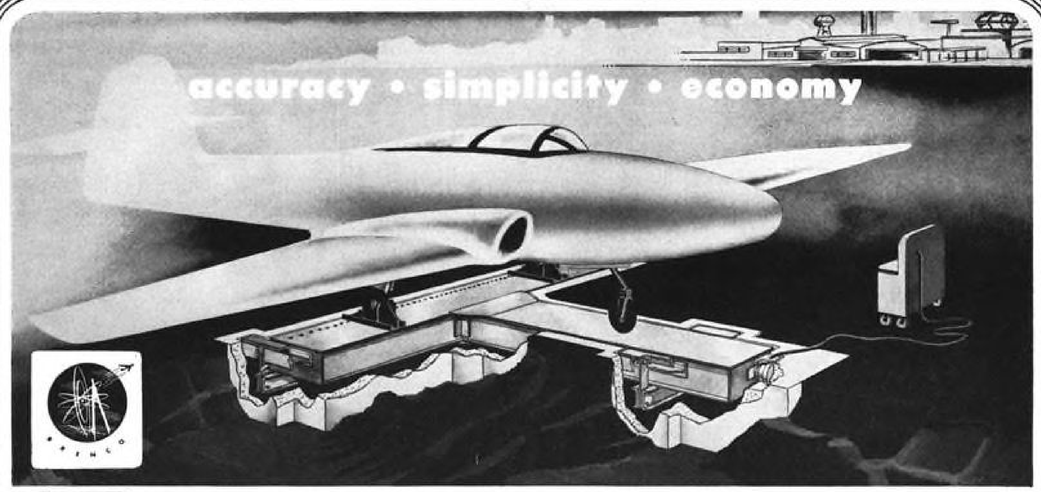
One of the most ambitious programs in this direction was developed by Convair in 1948 to rent the 240 transport to airlines, granting them a purchase option.

This scheme contemplated establishing the Convair Equipment Corp. as the leasing company, financing it largely by government funds.

Airlines were far from receptive, however, and government officials frowned on the idea.

► **Better Buy**—In recent years, a prominent commercial paper firm explored the possibilities of entering the aircraft leasing field in a substantial manner. But lease charges necessary to support the operation were too high.

In substance, any lease is as good as the credit of the lessor. This being the case and if there are no other extenuating circumstances, an airline generally can do much better by financing its own equipment directly rather than through a lease.—**Selig Altschul**



Bronco thrust stand for jet aircraft testing

Direct engine thrust measurements, accurate within ½ of one per cent, can be made with this new piece of test equipment. Stands are suitable for both single-engine and multi-engine planes and can be furnished for measuring any specified thrust. Maintenance problems are reduced to the minimum through the use of a closed circuit hydraulic system which permits exposure to inclement weather and extreme temperature conditions.

In addition to the ground level stand pictured above, portable stands of equal accuracy can be furnished. Detailed information on both types is available. Inquiries are invited.

AIRBORNE STORES AND TANKS • AIRFRAME DESIGN • GROUND HANDLING EQUIPMENT TRAINING DEVICES • SERVO MECHANISMS

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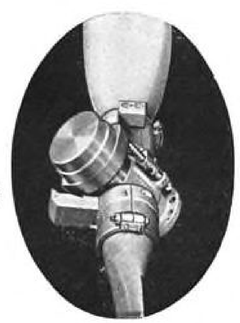
ARMAMENT INSTALLATIONS • ELECTRONIC PACKAGING • RADAR ANTENNAE & DRIVES FIRE CONTROL SYSTEMS • BOMB HOISTS

a HARTZELL constant-speed propeller was Cessna's choice for their 180

A Hartzell constant-speed propeller is standard equipment on the Cessna 180.



Simplicity of design insures trouble-free operation with minimum maintenance.

The phenomenal climb and cruise performance obtained from such airplanes as the Cessna Model 180 results from excellent airframe engineering and provision for maximum *thrust*. Not only is *all* the engine power made available by virtue of the Hartzell constant-speed propeller, but it is converted into the highest thrust power possible by efficient Hartzell metal blades.

Simplicity, low cost, minimum maintenance and low weight are other virtues of the new Hartzell Model HC-82-X constant-speed propellers. Full-feathering constant-speed propellers for light twin-engine aircraft are also available. Write for details.

HARTZELL PROPELLER COMPANY
DEPT. A. PIQUA, OHIO

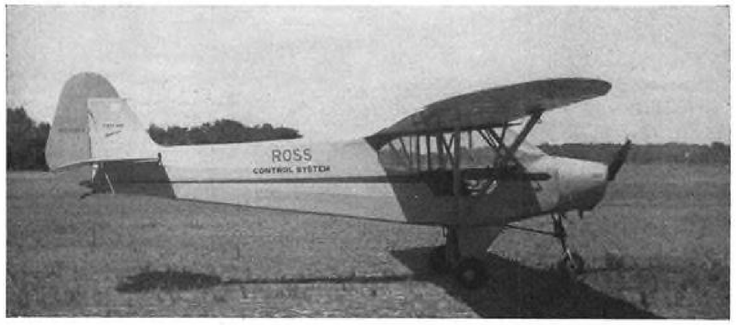
Kit Combines Rudder and Aileron Controls

- **New system increases safety in lightplanes.**
- **Lateral axis switches to rudder at low speeds.**

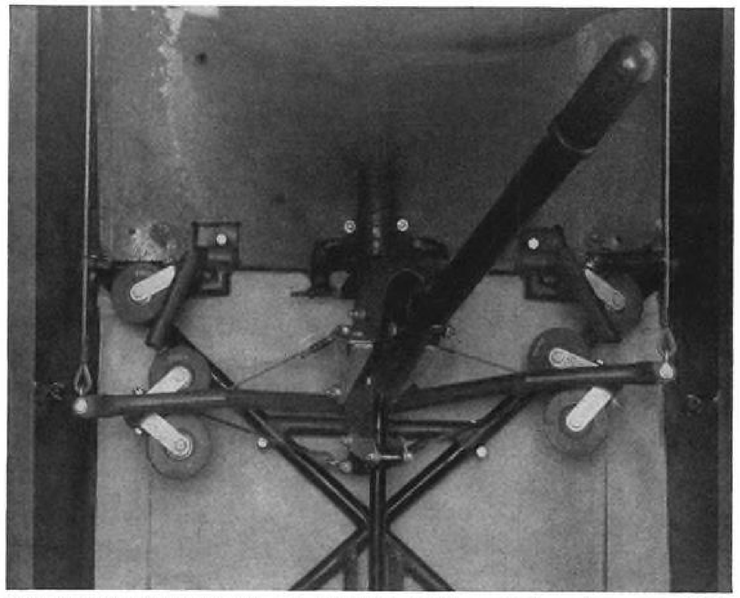
By George L. Christian

The Civil Aeronautics Administration has approved the Ross Simplified Flight Control System for kit conversion of Piper PA-11 and J3C aircraft.

The inventor of the system, Dr. Frederick W. Ross, professor of aeronautical engineering at the University of Detroit, says it is now flying in five Pipers and will be installed on an experimental basis in the forthcoming Meyers Model 200, a four-seater executive plane. It is also applicable to larger craft, Ross says.



PIPER PA-11 was converted to tricycle landing gear for demonstration of Ross controls.


FIELD INSTALLATION of Simplified Flight Control System is shown in rear seat of Cub.

▶ **Many Advantages**—The system unites both rudder and aileron controls in the stick (or column and wheel) but still permits full slip control by using the rudder pedals (AVIATION WEEK Apr. 16, 1951, p. 26).

Ross says this combined control improves aircraft performance; permits greater precision in flying; increases safety; reduces pilot fatigue, especially under IFR conditions; increases lateral stability, and reduces training time for student pilots.

The system also lends itself to autopilot development because the aircraft may be maneuvered with a two-axis instead of a three-axis control.

▶ **Aileron and Rudder**—Basis of Ross control is the relationship of aileron deflection to rudder deflection, coordinated with elevator position. A simple mechanical linkage—Ross calls it a mechanical computer—achieves these relationships between aileron, rudder and elevator.

At higher-than-cruise speeds, where elevator is somewhat forward, as in a dive, lateral control is more in the ailerons and less in the rudder.

At cruise speeds, where elevators are pretty well streamlined, relationship between aileron and rudder is such that plane performs a perfectly coordinated turn when stick is moved left or right.

As elevators are raised and aircraft speed reduced, Ross' control system takes proportionately increasing lateral control out of the ailerons and puts it into the rudder.

When stick is in the full back position and aircraft approaches a stall, all lateral control has been transferred from aileron to rudder, automatically. Ailerons remain streamlined although stick is deflected fully to either side and rudder is where lateral control should be at low airspeeds when use of ailerons might induce wingtip stalls.

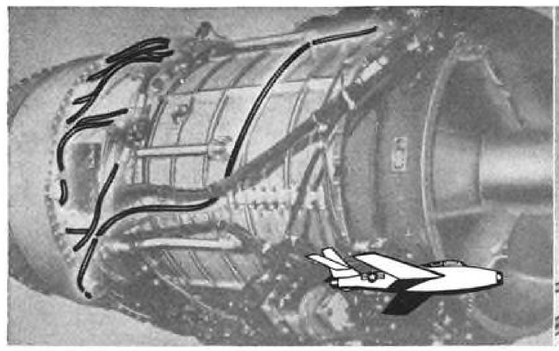
▶ **Side Slips**—Since all lateral and directional control is concentrated in the stick (or column and wheel) allowing all air work to be performed by a single control, the rudder pedals can be put to some use other than providing directional control, the system's inventor points out.

In fact, they are used "to coordinate the rudder and ailerons, only in reverse." This was plainly shown in a demonstration flight in Dr. Ross' Piper. If stick were held in neutral and pressure applied to either rudder pedal, rudder and ailerons were crossed in proportion to the amount of pressure applied. At full rudder pedal deflection, plane lost altitude rapidly.

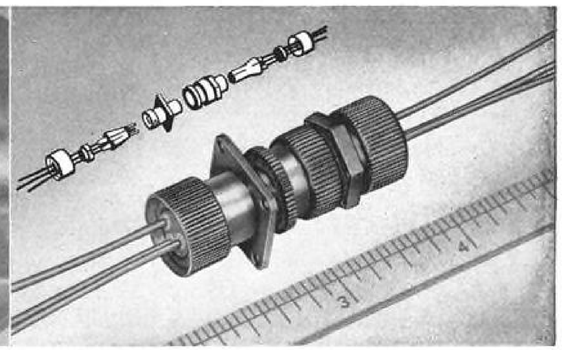
This cross control puts safety into coordinated control flying since plane may be slipped into a field when the approach is made too high. And crosswind takeoffs and landings are simple with the control.

The stick still provides roll control while controls are crossed with the rudder pedals, and the system automatically drops windward wing in a

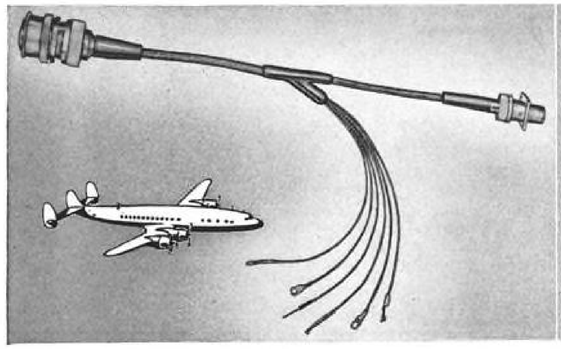
Four design ideas you can use right now...



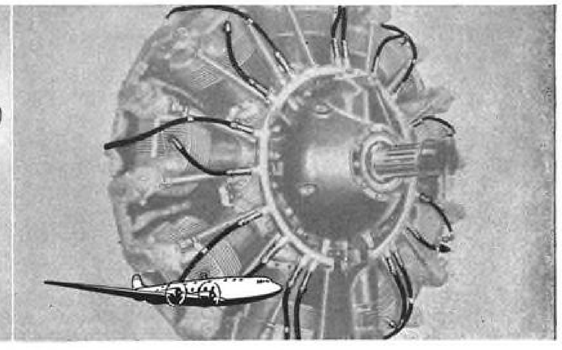
DEPENDABLE FUEL FEEDING. Fuel for the J65 Turbojet Engine is injected to the burners through Titeflex® flexible metal hose. Tough, lightweight Titeflex—tested for temperatures from —70°F. to +600°F. and for pressures up to 500 psi—reliably conveys fuel to engine nozzles; withstands vibration and rough use; is excellent for complex configurations.



FAILURE-FREE INSTRUMENTATION. Designed primarily for instrumentation service at high altitudes, lightweight Titeflex 07 Connectors are pressure-tight and resistant to moisture and corrosion. Plug and receptacle, mated, weigh only ⅔ of an ounce! Special sizes, meeting AN Specifications, can be made with 2 or 3 pins and AE threads—and adapted to *your* design.



CUSTOM WIRING SYSTEMS. Titeflex specializes in designing and building special "packaged" wiring systems and component assemblies for today's complex aviation and guided missile installations. These may be jacketed with protective silicone or other compounds—and Titeflex Special Connectors used as integral parts solve complex wiring problems.



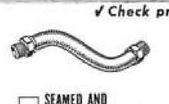
RADIO SHIELDING. Titeflex Harness for reciprocating engines is our specialty. Titeflex makes a wide range of standard ignition harnesses meeting rigid aviation specifications—can also supply component parts, such as serviceable leads for military and commercial aircraft. Titeflex application on Wright R 1820 Engine includes harness and leads.

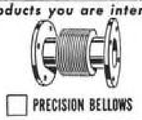
FROM DESIGN TO FINISHED PRODUCTS, Titeflex is especially well qualified to help you with all problems of special metal hose, wiring and connections. Take advantage of the long experience of Titeflex engineers in developing high temperature fuel lines, in designing and fabricating harness and wiring systems. Write us now about your application; our nearest representative will be glad to call and help you. Or send for our *new 48-page Metal Hose Catalog* No. 200.

Let Our Family of Products Help Yours

Titeflex

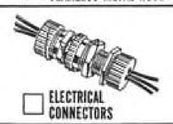
✓ Check products you are interested in.


☐ SEAMED AND SEAMLESS METAL HOSE

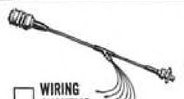

☐ PRECISION BELLOWS


☐ IGNITION HARNESS


☐ IGNITION SHIELDING


☐ ELECTRICAL CONNECTORS


☐ RIGID AND FLEXIBLE WAVE GUIDES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NEW PILOT PROTECTION WITH THE STURGESS MULTI-DIRECTIONAL Harness Reel

HERE IS THE NEW STURGESS HARNESS REEL THAT PERMITS NORMAL PILOT MOVEMENT AND INSTANTLY SECURES HIM AGAINST INJURY IN EMERGENCY

MULTI-DIRECTIONAL in its protective function. Instantly activated by slight shock load protecting the pilot against injury on instrument panel or other projections.

