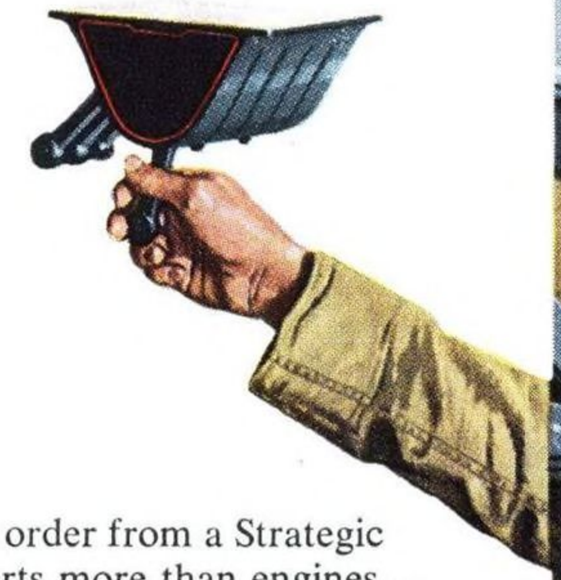
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JUNE 7, 1954

50 CENTS

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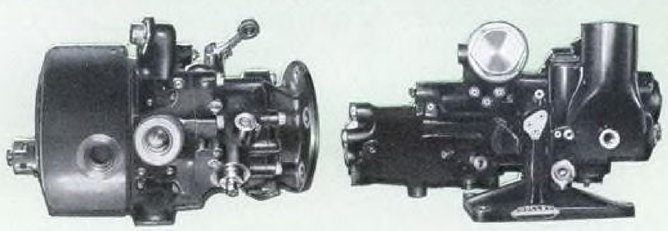
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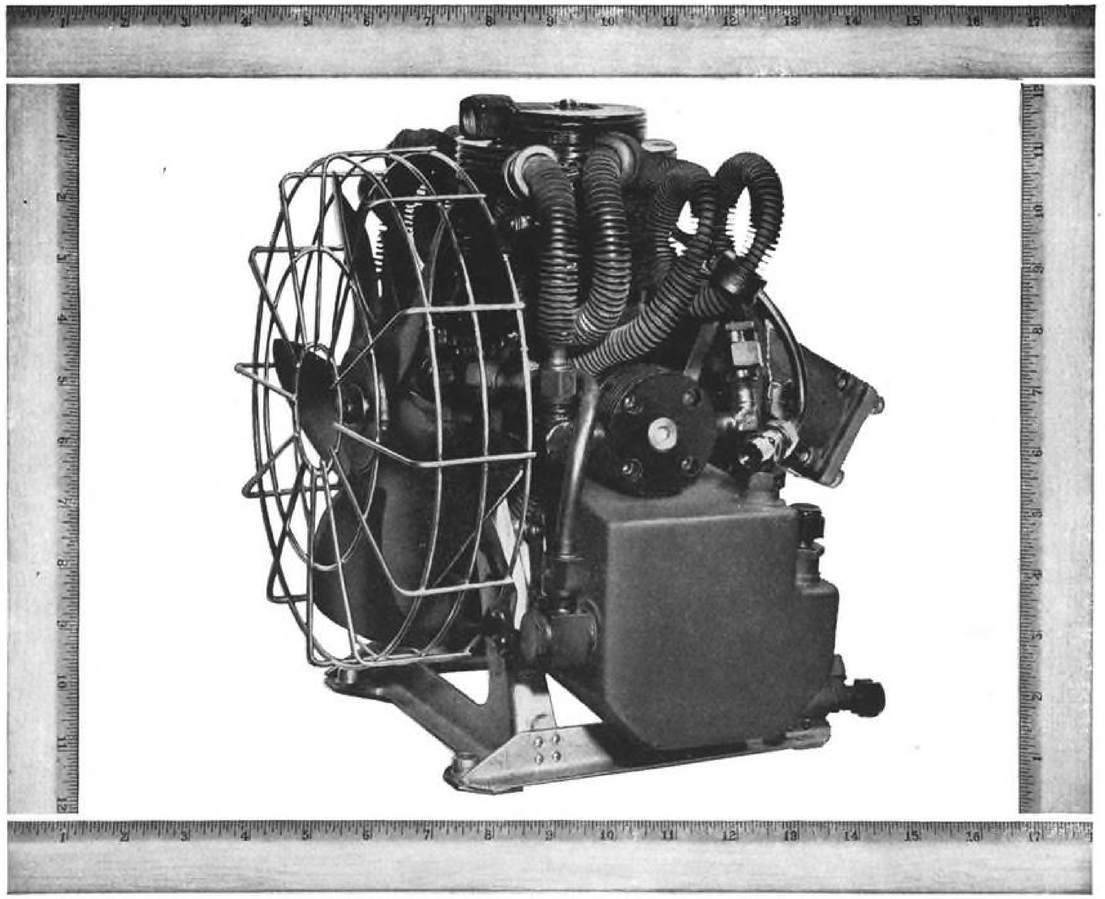
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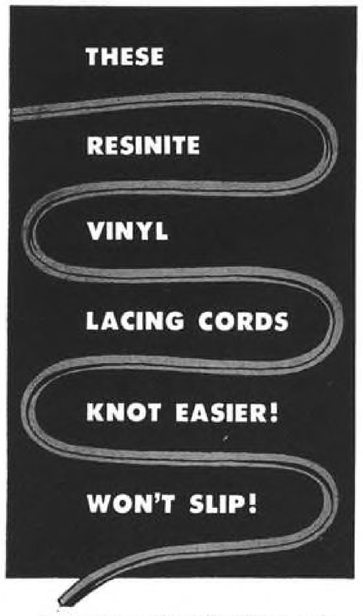
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Table of Contents on Page 8 51,722 copies of this issue printed