AUTOMATIC—Locks automatically and is equipped with manual control lever for pilot's use. Entirely mechanical in operation, requiring no auxiliary power such as electricity or hydraulics.

LIGHT WEIGHT—Entire unit, including manual control, weighs only 2 pounds—substantially less than MIL-R-8236 specifications.

TESTED—The Sturgess Harness Reel has successfully passed the most rigid qualification tests, and is in production.

IN PRODUCTION...Write Today for complete information Dept. AW-8

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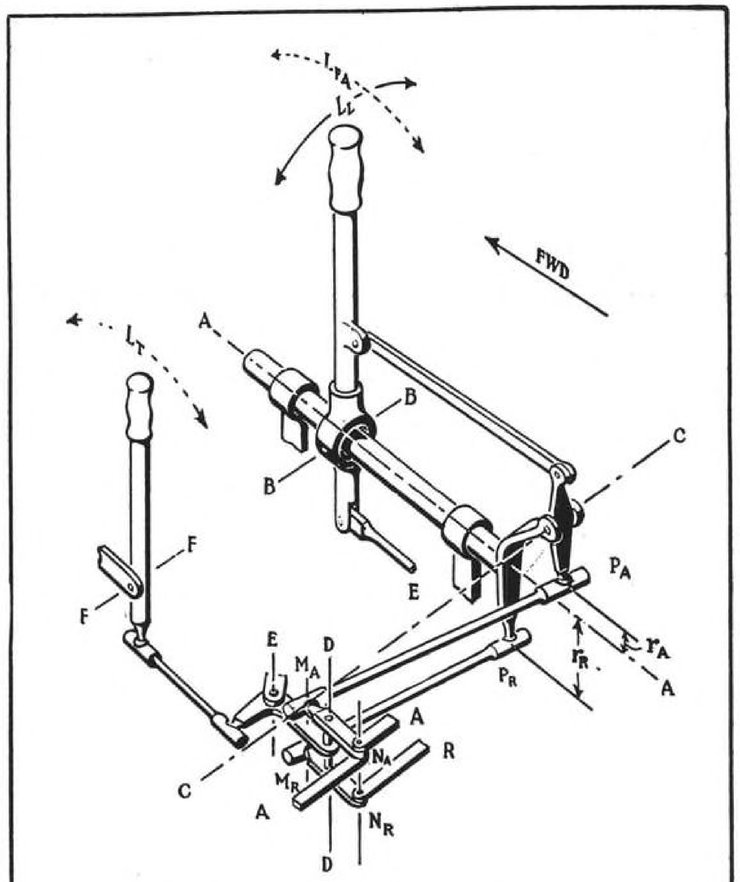


OPERATION of controls and computer linkage is shown by drawing of the Ross system.

crosswind landing, "taking the wind out of the wing."

In Ross' Piper, there is an alternate stick to the left of the rear seat, which actuates the same controls as the rudder pedals. Ross feels he will probably standardize on rudder pedals since almost all existing aircraft have them as standard equipment.

► **Improved Performance**—The Ross system automatically compensates for adverse yaw conditions by feeding in correct amount of rudder displacement for a given aileron displacement.

One result is that aircraft designers may design smaller span ailerons for a plane of a given wing spread, Ross says. Thus a greater amount of trailing edge area may be given to wing flaps, which in turn gives better takeoff and landing performance.

Another way of looking at it is that designers may use wings of shorter span because ailerons may be smaller (keeping flap size constant). The reduced frontal area would pay off in a 5-10 mph. speed increase on a plane of the Bonanza-Navion class.

► **All These Help**—Because displacement of rudder is constantly and accurately proportioned to aileron displacement, pilots are able to do a more precise job of flying than if they have to rely entirely on their own coordination, Ross points out. Advantages are very real at low, almost-stalling speeds.

Ross says his control system is a boon to student pilots. It simplifies one of the toughest jobs they have to learn—coordinating aileron and rudder controls. Another point he makes: Since student pilots are taught that lateral control is normally in the stick, they tend to use stick instead of rudder at critically low speeds.

Because the Ross controls are automatically coordinated, students using his system can concentrate on other things, and learning to fly is speeded.

Experience on the five Pipers currently equipped with his system shows that the average student can solo after about three hours of dual instruction instead of the standard eight, according to Ross. He says that students learn so fast, and their morale is so

Electrically-heated "NESA" glass solves problems of visibility and pressurization for boom operator in Boeing's Aerial Tanker

A report from

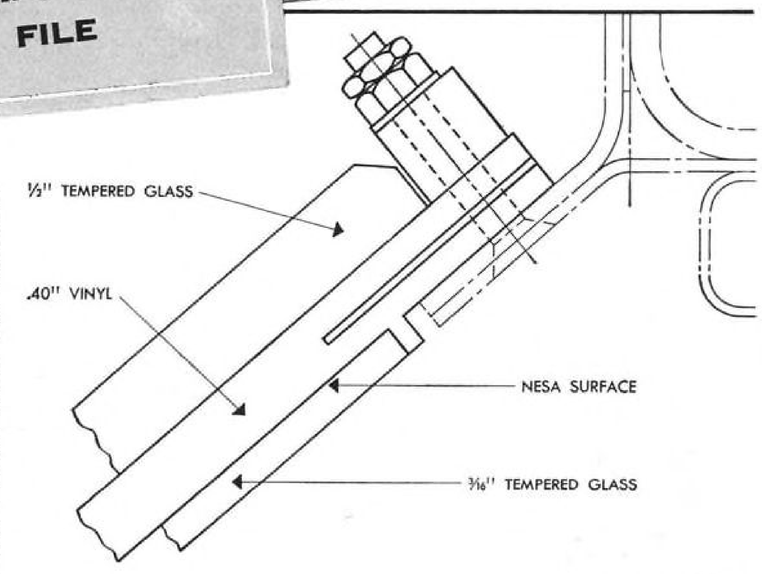
THE PITTSBURGH AIRCRAFT GLAZING FILE

A KEY factor in high altitude refueling from Boeing's KC-97 aerial tanker is good visibility at all times for the boom operator. A big 31" x 31" window of electrically-heated "NESA" glass assures this kind of visibility and handles the pressurization problems at all times.

The window consists of two sheets of tempered glass with a vinyl filler between. Because of the extreme size of the window, Boeing engineers felt it was absolutely essential that the vinyl layer hold the pressurization load if the glass should break. The vinyl used is .40" thick and the inboard layer of glass is ½" thick, making both elements the strongest of their kind used in aircraft.

The "NESA" coating conducts electrical current over the glass area, preventing fogging and icing and maintaining clear visibility. The same Flexseal type of "NESA" glass is used in the seven panels comprising the windshield area.

The accompanying detail shows a



cross section of the lower edge of this large window with the vinyl insert protruding from the two lights of glass to give a flexible, sealed connection with the fuselage. This lower edge is beveled to give better clearance in installing the large glass.

Pittsburgh Plate Glass Company technical representatives assisted Boeing engineers in designing this installation. You can take advantage of this same kind of assistance with your problem, drawing upon the wide experience of Pittsburgh representatives and the broad selection of glazing materials available to them. For complete information, write to Pittsburgh Plate Glass Company, Room 3344, 632 Fort Duquesne Blvd., Pittsburgh 22, Pa.

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Changing the map of the world

--with RCA Shoran

A SHIP SANK in these remote straits—because a chart was wrong. But that won't fool navigators any more. Modern aerial survey . . . using RCA Shoran and photography together . . . recorded the *true* shoreline (the lines in white). Now, the charts are right!

Surpassing any optical survey system now in use, this radar "yardstick" can map land-and-water areas never explored by man—and do it at flying speeds as high as 600 mph. Accuracy is better than 50 feet in 100 miles or more.

Just another application of RCA Shoran—added to its use in locating oil wells, plotting microwave radio relay and pipeline routes, detecting mine fields, and precision bombing.

You, too, can help our Armed Forces keep our country safe. The U. S. Air Force urgently needs men and women volunteers to spot enemy aircraft —man Air Defense filter centers—do the many jobs as part of the Air Defense team. 200,000 patriotic Americans are serving. 300,000 more are needed.

JOIN NOW! Contact your nearest local Civil Defense Director. Or write to: Ground Observer Corps, U. S. Air Force, Washington 25, D. C.

RCA **RADIO CORPORATION of AMERICA**
ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N.J.

high as a result, that it is not unusual for a student to fly on his first day.

► **Safety**—Making it difficult (I found it impossible) to drop a wing without using the rudder pedal, even with power off and the stick full back, obviously increases the plane's safety.

Ross believes his system helps reduce pilot fatigue, especially during approaches under IFR conditions. Here again, since the system does some of the pilot's thinking for him, he is free to concentrate on other aspects of making a blind approach.

► **Light and Cheap**—The system is entirely practical and simple; it can be designed to fit into any type and size of aircraft with any speed range, Ross says. The installation in the four-seater Meyers Model 200, Ross estimates, would add 6½ lb. to the weight of the aircraft. Price increase would be about $100 for a factory installation. Kit installation would be about twice that. Meyers supplied many of the components for the Ross systems now flying in the five Pipers.

► **Modified Demonstrator**—Ross demonstrates his simplified control system in a Piper PA-11 which has been modified to a tricycle instead of tailskid landing gear configuration. The modification is labeled "manufactured by Smyer Aircraft Sales, Ponca City, Okla.," and is called the Testerman Model SPM-1.

These are the changes: Left and right main gear take each other's place. This reversal of the interchangeable struts moves the main gear wheels rearward about 18 in. A steerable, shock-strutted nose gear is bolted to the firewall at the lower engine bearer attach points. Two nose gear drag struts run from nose gear to main gear forward attach points.

Total installation adds 17 lb. gross to the airplane. But removing 14 lb. of wheel pants and tailwheel bring the net weight increase to only 3 lb. Increased drag slows plane down about 4-5 mph., Ross estimates.

The Ross control system is approved for nose or tail landing gear.

► **The Inventor**—Ross has crammed considerable aeronautical experience into his career since he took his Ph.D. at the University of Washington. He was a lead aerodynamicist at Boeing, then worked for Northrop, Lockheed and Convair (Dearborn Div.). At Convair he was assigned to the Spratt controllable wing project.

Later he went with Bendix in Detroit where he was in charge of aerodynamics and flight test of the Models 51 and 52 private planes. Then, after a stint at the University of Michigan Willow Run Research Center on projects such as the Wizard and Bomarc, he joined the University of Detroit.

Accuracy as represented by integrating ranges of 300 to 1 is common to all modern flight simulators. But for reproducing the intricacies of supersonic flight the men who design and engineer Link Flight Simulators go further. A ten-fold increase in accuracy is built into Link ac analogue computer systems — which employ an electro-mechanical integrator with a 3000 to 1 speed range. And it really pays off! For example:

In order to produce realistic simulation for high speed flight, rates of descent as high as 30,000 feet per minute must be accurately computed. The conventional simulator integrating range of 300 to 1 cannot accomplish this without sacrificing accuracy at the slower speeds, e.g. — rates of descent less than 100 feet per minute. In Link's newest jet simulators, however, changes of altitude are computed over an integrating range of 3000 to 1, and thus accurately indicate rates of descent over the complete range of from 30,000 feet to as *low as 10 feet per minute!*

Equally important is the accuracy of dynamic performance which this integrating range provides. This provides the pilot with the actual "feel" of the controls in flight — making flight realism an inherent characteristic of today's Link trainers. *Precision pays off* — and nowhere more importantly than in training a pilot to make a controlled approach and instrument landing.

Link velocity servo-mechanism as used in the electro-mechanical integrations of the ac analogue computer systems of Link Flight Simulators.

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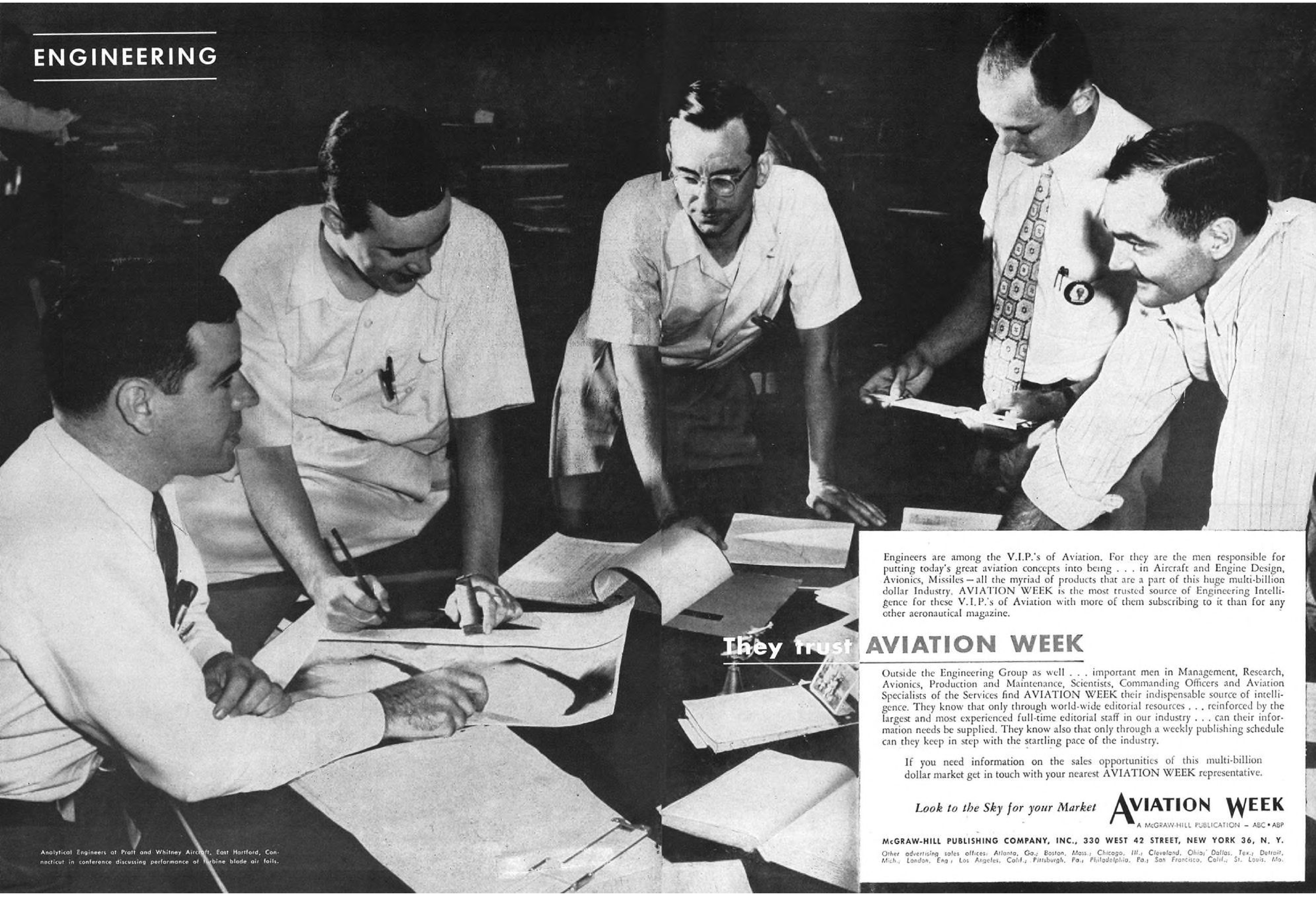

Analytical Engineers at Pratt and Whitney Aircraft, East Hartford, Connecticut in conference discussing performance of turbine blade air foils.

Engineers are among the V.I.P.'s of Aviation. For they are the men responsible for putting today's great aviation concepts into being . . . in Aircraft and Engine Design, Avionics, Missiles – all the myriad of products that are a part of this huge multi-billion dollar Industry. AVIATION WEEK is the most trusted source of Engineering Intelligence for these V.I.P.'s of Aviation with more of them subscribing to it than for any other aeronautical magazine.

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B-47B Tanker

- **Modified bomber refuels jets in high, fast flight.**
- **Conversion of Stratojet takes only a few hours.**

Newest Air Force development in air-to-air refueling—conversion of Boeing Airplane Co.'s 600-mph.-plus B-47B bomber for use as a tanker—offers new military tactical potential because of the plane's speed and altitude capability.

First public demonstration of the KB-47B tanker was scheduled for the Labor Day weekend at Dayton, Ohio, during the National Aircraft Show.

Equipped with a flight refueling hose and reel and extra tankage, the tanker is on the program to refuel a sister B-47B fitted with a probe in its nose to contact the funnel-shaped drogue at the end of the KB-47B's trailing hose.

Modifications to equip the bomber as an experimental tanker include installation of fuel tanks, pumps and lines, additional cockpit instrumentation and the reel hose and drogue system with the airplane's bomb-bay. The receiver plane, already equipped with a refueling receptacle for the alternate Boeing flying boom, required modification of this refueling system to affix a probe at the B-47B's nose.

▶ **Speed Edge**—Estimates are that the B-47 can be converted from bomber to tanker or vice versa within a few hours, giving the airplane new versatility.

But the main advantage is in increased speed. Heretofore, most USAF tanker planes have been piston-engine Boeing B-29s and C-97s, adequate for refueling other piston-engine aircraft but not well matched for refueling high speed jets under some tactical requirements.

The wide gap in speed between the jets and the piston-powered tankers often raises elaborate problems in arranging a rendezvous so that the jets will not be penalized in speed by the slower tankers. A highspeed jet-powered tanker that can fly with fighters or bombers and be available whenever needed up to its point of return will simplify this problem.

▶ **707 Conversion**—If the B-47 tanker continues to work as well as early tests have shown, it will strengthen greatly the military sales argument for Boeing's new 707 jet transport (AVIATION WEEK June 29, p. 12) in a tanker version.

One important factor in the company's decision to go ahead with "metal cutting" on the prototype 707 was the potential for military sales of a high-speed transport that also could be used as a tanker.

▶ **Fastest and Highest**—Exact data on altitudes and airspeeds, refueling capacities and rate of flow achieved during tests of the KB-47B were withheld for security reasons.

However, if the KB-47B was pushed to its normal cruising speed and altitude, it is assumed that the tanker already has set new records in air-to-air refueling.

No major obstacle to refueling while traveling at the 40,000-ft. cruising altitudes and 600-mph. speeds preferred by the modern jets is anticipated by engineers, if the receiver and tanker are well matched.

▶ **Significant Advance**—Edward C. Wells, Boeing vice president-engineering, calls the "now routine use of aerial tankers in Strategic Air Command one of the most significant advances in post-war aviation."

He considers the KC-97, equipped with flying boom refueler equipment, the best tanker yet developed and qualified for the majority of strategic bomber missions. It currently is used for refueling B-47s, B-50s, F-84s and RB-45Cs assigned to SAC.

One squadron of KC-97s is attached to each of the B-47 Stratojet medium bomber wings of SAC and is used for strategic support missions, personnel carrying or cargo hauling when not on tanker flights.

Wells says Boeing is looking forward to higher and faster flying tankers with more advanced refueling equipment and is experimenting with various types

Facts and Figures!..

Figure:

If she'd slipped teacher an apple with a dynamite cap in it, well, that'd a been somewhat different. But when Tanna Ladd has to sit in the corner at school for an almost-nearly-normal thing like flirting with a pilot, we call it Persecution! This remorse-wracked bundle of learning is blonde, blue-eyed, 116 lbs., 5'5", and 19.

Fact:

—And, speaking of learning, you can learn a lot about the condition of your airplane with the amazing new Bendix Ignition Analyzer, aviation's newest electronic trouble-spotter. In the shop or in the air, the Bendix Ignition Analyzer means important savings in maintenance time and money. Write for literature and price.

Southwest Airmotive COMPANY
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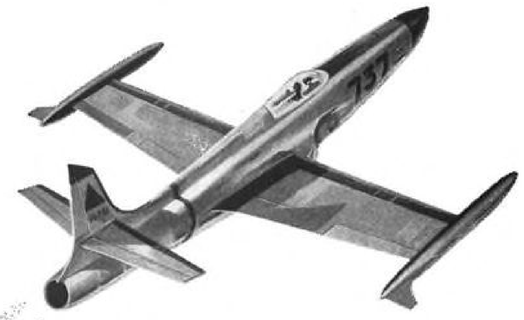
Why JET ENGINES need



Heat-Resistant Alloy Castings

Take a look at these castings...

In each one, specific advantages are gained by casting the part in heat and corrosion-resistant alloy containing nickel.

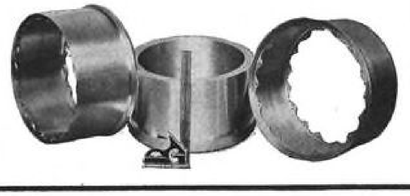
Nickel-containing alloys are also specified for combustion chambers, nozzle vanes, flame tube casings, and other components subject to heavy stresses, intense heat, corrosion fatigue and other service conditions.

High alloy castings containing nickel may be of help to you on jobs where resistance to heat and corrosion are prime requisites. Send us details of your problems for our suggestions. Write today.

EMBLEM OF INCO SERVICE

JET ENGINE DIFFUSER CONE...produced by SOLAR AIRCRAFT COMPANY, San Diego, Calif., for use in J34 jet engines. Made from 18-8 columbium-stabilized stainless steel (AMS 5363) this casting replaced forgings, and resulted in greater economy plus superior dimensional stability of the part after machining. Diameter: 24 in —Weight: 200 lbs

NOZZLE DIAPHRAGM . . . used in aircraft engines at temperatures up to 1600°F. Produced by LEBANON STEEL FOUNDRY, Lebanon, Pa., this part is cast in chromium-nickel stainless steel (CF-8C alloy, approximately equivalent to Type 347 wrought material).



JET ENGINE RINGS . . . centrifugally cast by the DURALOY COMPANY, Scottdale, Pa., using 25% chromium—14% nickel—3% tungsten alloy. The center casting is a rough machined blank. The end castings are finished rings. These parts are used at temperatures of 600°-700°F., under highly oxidizing conditions. Diameter: about 15 in

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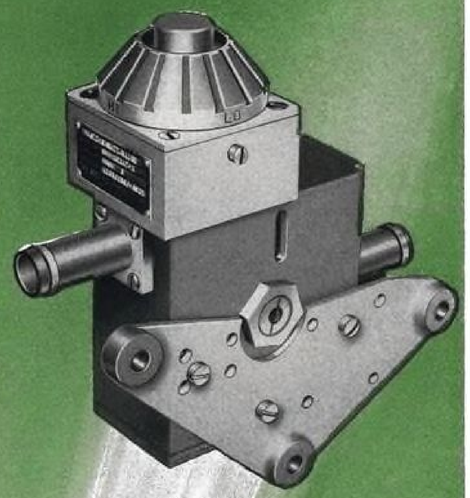
PILOT PROTECTION AGAINST "G" FORCES

Aro's new "Anti-G" Valve plays a vital role in today's protection of jet pilots.

This valve links the pilot's "Anti-G Suit" to a supply of compressed air. Any sudden change in "G" force (gravity or centrifugal force caused by turns, dives or climbs) opens the valve. Air accurately metered for the existing flight conditions is admitted to the "G" suit bladders, creating pressure on the legs, thighs and front abdomen. This pressure prevents the pilots blood from rapidly draining from his head down into his body thus preventing "blackout".

For further details on this "Anti-G" valve and other high-precision aircraft products produced by Aro write:

The Aro Equipment Corporation,
Bryan, Ohio
Offices in All Principal Cities



MODEL 10050
"ANTI-G" VALVE
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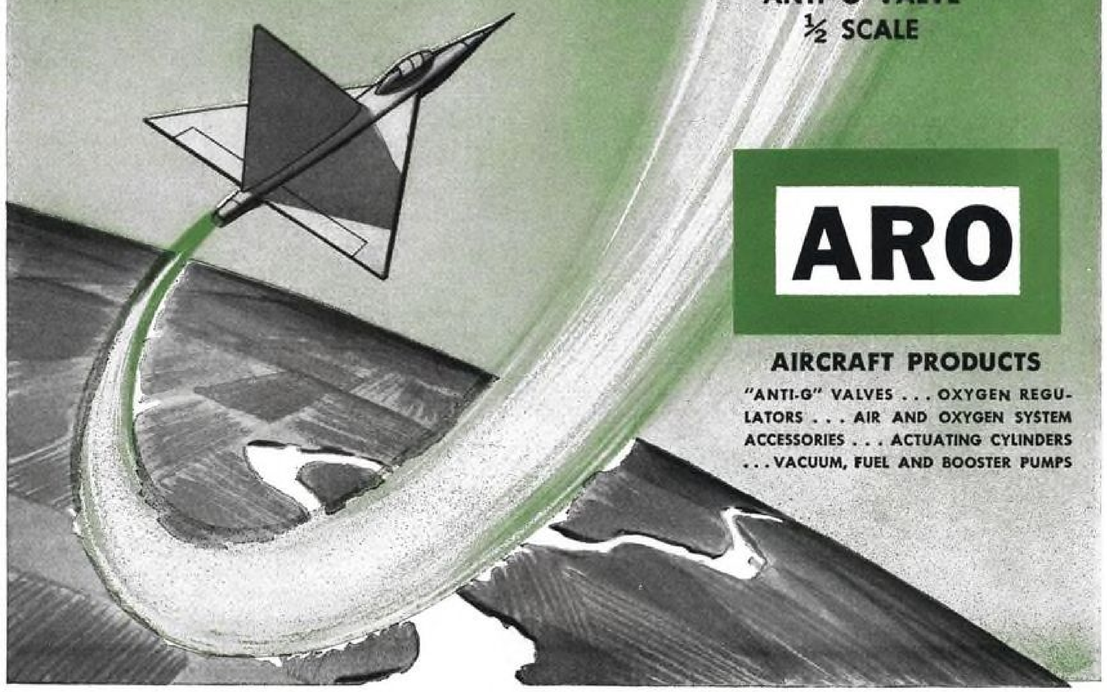


ARO

AIRCRAFT PRODUCTS

"ANTI-G" VALVES . . . OXYGEN REGULATORS . . . AIR AND OXYGEN SYSTEM ACCESSORIES . . . ACTUATING CYLINDERS . . . VACUUM, FUEL AND BOOSTER PUMPS

of refueling on several different aircraft.

► **First Refueling**—Boeing made its first successful air-to-air refueling in 1929 with a Model 95 mail plane as receiver and a Model 40B as tanker. This involved trailing a hose that was grasped by a crewman in the receiver plane and fitted manually into the filler pipe.

Most outstanding aerial refueling on record a nonstop flight around the world by the Boeing B-50 Lucky Lady 2 in 1949 with four refuelings enroute by four KB-29 tankers, enabling it to fly 23,452 mi. in 94 hr. 1 min.

Wright Air Development Center pilots have completed the first flight tests of the KB-47B and the prop-equipped receiver at Seattle. The two airplanes now are assigned to operational suitability test at Air Proving Ground Command, Eglin AFB, Fla.

—A. McS.

PAA Puts Messages On 2-Way Facsimile

Intrafax, an electrical, two-way facsimile communications system has been installed by Pan American World Airways in its New York offices, the first such installation for an airline, PAA says.

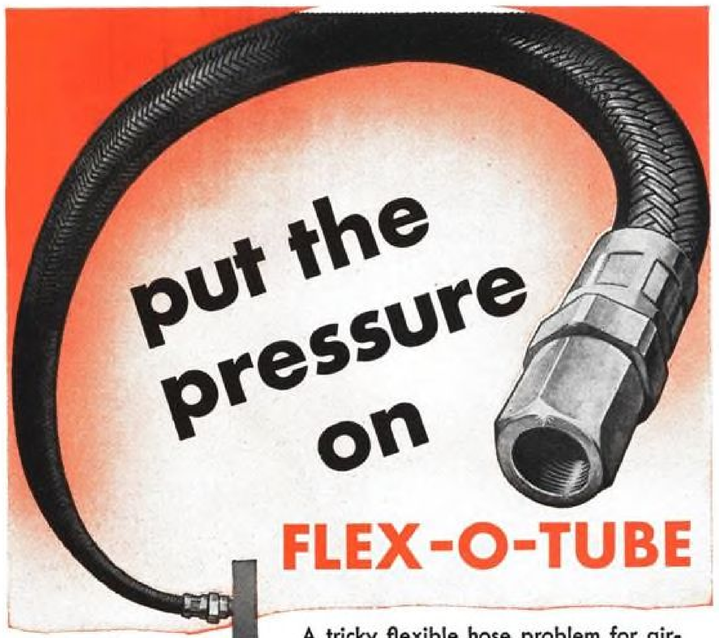
Intrafax is used to flash intra-company messages between key departments in the carrier's nine-story office building in Long Island City, the airline's district sales and ticket offices at 80 E. 42nd St. and its executive offices in the nearby Chrysler Building. The Intrafax center in the Long Island City offices serves a network of 11 branch stations.

P&W Engine Forum Scheduled at Dallas

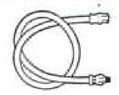
An aircraft engine maintenance and operation forum, jointly-sponsored by Pratt & Whitney Aircraft and Southwest Airmotive Co., will be held at SAC's Love Field plant, Oct. 14.

The one-day conference at Dallas is offered for executive aircraft owners and crews and fixed-base operators. It will feature a question-and-answer session and these talks:

- Pratt & Whitney Aircraft Engine and its Place in Present Day Aviation, by L. B. Clark, supervisor of PWA's Service School.
- Moderation and the Wasp Engine, by A. L. MacLain, PWA's first test pilot and now the company's installation liaison engineer.
- General Engine and Aircraft Operation on Current Transport-Type Airplanes, by W. G. Anderson, PWA's airlines engineer.



Supplied in Assemblies



Flex-O-Tube will help you determine the assembly needed or work to your own specifications. In either case, modern facilities and latest inspection techniques assure you a uniformly high quality product delivered promptly.

Supplied for Field Assembly

Flex-O-Tube hose is also supplied in bulk coils with reusable fittings for field assembly. Complete range of sizes and types.

A tricky flexible hose problem for aircraft? You can relieve the pressure by calling in Flex-O-Tube. Our engineers are specialists in the application of flexible hose products and are backed by a great fund of experience in the industry . . . twenty-five years of it.

Tight aircraft production schedules to meet? You can count on delivery schedules from Flex-O-Tube. And the uniform high quality that Flex-O-Tube is famous for is mighty important when every assembly counts.

These two factors, combined with the dependable performance of Flex-O-Tube products, are the very reasons why more and more aircraft engineers and production men are specifying Flex-O-Tube. You'll benefit, too, when you *put the pressure on Flex-O-Tube.*

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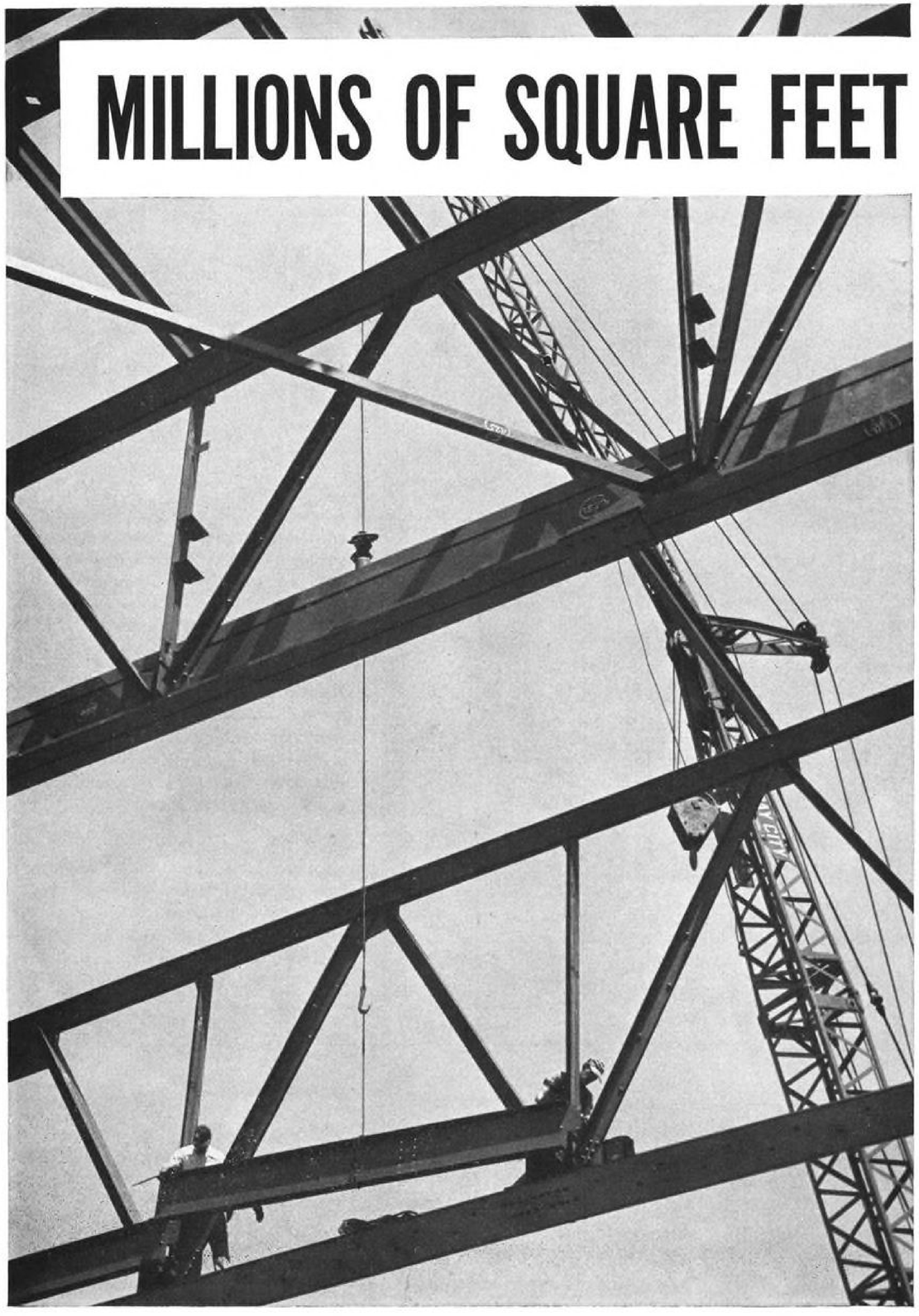


TO BUILD NEW TURBOJETS

In one sense, at least, the last six years of hard work at Pratt & Whitney Aircraft have been only preparatory.

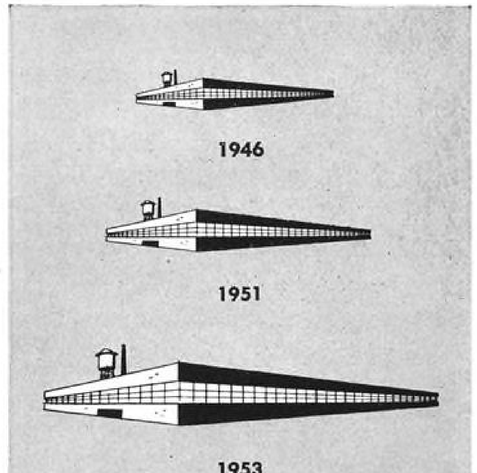
While we have increased output of both jet and piston engines, we have been building and expanding our plant, preparing for one of the most important engine programs in our long manufacturing history.

Today this company-financed plant expansion is almost complete. Production of gas turbine engines in the highest power category is accelerating rapidly to meet the urgent requirements of National Defense. In fact, this year for the first time, Pratt & Whitney Aircraft will produce more engine horsepower in turbojets than in piston engines.

But it has been a big job, building brick and mortar facilities for our growing turbojet program, and tooling up these facilities with the wide variety of equipment needed for jet engine production. At the same time we have had to keep increasing our production of piston engines for the armed forces and for civil aviation.

Beginning in 1947, extensive jet research, development and test structures were built. In 1950 the Navy stand-by plant at Southington was reopened, and the next year, Meriden was leased and put into operation. These two branch plants, plus a number of smaller facilities, totaled more than a million square feet. In 1952 our new North Haven plant was finished and occupied, and substantial additions were made at East Hartford. Pratt & Whitney Aircraft's *manufacturing areas alone* now total more than 4,000,000 square feet.

Yes, it has taken years of hard work to fully expand our plant for the new engine programs. But our new facilities are nearly complete and we are concentrating on the major work ahead—increasing production of our turbojet engines. We are proud of the important part the J-57 and other Pratt & Whitney Aircraft engines are playing in helping to keep America's airpower strong.



THE ABOVE CHART illustrates the huge increase in plant facilities at Pratt & Whitney Aircraft . . . from the immediate postwar period, when our turbojet work began, to the present total of over 6,000,000 square feet. Approximately four-fifths of that total is company-built and company-owned, representing an investment of many millions of dollars in the continuing development of dependable aircraft engines.

Pratt & Whitney Aircraft

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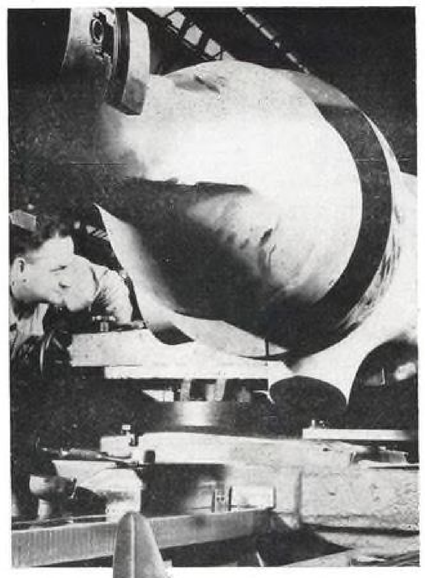

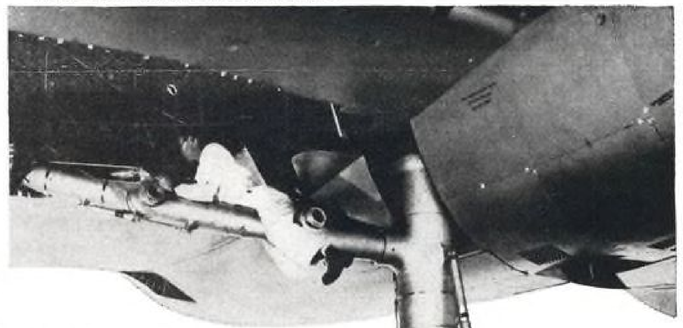

U·S·S CARILLOY electric-furnace aircraft quality steel meets every requirement for these vital parts. The precision machining and expert heat treatment they get at Cleveland Pneumatic Tool Company complete the job.

NO ORDINARY STEEL could withstand the huge shock loads imposed on the main landing gears of Convair's giant Air Force B-36 Bomber. The plane has a maximum gross weight of 358,000 lbs., with still higher landing shock loads. But U·S·S CARILLOY steel has more than enough impact strength to hold up under this severe punishment.

Every B-36 lands on U·S·S Carilloy Steel

WHEN 179 tons of B-36 thump down on a landing strip, tremendous stresses are built up in the structural parts of the landing gear. Only the highest quality in steel can handle this tough job, which is one of the most exacting in the aircraft industry.

All of the rugged main columns for these landing gears are made from U·S·S CARILLOY electric-furnace aircraft quality ingots. This high quality alloy steel provides the great strength and shock resistance demanded in the performance of the finished part. The main columns for these landing gears are forged. The original ingot, as shipped to the forger, weighs approximately 37,500 lbs. From it are produced two columns, each weighing about 1200 lbs. In other words, approximately 93% of the steel has been removed—with a mere 7% of the original ingot left to do this tremendous job. Obviously, only steel of the very best quality can meet such exacting requirements.

The same care and skill go into every ton of CARILLOY steel that *you* buy, whether it's a giant alloy ingot or a few tons of special steel. Our experienced metallurgists keep a close check on *every* heat of steel to make sure it has the strength, hardness, toughness and machinability that's needed.

If you have a special steel problem, let us know. We'll be glad to help you with it.

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UNITED STATES STEEL

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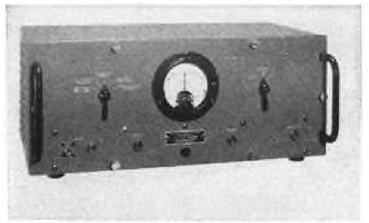

Instrument Measures VOR Signal Generator Accuracy

A simple, lightweight device to measure the accuracy of omnirange signal generators that are used to check out airborne VOR receivers has been announced by Aircraft Radio Corp. The 11-lb. set—the H-16 Standard Course Checker—is said to be smaller and easier to operate than previous types.

A built-in self-checking circuit insures the accuracy of the machine, which can measure the phase difference between the 30-cps. envelope of the 9,960 ± 480 = cps. reference modulation and of the 30-cps. variable modulation. It checks: 0-deg., 15-deg. and 180-deg. courses. Amount and sense of the error, up to a maximum of 4 deg., is indicated on the panel meter.

Designed to operate efficiently under high-heat and -humidity conditions, the device is available with a 503-lb. power unit. Input power is 35 watts, 115 v., 60 cps. Input voltage may vary from 105 v. to 150 v. and frequency from 50-70 cps. The unit is priced at $398 FOB Boonton, N. J.

Aircraft Radio Corp., Boonton, N. J.

New Aircraft Motor Is Explosion Proof

Explosion-proof motors with fast-acting electromagnetic brakes are being produced for aircraft by Lear, Inc.

The small powerplants are designed to yield the highest hp./lb. ratio consistent with reliability demanded of them, Lear says, and can be used in any application requiring five to 45 watts output at speeds from 9,500 to 15,000 rpm.

Intermittent duty types, the motors drive valves, shutters, flaps, trim tabs, positioning systems and mechanical linkage. Maximum diameter is slightly more than 1¼ in. with lengths up to nearly 4 in.

The motors are designed to meet environment and service requirements of specification AN-M-40 and new proposed MIL specs. They are available with single, split or tapped series, shunt or compound windings.

Lear, Inc., 110 Ionia Ave., N. W., Grand Rapids, Mich.

Low-Cost Lighting Unit Brightens Small Runways

A new, small landing strip lighting unit that has hit the market will reportedly illuminate runways for as little as 30 cents per ft.

Manufactured by Line Material Co., the unit is called the Flying Farmer. It is made available as part of a runway lighting package which includes either 12, 24 or 30 lights with cones, lamps, green threshold lights, control switch and a sufficient amount of No. 10 direct burial conductor.

According to LMC, the packages contain everything necessary for simple, effective installations of 2,000 (12 lights), 2,500 (24 lights) and 3,000 (30 lights) ft. Installation procedure simply consists of ploughing a 6-in. furrow, dropping in the wire, driving stakes at 200-ft. intervals on both sides of the runway and hooking up the cable.

Designed to work directly off a 115-v. a.c. lighting circuit, the system is suitable for landing strips, runways at smaller fields and taxiways. Lamps are 15-w., 105 lumens, giving 27 candlepower output. Voltage drop is kept down to 5% at the ends of runways through the use of No. 10 plastic-covered wire. No transformers are necessary.

Accessories for the Flying Farmer include photoelectric controls, time

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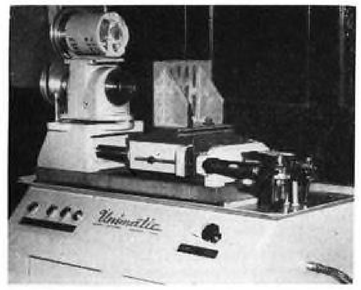


Precision Boring Machine Features Automatic Cycling

Precision boring and turning of intricate machined parts for aircraft engines can be performed with the Unimatic, an automatic-cycling horizontal boring machine developed by Atlantic Instrument Corp.

High stability is provided for the sealed spindle and other working parts of the machine by mounting them on a 6-in.-thick granite mounting base plate, free from residual stresses and temperature effects and shock-mounted against vibration, the company says.

The spindle uses precision preload bearings of 1-in. 5C collet capacity and a hardened ground-threaded nose spindle of standard Hardinge Bros. design, permitting use of standard face plates and chucks.

The table provides a 12x12-in. working area and has four-T-slots for mounting angle irons or fixtures. The spindle pivots on a 10-in. bolt circle for angular boring to an accuracy of .0001.

Atlantic Instrument Corp., 90 Broadway, Norwood, Mass.

Meter Measures Resistor, Transistor Performance

Boonton Radio Corp. is markting an instrument designed for measuring the performance of resistors and transistors at high frequencies.

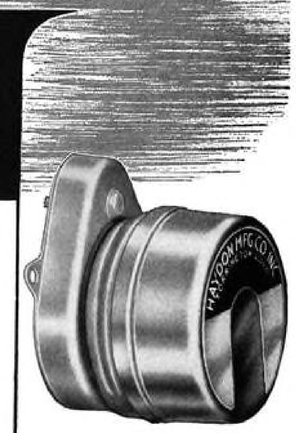
The unit, Type 250-A RX, also serves as a convenient tool for determining characteristic impedance attenuation and velocity of propagation of transmission lines, the company claims. It has a completely self-contained RF bridge permitting direct measurement of equivalent parallel resistance and capacitance of two terminal networks over an unusually wide frequency range, the company says.

Frequency coverage is 500 kc. to 250 mc. in eight ranges. The meter has a resistance range of 15 to 100,000 ohms and capacitance range of plus 20 mmfd. to minus 100 mmfd.

Boonton Radio Corp., Boonton, N. J.

TIMING MOTORS *for*

MILITARY APPLICATIONS



CONSTANT RESEARCH on improved timing motors enabled HAYDON* to introduce among other advanced timing components, its 6700 series 400 cycle timing motor. This is an hysteresis type synchronous timing motor, essentially two phase. It is furnished with capacitor for self starting operation on single phase. Variations in temperature, voltage and heat do not affect timing, which is as accurate as the frequency control.

The HAYDON 9200 Series D. C. motor for timing applications is designed for operation from 6 to 30 volts. It can be supplied uncalibrated for use with external resistance or calibrated with resistance type leads.

The 9250F Series HAYDON D. C. motor provides the more uniform torque and speed characteristics of a unit wound for 28 volts, and has an R. F. Interference filter. It offers superior performance over a wide temperature range as well as under load. The current and power drain is lower and no calibration is required.

The 1600 Series is the basic motor of the HAYDON line. This motor offers dependable performance, small size, total enclosure, operation in any position, controlled lubrication, simple assembly and a wide range of standard speeds from 60 to 1/60 rpm. Can be supplied to service specifications.

HAYDON Sales Engineers will gladly demonstrate that HAYDON motors will meet your requirements. Write details of your needs and we will be glad to help.

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Cutaway view of Hansen Push-Tite Coupling

With Hansen Couplings you save precious minutes every time you change air tools—every time you connect or disconnect a fluid line carrying gas, liquid, or grease.

To connect, you merely push Plug into Socket—flow starts instantly. To disconnect, pull back sleeve on Socket—Coupling disconnects and flow is shut off instantly and automatically.

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Oil grooves are cut faster with machine recently developed in England by Trojan, Ltd. It replaces 5-6 conventional machines; in demonstration, it completed left- and right-hand multiple oil grooves in phosphor bronze bushings in 2½ min. (compared with 40 min. normally). Tool will be marketed by Selson Machine Tool Co., Ltd., Chase Rd., North Acton, London, N. W. 10.

Special converter adds short-wave band to portable aircraft radios. Utilizing radio's tuner, unit has no tubes, operating on principle of parallel impedances through range of 1,650-4,000 kc.—Vacuum Electronic Research Laboratories, Room 915, 210 Post St., San Francisco.

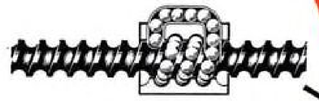
Improved aluminum welding flux, Type 202, carries off oxide slag (without need of puddling stick) and gives operator a clearer view of work. New flux also serves as good temperature indicator, as it becomes liquid at that point in heating cycle when metal is ready for welding.—Solar Aircraft Co., 2200 Pacific Highway, San Diego 12, Calif.

Pressure-sensitive markers for coding small-gage wires in avionic equipment do not have to be trimmed to size. Die cut and mounted on pocket-size backing cards, they have tabs which permit quick removal without disturbing other codes.—Westline Products Div. Western Lithograph Co., 600 E. Second St., Los Angeles 54.

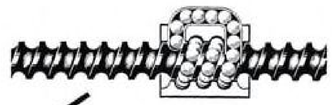
Film templates covering more than 10,000 standard machine tools and metalworking plant equipment items are featured in new line designed to speed plant layout planning.—Repro-Templets Inc., Oakmont, Pa.

Higher economics in grinding 6-8-in. elliptical aircraft engine pistons to fine tolerances and finish are claimed possible with semi-automatic machine which permits speedy setup and minimizes operator's steps. Machine grinds complex skirts where degree of relief varies from top to bottom. Wheel truing and other functions are accomplished automatically.—Norton Co., Worcester 6, Mass.

Steam-cleaner operates two guns for heavy-duty work, delivering 200 gal./hr. steam and detergent combined, with two switches the only controls. Full steam is generated from cold water in two minutes and is delivered in 130-psi. spray that quickly cuts dirt, grease and other objectionable matter.—Quick-Charge, Inc., 1750 N. E. 10th St., Oklahoma City, Okla.



WING FLAPS • Saginaw Ball Bearing Screws transmit rotary-to-linear force through rolling steel balls to provide highly efficient linear actuators for wing flap, aileron and tail surface controls.

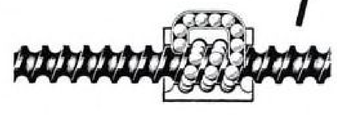


WING FOLD • Saginaw Screws are compact and low in weight-strength ratio, making them ideal for many aircraft applications. They have proven highly successful in fast, positive wing fold actuating.

BALL BEARING SCREWS BY Saginaw – the heart of the ideal actuator

TAIL CONTROL SURFACES • Saginaw Screws can be combined with electrical, hydraulic or pneumatic units. They can be furnished in any size in a complete range of load and life requirements.

LANDING GEAR Operating at more than 90% efficiency, Saginaw Screws for the retractable landing gear of modern aircraft, require only a small fraction of the torque required for ordinary thread-to-thread screws.



Saginaw Ball Bearing Screws are being used in many other aircraft applications. Write for our Engineering Data Book. It will give you more complete information about Saginaw Ball Bearing Screws.

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Copter Airline Plans Reservations Setup

- **Each of Big Four seeks to aid New York service.**
- **NYA carried nearly 400 persons in July, August.**

NEW YORK AIRWAYS S-55 takes off at La Guardia on a three-terminal shuttle run.

PASSENGER transfers from a trans-Atlantic transport to an NYA copter at Idlewild.

Metropolitan New York's first helicopter airline, New York Airways, completes its first year of operations next month, and president Robert L. Cummings, Jr., reports it has been a "most successful freshman year."

NYA's growth has been so spectacular, says Cummings, that today it finds itself in the enviable position of being wooed by each of the Big Four—United, Trans World, Eastern and American Airlines—for exclusive representation rights.

He told AVIATION WEEK that one of these proposals will be accepted within the next week, because up to now the carrier has had no reservation facilities of its own at any of the terminals.

A major passenger complaint, he says, is the fact that NYA facilities have been so difficult to find.

Cummings says the big carrier probably will set up its switchboards so that when a passenger requests helicopter service, a signal will indicate to the reservation clerk that he is answering for NYA. The clerk, in turn, will have a direct wire to the copter line's offices.

▶ **First Passenger Line**—NYA began as a mail shuttle serving La Guardia, Idlewild and Newark Airports in October 1952, inaugurated airfreight service last January on the same run (AVIATION WEEK Jan. 26, 1953).

In June, the carrier extended its mail run to include a southern route, serving local communities between Newark and Trenton, N. J., and a northern route, serving communities in lower Connecticut as far as Bridgeport and in New York State as far as Pleasantville.

Last month NYA became the first scheduled helicopter passenger airline in the world with the inauguration of a shuttle service between the three New York airports. This service operates 11 times daily, but airline officials say that the schedule will be appreciably increased Sept. 28.

▶ **20-Seat Copters**—NYA operates a fleet of five Sikorskys-55s. Cummings says, however, the carrier looks forward to the day when it can get an economical, two-engine helicopter capable of carrying 18 to 20 passengers at 125-140 mph.

"Nothing against the S-55," the airline chief adds. "We've had wonderful experience with them. We have over 1,400 hr. on two of them, as a matter of fact, and I'm told that's the most hours flown on any S-55 to date."

▶ **Growing Pains**—Even with the small passenger capacity of the S-55 (NYA carries six passengers plus pilot), the carrier was able to fly nearly 400 passengers during July and August. Rates are approximately 50 to 60 cents per mile.

NYA collects its passenger fares at the end of the run instead of at the time ticket is issued.

"Psychologically, this might be good," says Cummings, "but as yet we're not sure.

"We're still going through growing pains, and everything is still in the experimental stage. Rates, for example, are extremely hard to establish, for cargo as well as passengers, since nothing like this has ever been done before."

▶ **Questionnaire Cure**—In an attempt to cure some of its growing pains, NYA distributes a passenger questionnaire on each of its flights. To date, according to Cummings, 70% of the questionnaires have been filled out and returned.

Majority of passengers have been most enthusiastic about the service. One man stated that after he arrived at Idlewild from Europe, NYA enabled him to make a connection at La Guardia for a business appointment in Chicago, while a woman wrote that the service helped her make a connection that allowed her to visit with her father for a few hours before his death.

Passengers also complain. Two major criticisms expressed most often:

- **"Too much engine noise** in the cabin."
- **NYA facilities** are too difficult to find."

▶ **Network Expansion**—Cummings reveals that his company has a wide range of plans for the future.

Chief among these, he says, is eventual passenger flights over the present

northern and southern mail routes and extension of service west to the Morristown and Paterson, N. J., areas.

The eventual result, he says, would be an integral network of helicopter service within an approximate 75-mi. radius of New York that would give rural towns and communities access to domestic trunklines and overseas air carriers in a matter of minutes.

All towns on the present mail run and those contacted in the proposed network have been most enthusiastic, according to NYA's president.

Many are trying to outdo each other in the construction of heliports. Some in the Red Bank and Freehold, N. J., area have installed lights at their heliports. All of this construction has been of no cost to NYA, the carrier's president reveals.

▶ **Heliport Hub**—The key to the entire network, he says, is acquisition of a suitable landing facility for helicopters in the Manhattan area.

NYA has been touring the city in an effort to locate a suitable heliport, preferably the top of a flat building. This, however, would be an interim measure at best.

The eventual solution, says Cummings, will be the construction of a first-class heliport with adjacent terminal and cargo storage area. Architects have submitted these two proposals:

MAIL PICKUP is made at Norwalk, Conn.

• **One-story, pier-type construction** that would extend over the Hudson River. Top of the building would be the heliport, while the lower portion would house terminal and storage facilities and private shops or businesses.

• **Second proposal** envisions a similar construction but not over water (NYA wants an over-water approach, however). This calls for a one-story building covering the approximate area of one square city block. Terminal and storage facilities and shops would make up the lower portion.

It will be some time before either of these proposals can be acted upon and, in the meantime, NYA is shopping for an interim site.

The copter line also is considering an attempt to lease an old Navy aircraft carrier and tying it up to a Manhattan or Brooklyn pier.

▶ **Problems**—Although rapid and successful, NYA's growth has not been without problems.

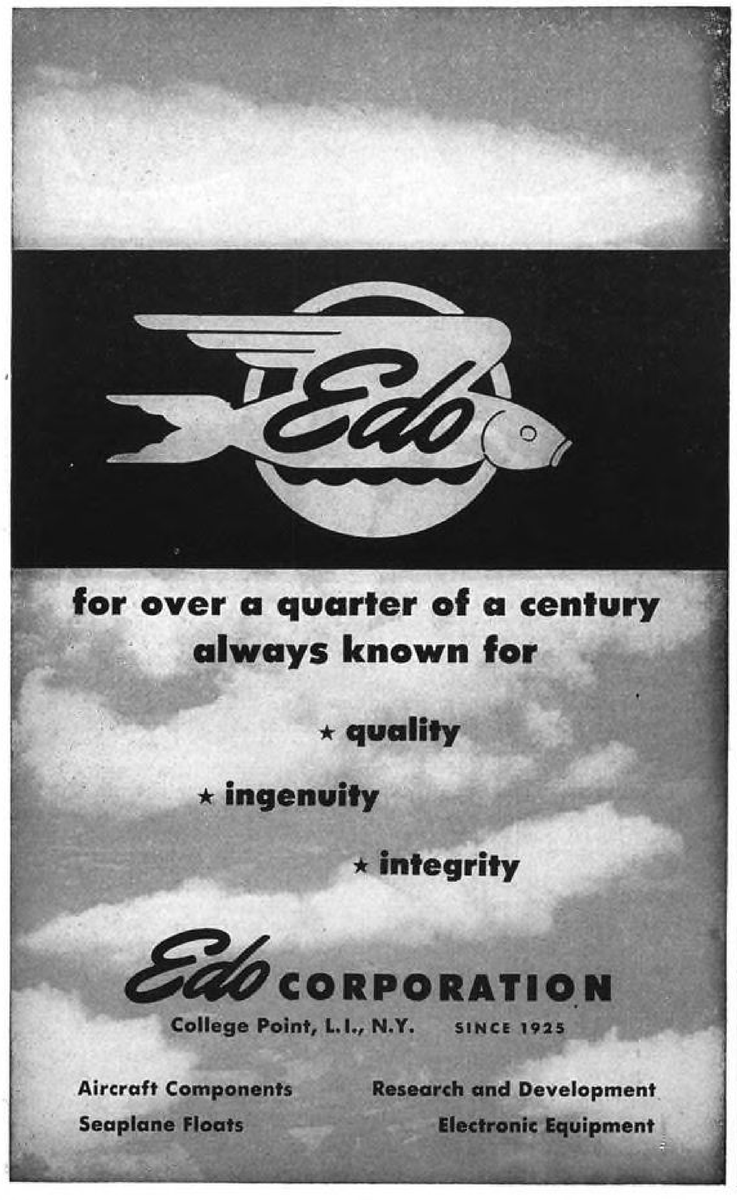
• **Passenger service** forced conversion of S-55 cabins to a new configuration.

• **Safety problems** had to be considered. Because a considerable portion of NYA's route is over water, inflation bags were installed. Three are located in the tail cone, with one on either side of the fuselage.

• **Airport approaches** with the least amount of interference to and from fixed-wing aircraft had to be resolved before the line could inaugurate its shuttle route. Approaches were plotted as far from traffic patterns as possible at all three terminals, and there have been no incidents or complaints on either side, Cummings says.

Until recently, Civil Aeronautics Administration required NYA to carry a flight attendant in the co-pilot's seat. CAA felt a pilot aide was needed.

The copter carrier found him 160




1918—Pikes Peak, Colorado, was historic site of first G-E turbosupercharger tests


1920—Dr. Moss of G.E. (left) stands with USAS pilots who flight-tested G-E turbo


1921—Record altitude flight was made in "souped-up" turbo-equipped LePere biplane


1928—Army experimental airplane at Wright Field reached record 37,854 ft. with G-E turbo

1937—Northrop Gamma test plane proved turbos OK for use on commercial airliners


1939—B-17s equipped with G-E turbos flew coast-to-coast in 9 hours, 14 minutes

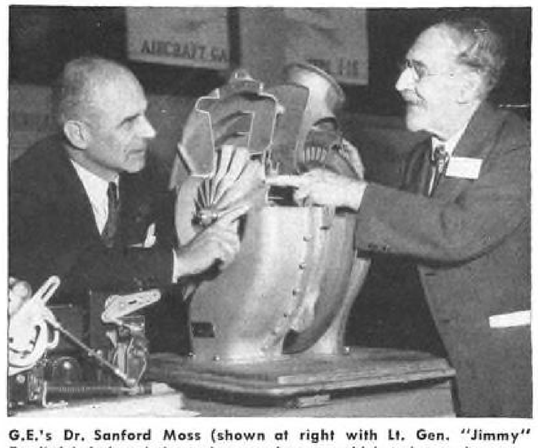

1944—In Pacific, Boeing B-29s bombed from high altitudes with aid of G-E turbos


1946—twelve G-E turbosuperchargers help increase range and altitude of Convair B-36


1953—Bigger payloads, higher flight is possible today with G-E turbosuperchargers

1918-1953 . . . G-E Turbosuperchargers Help American Aircraft Achieve

Higher, faster, more economical flight


G.E.'s Dr. Sanford Moss (shown at right with Lt. Gen. "Jimmy" Doolittle) fathered the turbosupercharger, which today makes possible higher, faster, more economical flight.

Thirty-five years ago, in the summer of 1918, the first turbosupercharger test began on top of Pikes Peak, Colorado. Engineers who watched Dr. Sanford Moss' experiments were impressed. For at 14,110 feet, G.E.'s new "supercharger" enabled a WW I Liberty engine to produce 356 hp—6 hp more than the engine could produce at sea level.

To commemorate the 35th anniversary of the turbo, a special celebration was recently held at the original Pikes Peak test site. Turbosuperchargers—the "stilts" that permit today's piston-engine planes to fly at higher altitudes with bigger payloads—are, we feel, typical of the contributions made to aviation by General Electric. In years to come, G.E. will continue to develop and produce new equipment for U.S. aircraft. Equipment for higher . . . faster . . . farther flight. 230-20

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lb. of excess baggage whose function consisted primarily of loading and unloading the mail.

NYA succeeded in convincing CAA there was no need for having the extra man and the requirement was lifted.

BOAC Trains Crews For New Turboprops

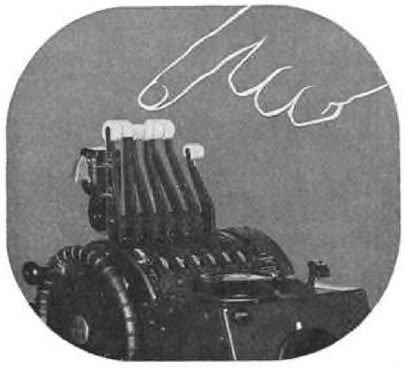
British Overseas Airways Corp. is setting up a special operating and training unit to prepare for delivery next year of the first of 26 turboprop Britannias ordered from Bristol Aeroplane Co.

BOAC says the transport is slated to become the "workhorse" of a projected all-jet fleet and will be operated primarily as a tourist liner carrying up to 104 passengers.

The new unit will be headed by Capt. W. B. Houston, former manager of the airline's fleet of Hermes and York transports.

The British international carrier's order for Britannias includes 10 transports with longer fuselages than the normal version.

BOAC also is the holder of an option to buy five turboprops of passenger-freighter configuration, is negotiating with Bristol for three all-cargo versions.



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Nonskeds Fight CAB In Supreme Court

Enforcement proceedings begun against North American Airlines by Civil Aeronautics Board early in July faced another delay last week when attorneys for the nonsked air carrier group asked the Supreme Court for an injunction to stop CAB action.

The appeal was filed after U. S. Court of Appeals rejected North American's plea for an order restraining the Board from holding hearings on charges that the carriers violated regulations by operating scheduled flights (AVIATION WEEK July 6, p. 80). A district court previously had dismissed the case. Court of Appeals, however, denied CAB's motion for summary affirmation of the district court ruling.

Airline attorneys based their argument to the Supreme Court on the latter issue, claiming the Court of Appeals erred in refusing an injunction when it could not affirm the lower court's findings.

North American's motion was addressed to Chief Justice Fred Vinson, as Circuit Judge of the District of Columbia. His death a few days later seemed likely to delay the proceedings even longer than originally expected. The case eventually will be assigned to one of the other eight justices.

CAB had until last Thursday to file a statement opposing the airlines' motion and was expected to do so. No Board staff member would venture a guess on when the case might be resumed.

Strike Against PAA Brews in Guatemala

(McGraw-Hill World News)

Guatemala City—Unionized employes of Pan American World Airways are threatening to walk off their jobs within the next 60 days in a protest strike against the carrier's move to cut costs in this Central American capital city.

A walkout probably would be endorsed by the government's pro-union labor court, a backing that could freeze all PAA equipment here.

Company officials say the airline may eliminate Guatemala from its schedules for an "indefinite period" if the strike is called. They blame the left-wing Guatemalan government for a continual drive against all U. S.-owned interests.

PAA's labor troubles were touched off after manager J. H. Wilson advised employes that approximately 36 workers would be discharged Sept. 30, cutting the carrier's personnel here by 25%.

Last year, Pan American employes called a wage strike that was backed by a labor court decision, and PAA flew over Guatemala for more than two months.

All offices and equipment owned by the airline were attached by the court during the walkout.

CAA Installs DMEs At Oakland Airport

Civil Aeronautics Administration has installed two sets of distance measuring equipment at Oakland (Calif.) Municipal Airport, one of the three new landing aids going into the field. The others are precision approach radar and surveillance radar.

The DME is installed completely, but actual test operations must await arrival of crystals that control the wave lengths. The two sets will be on different wave lengths, one operating in conjunction with the instrument landing system on the runways and the other with the omni-directional range station on the western tip of Bay Farm Island.

Meanwhile, 38,000 lb. of equipment for installing PAR has been received from Oklahoma City. The installation is scheduled for February or March of 1954.

Surveillance radar, which has been undergoing tests at the airport control tower, will be commissioned formally Sept. 1.

Capital Sets Up New Standby Ticket System

Capital Airlines has adopted a ticketing procedure to assure standby passengers fair play at nine of its major terminals.

Each passenger is given a numbered ticket in the order in which he reports for a seat. He is paged according to the numbers.

The system has been tested at Capital's Washington National Airport station for the past year and now is in effect at Norfolk, Va.; Pittsburgh; Cleveland; Detroit; Chicago; Buffalo, N. Y.; Milwaukee and New York.

New Coupler Holds Airliner on Glide Slope

A new autopilot approach coupler, designed to provide better automatic ILS approaches and to permit automatic flight along VOR (omnirange) airways, has been developed by Sperry Gyroscope Co. for its military automatic pilots and will soon be available, in a simplified version, for use by the airlines, the company says.

The device, called a "beam guidance control," has several new automatic features.

For instance, the device automatically shuts off the autopilot's constant altitude control when the airplane intersects the ILS glide slope beam and noses the plane down onto the glide-slope. New circuit refinements enable the BGC to hold the plane on the glide slope, despite changes in airspeed or airplane configuration, Sperry says.

Jet Liner Study

Ivar L. Shogran, chief of Douglas Aircraft Co.'s jet transport study and development project, last week studied Britain's turbine engines and jet-powered airliners at the Society of British Aircraft Constructors show in Farnborough, England.

Shogran was scheduled to exchange views with major airline operators on jet and turboprop transport requirements and to tour British turbine powerplant factories.

ATA Likes Copter's Lower Noise Level

A plus value being considered seriously by Air Transport Assn.'s Helicopter Committee in its study of rotary-wing aircraft as the ultimate local service vehicle to replace the fixed-wing plane is the low noise level and possibilities for more effective muffling of copter powerplants.

With community complaints causing the airline industry for the first time to do a really serious job of attempting to reduce airplane noise level, the carriers are not eager to bring any more such noise into close-in airports. And such airports are economically necessary for local service operations.

However, this same noise factor may rule out the jet-tipped rotor helicopters for commercial use, until the day comes that the jet rotors can be successfully muffled.

If this can be done, the fixed-wing airplane's powerplants can likewise be silenced.

But right now the best technicians say there doesn't seem to be any good way to silence an airplane powerplant and still derive enough power to operate economically.

The helicopter, on the other hand, is different. Its big rotor turns at slow rpm., doesn't kick up nearly as much noise as the propeller or jet turbine wheel at higher rpm.

Newark Strengthens. Repairs Runway

Newark (N. J.) Airport last week closed one of its two operating runways for an $88,421 rehabilitation and strengthening job that boosted funds expended or committed by Port of New York Authority for field improvements to $27 million.

Contract calls for strengthening the 6,800-ft. east-west runway 10-28 to the required standards for handling aircraft weighing up to 150,000 lbs., and repair of bumps.

Until the job is completed in approximately five weeks, all traffic at Newark will land and take off from the new 7,000-ft. instrument runway 4-22.

KLM GETS ITS FIRST CV-340

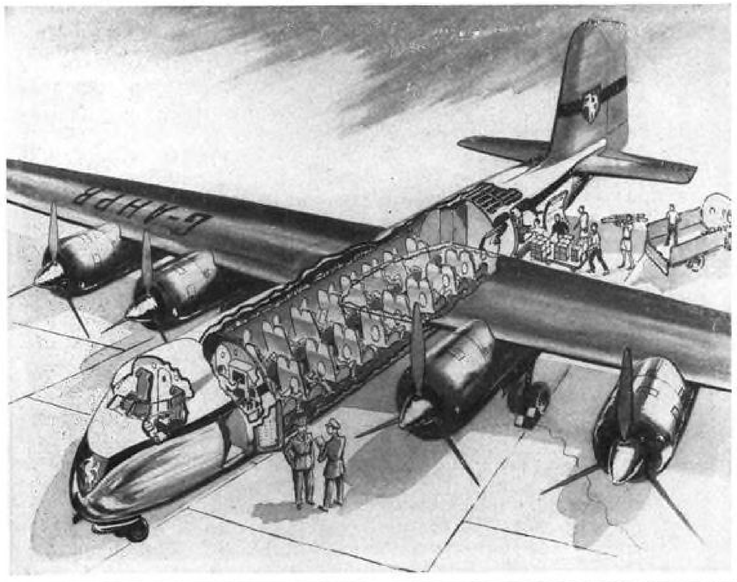
This Convair 340, first of 12 ordered by KLM Royal Dutch Airlines, was delivered to the carrier recently. The airline has a dozen 340s on order for use on its European routes. KLM is to get another 340 this month, five in October, three in December and the remainder in January. KLM has had a dozen CV-240s in service for five years.

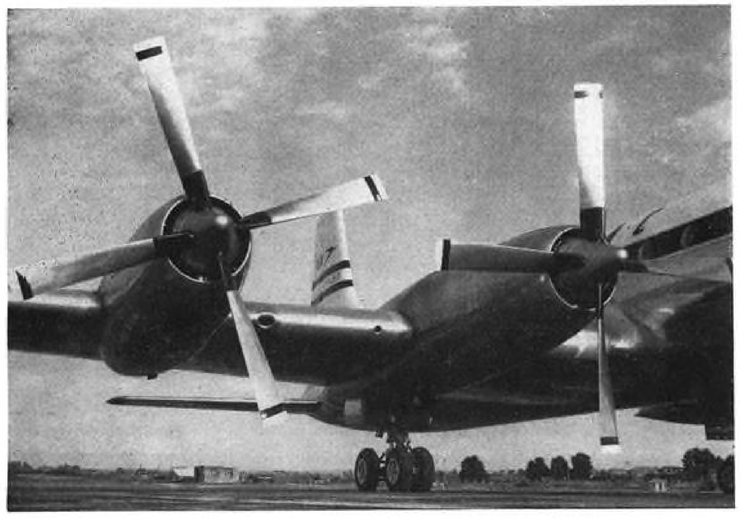
Amsterdam Wants International Airport

Amsterdam's Schiphol Airport may become an international field—75% owned by The Netherland's government—if present talks are successful. At the present time, the airport is wholly owned by Amsterdam.

That city is asking The Hague and Rotterdam to participate in support of Schiphol in order to make it a national air field. Extension of one runway to 8,500 ft. is expected to be completed by the end of 1954.

Officials are eyeing a long-range proposal to construct a system of tangential runways at Schiphol to extend from the central administration area. However, the proposal may not be fully implemented for 25 years.





NEW BRITISH TRANSPORT DEVELOPMENTS

Latest Handley Page airliner project is the H.P.R. 3 shown in the sketch at the top. The four-engine craft, to be powered by 870-hp. Alvis Leonides Major twin-row engines, is now in the mockup stage. It is designed to carry 36-44 passengers in rearward-facing seats. Cruising speed of 220 mph. for 1,500 mi. with a 7,050-lb. payload is calculated. Lower photo is a closeup of the turboprop-powered Bristol Britannia transport fitted with new Bristol Proteus 705 engines, each producing 3,781 eshp. These engines will go on the ten Britannia Mk. 100s ordered by British Overseas Airways Corp. Previously this prototype shown was powered by Proteus 600 series engines.

New Beaver

New Beaver Mk. 2, single-engine transport produced by de Havilland Aircraft of Canada, last week was scheduled to give a flight demonstration at the Society of British Aircraft Constructors flying display in Farnborough, England.

The seven-place Mk. 2 is powered by a 550-hp. Alvis Leonides engine and is equipped with a DH Hydromatic propeller, giving the light transport 20% more takeoff power than earlier versions with Wasp powerplants.

De Havilland reports the new Beaver cruises at 145 mph., lands with a light load in approximately 200 ft., has a range of 700 mi., and climbs 1,500 feet per min. carrying six passengers.

Mexico Bars Start Of PAL Service

(McGraw-Hill World News)

Mexico City—Last minute objections from a competing Mexican airline reportedly have postponed indefinitely Philippine Air Lines' plans to inaugurate service from San Francisco to the Mexican capital and then to South American points.

PAL officials thought everything was set; but then Compania Mexicana de Aviacion, flying out of Los Angeles, succeeded in having the entire matter restudied by Mexican authorities.

SHORTLINES

► **American Airlines** ended July with a total of 308,621,000 passenger miles, compared to 262,253,000 for July of 1952. Record for a month is 320,079,000, set in June of this year.

► **Brazilian International Airlines** has purchased two DC-6s, will operate the transports on direct New York-South American flights early in 1954.

► **British Overseas Airways Corp.** will introduce an international memorandum tariff Oct. 1 designed to make available in simplest form all information necessary for determining fares and routings from cities in North America to all other points throughout the world.

► **Canadian Pacific Airlines** either will begin refueling at Anchorage, Alaska,

Three reasons why Lockheed in California offers

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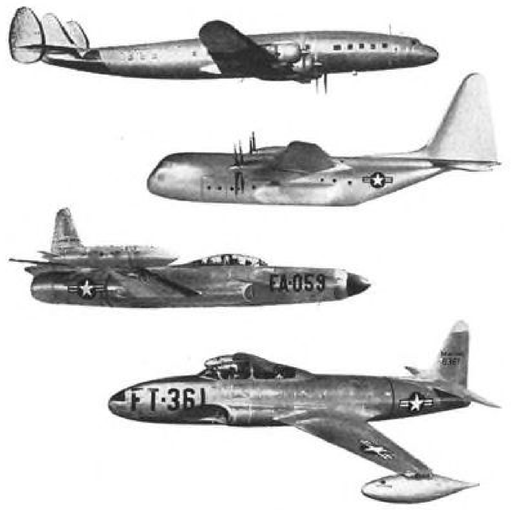

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Lockheed AIRCRAFT CORPORATION
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or re-route its North Pacific service to the mid-Pacific because Royal Canadian Air Force has ordered shutdown of Shemya and Cold Bay.

► **Deutsche Lufthansa,** German airline, may extend its routes through major South American countries when the carrier resumes service.

► **International Air Transport Assn.** reports interline transactions in May hit $19,851,000 this year, almost $1 million more than a year ago.

► **KLM Royal Dutch Airlines** is offering a variety of six-to-13-day all-expense air cruises to the Caribbean.

► **Kamuela, Hawaii,** received its first airmail service Sept. 11.

► **Lake Central Airlines** payroll now tops $1 million a year.

► **Lockheed Aircraft Service-International** at New York's Idlewild International Airport had a work load totaling 442,606 man hours for the first six months of this year, an increase of 41% over the same period of 1952.

► **North Central Airlines** last month carried a record 24,369 revenue passengers, topping by 217 the previous high of 24,152 set last July.

► **Northwest Orient Airlines** is about to install emergency evacuation chutes in its Boeing Stratocruiser and DC-4 fleets. They will replace emergency ditching ropes and will be used to evacuate passengers in the event of a wheels-down emergency landing. The chutes will be carried immediately forward of the main cabin door.

► **Oakland, Calif.,** is spending $3.5 million on a new passenger terminal building, which will complete present improvements at Oakland Municipal Airport under the $10-million airport bond issue approved by voters in April.

► **Pan American World Airways** has set up two new weekly cargo flights to South America, covering Miami, Fla., Maiquetia, Venezuela, and Barranquilla, Columbia.

► **Philippine Air Lines** is expanding service in Chicago, has opened new offices at 18 South Michigan Ave. in that city.

► **Sabena Belgian Airlines** reports eastbound trans-Atlantic traffic increased 50% to 8,622 passengers during the 12-month period ended Aug. 31 from last year's total of 5,750.

► **Seaboard & Western Airlines** logged 3,676 revenue flight hours in commercial and military operations over the Atlantic and Pacific during July. Traffic was 21% greater than for the same month of 1952.

13 Safe Months

U. S. international airlines in August completed their 13th consecutive month without a fatal accident, and in a period in which they flew approximately 3.5 billion passenger-miles.

Meanwhile, Air Transport Assn. disclosed that the combined passenger fatality rate for the 12 months ending in August, for domestic and international carriers, amounted to 0.35 per 100 million passenger-miles. In this 12-month period, the domestic and international airlines flew 17.6 billion passenger-miles. For the month of September the domestic airlines plan 2,089 flights daily.

► **TACA** is the third Venezuelan airline to inaugurate night flight service between Caracas and Maracaibo. Airline officials say night planes have been filled to capacity since the first scheduled flight. TACA will begin nightly flights to Barcelona sometime this month.

► **Trans World Airlines** is providing a prepaid ticket program at its offices in 60 U. S. cities in an effort to simplify the process of bringing alien relatives to the U. S. from foreign countries. The airlines handles the transmittal of ticket authorization to the foreign station. . . . The carrier has 14 Curtiss-Wright Dehmel electronic flight duplicators on order. They will be installed at TWA's seven pilot training centers—New York's International Airport and La Guardia Field, Kansas City, Chicago, Detroit, Los Angeles and San Francisco. . . . Company reports the 1953 season thus far has been the largest in its history. Eastbound traffic to Europe has increased 11% during May, June and July over the same period last year. C. S. Fullerton, TWA general sales manager, predicts August will be peak month for trans-Atlantic travel.

► **United Air Lines** has received the last of a fleet of 21 four-engined DC-6Bs from Douglas Aircraft Corp. Cost of the 21 planes was $22 million. They will augment services of 43 DC-6 Mainliners bought in 1947. . . . UAL expected to carry more than 50,000 passengers over Labor Day weekend, a 10% increase over the total number carried by the airline during the holiday last year.

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(Continued on page 124)

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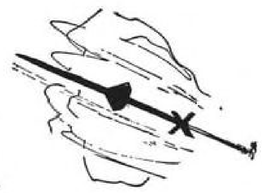

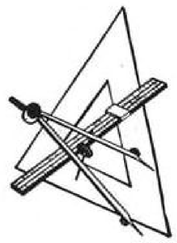

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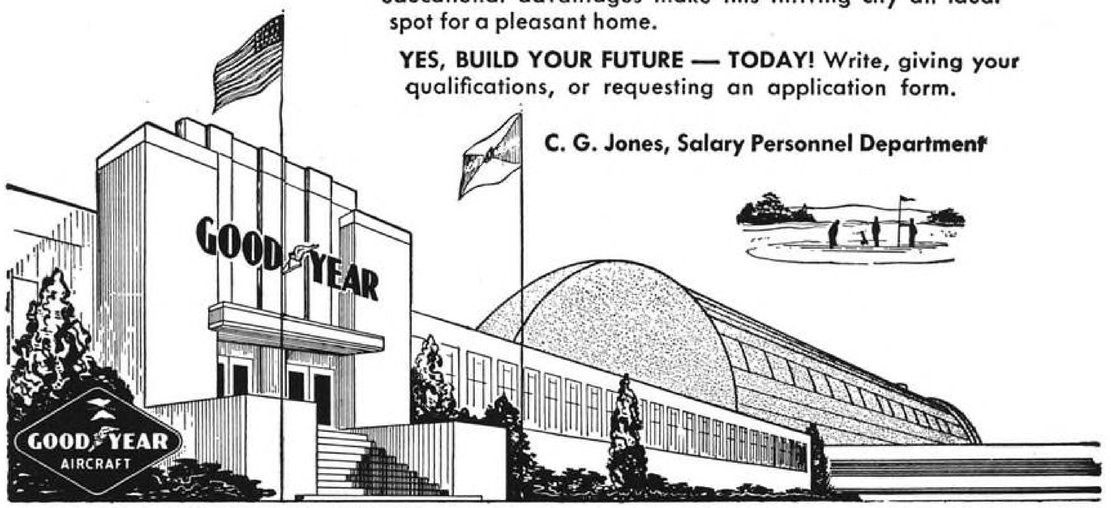

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66	10078-1AG	Eclipse	Gyro Indicator
62	CQ-9	Eclipse	Clutch Switch (PB10)
11	12086-1C	Eclipse	Amplifier
19	15100-1B-A1	Eclipse	Pitch Trim Gauge
8	20000-43A-13A1	Eclipse	Magnesyn Transmitter
67	23000-2A	Eclipse	Magnesyn Indicator
15	22101-11-A4	Eclipse	Pressure Trans.
6	2226-11C-3A	Eclipse	Dual Tach.
9	20100-42B-14A2	Eclipse	Torque Ind.
9	20000-8A-14	Eclipse	Magnesyn Pos. Ind.
23	20100-11C-4-A1	Eclipse	Wing Flap ndicator
11	DW-33	Eclipse	Transformer
80	DW-28	Eclipse	Transformer
11	2227-11-D3A	Eclipse	Tachometer
75	1416-12E	Eclipse	Starter Generator (NEA-3A)
100	716-3A	Eclipse	Oil Separator
384	564-2A	Eclipse	Oil Temp. Indicator
71	828TY13Z2	Weston	Carb. Air Temp. Indicator
40	119862	Weston	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
1000	AN5780-2	GE	Dual Carb. Temp. Gauge
40	828TY12Z2	Weston	Air Temp. Ind.
11	727TY70Z2	Weston	Air Temp. Gauge
85	727TY72Z2	Weston	Air Temp. Gauge
88	727TY73Z2	Weston	Air Temp. Gauge
83	727TY74Z2	Weston	Air Temp. Gauge
10	728-40Z2	Weston	Cowl Flap Ind.
21	8DJ29AAY	G.E.	Carb. Air Temp.
22	77C5	Lewis	Cyl. Head Temp.
8	76B19	Lewis	Oil Temp. Gauge
23	77C3	Lewis	Oil Temp. Ind.
13	77C4	Lewis	Free Air Temp.
30	47B21	Lewis	Air Temp. Gauge
33	47B22	Lewis	Air Temp. Gauge
28	47B23	Lewis	Air Temp. Gauge
54	47B24	Lewis	Diff. Press. Gauge
22	906-6-011	Kollsman	Diff Press. Gauge
48	254BK-6-052	Kollsman	Transformer
33	DW-47	Eclipse	Fire Detector
46	117-47	Edison	CO2 Cylinders
185	981280	Kidde	Interconnector
43	966090	Kidde	Pressure Control
104	966679	Kidde	Tee
225	981591	Kidde	Switch
151	A-4614	Kidde	CO2 Cyl.
47	M870036B	Kidde	Oxygen Cyl.
74	923748	Kidde	Valve
396	982585	Kidde	Valve
325	AN60009-1B	Oh. Chem.	Valve
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17	AN4014	Erie Meter	Wobble (D-3) Pump
70	AN3213-1	Scintilla	Ignition Switch
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66	M862A	Jos Pollack	Master Switch
148	PG208AS1	Honeywell	Switch Air Ram.
40	PG208AS7	Honeywell	Air Ram Switch
18	4582-AA-6C	Dynamic Air Eng.	Blower
24	U-702-15	Joy Mfg. Co.	Blower
20	V301B7	Aerotec	Pressure Relief Valve
419	450	Skinner	Filter
287	1033-4E1	White-Rodgers	Heater Control Switch
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25	46B311	Vapor Car Heating Co.	Compesnator
202	A812	Interstate Aircraft & Eng. Co.	Solenoid
46	146102	Bendix	Valve (0-500 PSI)
240	1265-900	Airex	Relief Valve
29	HC2109	Air Associates	Hyd. Cylinder
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188	EYLC-2334	Barber-Coleman	Control
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30	0655 D	Aro	Oxygen Regulator
65	ASDC2	CO2 Mfg. Co.	Fire Detector
97	6041-H-146A	Cutler Hammer	Relay (B-12)
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47	7964-404	Leach	Relay
22	M-2031	Air Associates	Actuator
11	FYLD2516	Barber-Coleman	Thermostat
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20	72400	Ham. Stand.	Prop. Reversing Control
10	5X18	Woodward	Governor
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6	83A9	Surface Combustion Co.	Heater
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115	C6363-1-2A	Spencer	Circuit Breaker
33	18784	Adel	Restrictor Valve
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744	D10044	Adel	Selector Valve
244	D10051	Adel	Selector Valve
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74	AN5830-6	Whittaker	Valve
60	AN5831-1	Parker	Valve
130	612-4A	Eclip e	Valve
2200	37D6210 (AN4078-1)	United	Solenoid Valve
1888	K1593-6D	Kohler	Valve
500	NF3-5	Mallory	Noise Filter
20	TA-12B	Bendix Radio	Transmitter
35	RA10-DB	Bendix Radio	Receiver
2585	AN3096-4	Grimes	Dome Light
775	AN3096-5	Grimes	Dome Light
1365	AN3096-6	Grimes	Dome Light
6	610-2C	Eclip e	Vacuum Pump
550	PD12K10	Stromberg	Carbureator
236	PR48-A1	Stromberg	Carbureator
100	1685-HAR	Holley	Carbureator
19	1375F	Holley	Carbureator
407	SF9-LN-2	Scintilla	Magneto
185000	LS4-AD1	Aero	Spark Plug
1	R1820-52	Wright	Engine
16	R1820-54	Wright	Engine
4	R1820-60	Wright	Engine
1	R1830-43	P & W	Engine
166	1045A	P & W	Bearings
500	3506	P & W	Flange
130	8288	P & W	Follower Ass'y.
814	3M814	P & W	Blower Ass'y.
53	48362	P & W	Shaft
75	48363	P & W	Shaft
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390	48461	P & W	Gear
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1178	84289	P & W	Bearing
113	84487	P & W	Housing
77	84591C	P & W	Nose Housing
200	84350-D	P & W	Crankcase Ass'y
188	84083	P & W	Cylinder
97	84084	P & W	Cylinder
144	84085	P & W	Cylinder
281	CR9791-G100-K4	G.E.	Relay
626	CR9792F101-A3	G.E.	Relay
41	G34464	Guardian	Relay
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22	146102	Vickers	Brake Valve
9	557-5	Eclipse	Check Valve
107	D12296	Adel	Pump
67	19100-2-101B	Kenyon	Check Valve
88	3135-11C	Eclipse	Pressure Switch
32	3V-217-HC	Pesco	Separator
100	27314	Purolator	Oil Filter
128	3801-3B	Eclipse	Fuel Quan. Gauge
33	420313	Wright Aero	Pump Ass'y.
46	416421	Wright Aero	Drive Ass'y.
76	U635A (AN4000-2B)	U.A.P.	Fuel Strainer
12	U8416-MM	U.A.P.	Oil Cooler Ass'y.
25	26675	Airesearch	Motor
35	AA14002A	Vickers	Accumulator
21	FD65-5	Diehl	Motor
81	3616	Bendix Radio	Control
23	3620	Bendix Radio	Station Box
335	G1 (94-32376)	G.E.	Oxygen Pressure Signal Ass'y.
180	AW-CV-1-1	U.S. Gauge	Check Valve
740	1C-200	G.E.	Radio Noise Filter
15	1EAR-280BH	Pesco	Pump
7	SP-1-445-8	Parker	Selector Valve
8	1E621	Pesco	Pump
29	NEP-2	Eclipse	Auxiliary Power Unit
16	LER-30D	Lawrence	Auxiliary Power Unit
4	2CM46A2	G.E.	Generator
6	2P248EB	Pesco	Fuel Pump
21	2E258SA	Pesco	Pump
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27363	CREB3N	Casco	Rod End
18	SA/3A	Kidd	Impact Switch
13	3GBD1A18A	G.E.	Regulator
18273	AN200-K3L2	Fafnir	Bearing
245	LMR-4	Micro	Switch
2094	PM-5	Spencer	Circuit Breaker
44	5BA25D-J4B	G.E.	Motor
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25790	NR6L12	Torrington	Bearing
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327	JAN 6AL5		Tube
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36	FM-1		O.E.C. Unit
17	PY4M (B24)		O.E.C. Unit
8	G16A2CA21	Minn. Honeywell	Pressuretrol
1865	73-A-01		Throttling valve

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411	-C6	7742	-C20	102	-C36
8211	-CH6A	345	AN5-C7A	246	-C41
173	-C7	2543	-C7	165	AN6-C7
457	AN4-C4	1531	-CH7	129	-C14A
516	-CH6	2578	-CH7A	450	AN7-C21A
6714	-C7	185	-C11A	194	AN8-C15
80	-C10A				

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The Eight-Hour Law

Pilot flight-time limitations are a topic of considerable interest along the airways these days. The long-standing urge to provide nonstop, coast-to-coast service and the fact that there is now an airplane—the DC-7—capable of this, makes the matter important at this time.

Specifically the law, which sets eight hours as the maximum flying day, is under fire. There is no problem with eastbound flight but the DC-7 will need more than eight going west.

► **The Pilots' Side**—The views of the air carriers on the desirability of raising—or eliminating—this flight-time limit are obvious. Also obvious is the fact that pilots will resist a change.

So the purpose here is to set forth these pilot reasons. And this is difficult because so many factors are involved, with complete coverage impossible, that it is not easy to find a starting point.

Almost everyone agrees some regulation is required. Whether the regulation should set the flying hours, and, if so, how many, or the total hours on duty—and again how many—or whether both limits should be included, is the beginning of the argument.

► **The Cornerstone**—In general, pilots feel that the "eight-hour law" is the cornerstone of the process. Since this number was a safety measure carefully arrived at and has successfully withstood three "generations" of airplanes, it should not be toyed with lightly. In fact, with the continued increase in aeronautical complexity and speed, there is considerable basis to believing that a number *less* than eight hours may be in order.

It is always true that isolated situations can be found which would be bettered by a change in the rule. Pilots, however, maintain that situations should meet the specs of the law; don't change the law merely to make the airplane legal. A revision therefore should require a "show cause" of general industry hardship plus a guarantee of overall improvement.

► **Isolated Now, But**—At the present time the coast-to-coast, nonstop flight is an isolated case. For some time it will represent only a fraction of airline flying. Unless extremely rigid precautions were taken, an increase in flight time could hurt many (local service fliers, for instance) in order to benefit a few.

Also, pilots realize that the DC-7 type is probably the last of the reciprocating-engine transports. Next come jets in one form or another. These newer types should easily operate transcontinentally within the boundaries of present rules.

So a change now, to say nine or 10 hours, would not benefit any of aviation for very long. And an increase now could well create the desire for further increase in the "jet era" to make possible a roundtrip.

Standing pat on eight hours does not, of course, rule out our coming attraction. Many other answers are to be found with no change in present laws. Providing relief pilots is one answer. Or schedules could be fixed at less than eight hours—say 7:59.

This latter would naturally be a case of winking at the law but this would not be new in aviation. At worst it would be slightly misleading to the public—but this isn't new either.

► **On-Duty Standard**—Sixteen hours has long been the unofficial on-duty standard—a preposterous figure. This is gradually being reduced, mainly through labor contracts, and appears destined to end up at about 12. But pilots genuinely feel that it would be unsafe—from the fatigue standpoint—to eliminate either the flight or on-duty limitation.

As it stands now the most likely answer, for this "interim problem," appears to be a side step—by printing a fast schedule. And it may work.

AVIATION CALENDAR

Sept. 14-16—National Flying Farmers Assn., 1953 convention, Wichita.

Sept. 19—Seventh annual Canadian Air Force Day. RCAF bases will be opened to limited inspection by the public.

Sept. 20—Naval Air Reserve Day commemorating 50th anniversary of powered flight, Niagara Falls (N. Y.) Municipal Airport.

Sept. 21-25—Eighth National Instrument Exhibit, Instrument Society of America, Sherman Hotel, Chicago.

Sept. 22-25—1953 meeting of Aircraft Spark Plug and Ignition Conference, Champion Spark Plug Co., Toledo.

Sept. 28-30—Ninth annual meeting, National Electronics Conference, Hotel Sherman, Chicago.

Sept. 29-Oct. 1—American Institute of Electrical Engineers, middle eastern district meeting, Daniel Boone Hotel, Charleston, W. Va.

Sept. 29-Oct. 3—SAE National Aeronautics Meeting, Aircraft Engineering Display and Aircraft Production Forum, Hotel Statler, Los Angeles.

Sept. 30-Oct. 2—Aircraft electric equipment conference, American Institute of Electrical Engineers, Benjamin Franklin Hotel, Seattle.

Sept. 30-Oct. 2—Series of seminars on transonic testing in windtunnel, Purdue University, Lafayette, Ind.

Oct. 1-3—Air Reserve Assn.'s annual convention, Augebilt Hotel, Orlando, Fla.

Oct. 5-9—General meeting of the International Air Transport Assn., Montreal.

Oct. 9-23—National Safety Congress and Exposition, Chicago. Aeronautical industries section will be held at the Hamilton Hotel, air transport section at the Conrad Hilton.

Oct. 10—England-Christchurch (New Zealand) air race.

Oct. 13-15—Air Transport Assn.'s annual Engineering and Maintenance Conference, Saxony Hotel, Miami Beach, Fla.

Oct. 14-15—Annual airport development and operation conference, sponsored by New York Dept. of Commerce, Onondaga Hotel, Syracuse, N. Y.

Oct. 15-16—Aircraft Electrical Society, 10th annual display meeting, Pan-Pacific Auditorium, Los Angeles.

Oct. 22-23—Radio Technical Commission for Aeronautics, 1953 fall assembly, Sheraton Park Hotel, Washington, D. C.

Oct. 23—National Advisory Committee for Aeronautics annual meeting, Illinois University Institute of Technology, Champaign, Ill.

Oct. 23-24—Fourth annual National Noise Abatement Symposium, Armour Research Foundation of Illinois Institute of Technology, Chicago. Airplane and airport noise will be discussed by NACA's H. H. Hubbard.

Nov. 3-4—1953 Transport Aircraft Hydraulics Conference, sponsored by Vickers, Inc., Hotel Park Shelton, Detroit.

Nov. 4-6—Society of Automotive Engineers, meeting of committee on aircraft hydraulic and pneumatic equipment, Statler Hotel, Washington, D. C.

Nov. 19-21—National Aviation Trades Assn., 14th annual convention, Hotel Broadview, Wichita.

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McGRAW-HILL PUBLICATIONS

LETTERS

DeHaven & Damon

I would like to comment on your editorial of June 1 on the crash protection work of Hugh de Haven and his associates at the Cornell University Medical College and the one of June 29 on Ralph Damon.

The value of de Haven's work went unrecognized for many years. He had to overcome an enormous amount of inertia, but patience, persistence and a superlative dedication to the perfection of his techniques have won for de Haven some of the recognition he deserves. His work will save thousands of lives and enormous suffering, both in aviation and in ground transportation.

I believe Beech was the first manufacturer to recognize and to advertise the value of adopting de Haven's ideas. The military services have furnished him with funds and encouragement. The airlines now seek his advice, and lately he has also cooperated with the automotive industry. This is one of many instances where research in aviation has benefited other industries.

From the standpoint of the airlines, the work of de Haven has a unique and, in a way, a paradoxical value. The airlines have enormously improved their safety record since about 1946, based on accidents per million plane miles. They have reached a point on fatal accidents where it is difficult to say that by such and such a method, device, or procedure we shall be able to reduce accidents by some given percentage.

The causes of the few fatal accidents seem to occur without a pattern that lends itself to attack. One plane gets caught in a storm, another dips into the water of a bay in good flying weather, prop controls cause another, a fuel pump another. The few accidents that occur will be difficult to reduce, so it is logical to predict that the next significant step in preventing fatal or serious injuries will be to protect the people who are unlucky enough to be involved in the one fatal accident that occurs every 80 million miles of flying. De Haven has shown the way. Your editorial was well deserved.

I have found Ralph Damon to be respected and admired by his business competitors as well as by his friends. He represents all the factors that have made a success of aviation: vision, statesmanship, square dealing, tremendous energy and dedication to the job at hand, appreciation of the other fellow's viewpoint, quick, clear analysis of a situation, diplomacy, firmness, organizational insight and organizational genius.

JEROME LEDERER, Director
Flight Safety Foundation
471 Park Ave.
New York 22, N. Y.

More on Collisions

It is disappointing to read Captain Robson's facile brush-off of AOPA's campaign to lessen collision hazard by increased cockpit visibility and relieving airline pilots of distracting duties during approach.

As the Captain says, due to the construction of airliner cockpits it is often nearly impossible for pilots making steep descents to pick out airplanes below—CAR notwithstanding. That is what AOPA would like to have improved. The overall tone of the Captain's column as well as three or four specific statements made in it cause the reader to wonder whether he is among those "who read the CAB reports," particularly the now-famous Dallas report.

The article also reveals rustiness on the CAR, which do not necessarily require a plane to establish radio contact before proceeding through control zones and which certainly do not relieve pilots from maintaining a good lookout simply because a tower clears them into a landing pattern. This is the kind of error that besets the experienced pilot more than the novice. Familiarity gives a false sense of exact understanding. This is so well known to marine captains that it is an established practice for them to reread and require their watch officers to reread the rules of the road at frequent intervals. This precaution against the hazards of forgetfulness should recommend itself to every pilot, particularly to the Old China Hand.

Finally, it is surprising to read that the Captain feels it is "a popular misconception that a slow airplane cannot overtake, and be at fault, in a collision with a faster one." To be sure, many collision courses can be set up between two planes in which the slower one is burdened to keep clear under the CAR, but these are all converging, 60.14 (b), or approaching head-on, 60.14 (c) cases. When it comes to overtaking, 60.14 (d) cases, the CAR says "an aircraft that is being overtaken has the right-of-way, and the overtaking aircraft, whether climbing, descending or in horizontal flight, shall keep out of the way of the other aircraft by altering its course to the right, . . ."

To be sure, the CAR, unlike the marine rules, do not define the meaning of the word "overtaking." But it is hard to interpret it otherwise than to mean that a plane is being overtaken if it is being approached along a line of relative bearing abaft the wing. It is manifestly impossible for one plane to approach another along such a line of bearing unless it is going faster. If the Captain will draw a vector diagram he will get the point.

GIFFORD C. EWING
Rancho Santa Fe, Calif.

From a Communicator

The recent crash in the Pacific Ocean with a total loss of life aboard the Transocean DC-6B brings up all the old questions—What happened? Why? What can be done to prevent its happening again?

I suggest there has been a fatal misjudgment which has led to a reduction in safety beyond the point a passenger is entitled to expect. The CAB, the CAA, and the airlines are all involved, and recent developments indicate none of them clearly sees the results it will eventually lead to. This misjudgment was the decision allowing the removal of trained communicators from air transport aircraft in desolate country and over-ocean flying.

Communications blackouts prior to crashes rarely are the result of a single cataclysmic incident. Investigation reports reveal that crashes are usually foreshadowed by a series of events. Under their operating limitations, I'll bet the pilot and copilot of that DC-6 were desperately occupied with controlling the aircraft. They couldn't waste time fooling with the radios. A trained communicator whose primary responsibility is en route communications would have transmitted some clue of the basic cause of the disaster. He would have helped prevent another one like it. At least future passengers would have gained something. As it was, everything was lost—here and hereafter.

No addition to the fund of knowledge of transport flying was gained in this Transocean crash. It was the same with the PanAm crash in the jungle of South America. It may be the same with others flying the North Atlantic without trained communicators. And in an industry grown slowly safer through data accumulated largely from tragic accidents too. They should know better!

In the final analysis the passenger pays for his safety. To obscure this with the query, "Well, how much is he willing to pay?" does not alter the fact that he has little choice in the matter. He either takes it or leaves it on the calculated-risk terms of the air carrier; presumably concurred in by the CAA and the CAB.

I believe the CAB should thoroughly review its position and that of the CAA toward communications in international air transportation, particularly over desolate country and over-ocean passenger service. Don't forget safety and human lives in the economic race to carry all the unsuspecting people who clamor to travel by air.

ARDEN WOOTTON
Chairman Council #10
Air Carrier Communication
Operators Assn.
Chicago, Ill.

Praise

I want you to know that we read your detailed accounts of accidents in all sincerity. They should be brought to the attention of all concerned with aviation. If one report rings a bell in the mind of an engineer, and he keeps in mind this thought in his design . . . this is progress.

WILLIAM F. CHANA, President
Beecraft Associates, Inc.
San Diego 9, California

We were very pleased with George Christian's story on the Flight Analyzer and as usual, you had everything well stated, accurate and clear, so that even we, who sometimes grope for words to explain things, must admire your clear manner of expression. . . .

KARL J. FAIRBANKS, Vice President
Sherman Fairchild & Associates, Inc.
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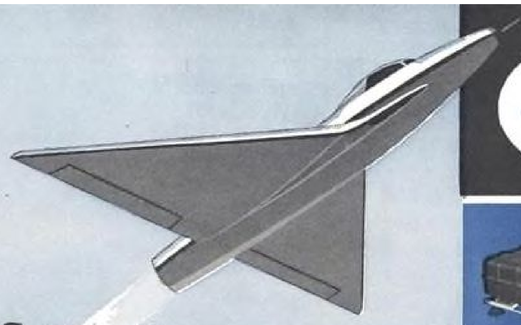
New York, 20 N. Y.



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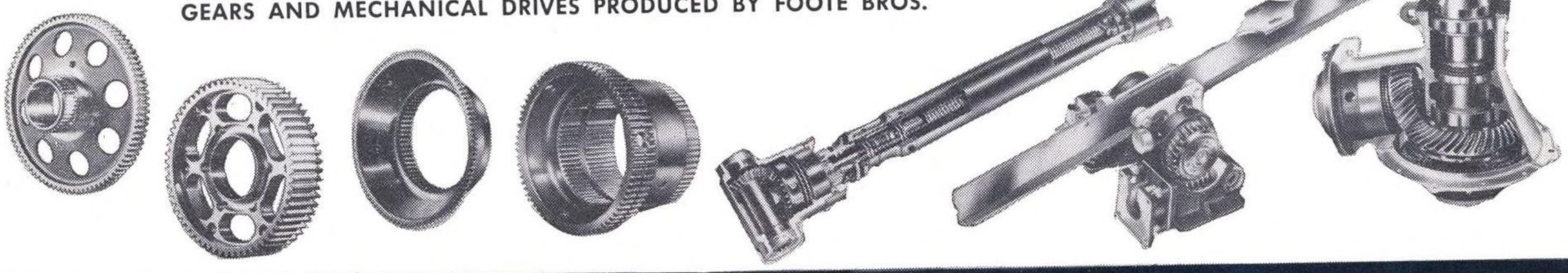

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