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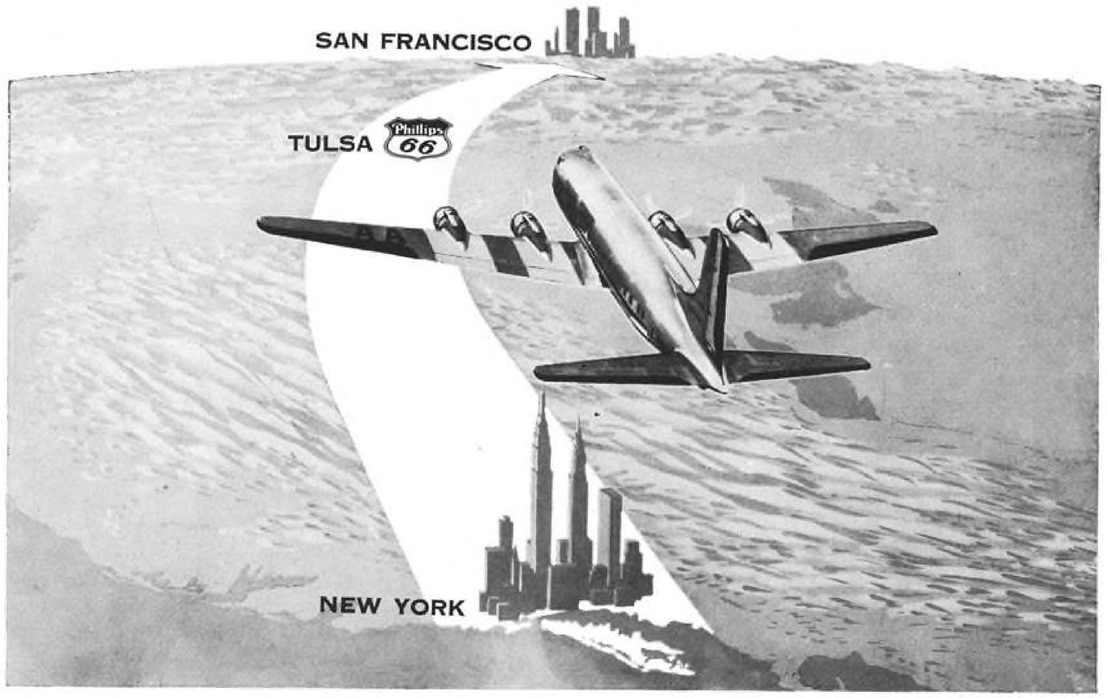
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NEWS DIGEST

Domestic

Scandinavian Airlines System is expected to begin operations over its long-sought transpolar route from Europe to Los Angeles this fall. The U. S. State Department, with Civil Aeronautics Board approval, has offered the Scandinavian governments the transpolar route on a reciprocal basis for a three-year period (AVIATION WEEK Mar. 29, p. 59).

John P. Riddle, founder and former president of Riddle Airlines who sold the airfreight carrier a year ago, has repurchased sufficient stock to regain control. He was appointed executive director of the company's executive committee following the transaction. A release issued by Riddle quotes him as saying the airline "is growing steadily under the presidency of William R. Boyd," who succeeded Riddle last July.

"Trisonic" windtunnel, capable of testing aircraft and missile designs at from 400 mph. to three times the speed of sound, will be constructed by North American Aviation near its Los Angeles plant. Estimated cost: $4.5 million.



Stratojet Tests Retractable Rato Units

A Boeing B-47B Stratojet medium bomber takes off with an assist from new retractable liquid-propellant rocket units, called the most powerful ever designed for aircraft by their maker, Aerojet-General Corp., Azusa, Calif. The units are fitted to panels on the side of the fuselage, which swing open when in use. Performance data on the company's new Rato devices still is classified by the U. S. Air Force.

Two USAF subcontracts involving parts and subassemblies for Boeing Airplane Co.'s B-47 and KC-97 have been transferred from Briggs Manufacturing Co. to Chrysler Corp., both of Detroit. Informed sources say the contracts originally were let for $13 million and later increased to $21 million. Terms of the Chrysler agreement are not known.

Ryan Aeronautical Co.'s Electronics Division is developing an airborne, self-contained helicopter hovering control under a Navy BuAer contract.

J69 turbojet, Continental Aviation & Engineering Corp.'s version of the French Turbomeca Marbore, will be built for USAF under a contract covering production tooling and manufacture of five powerplants. The J69 is scheduled to power Cessna's T-37 trainer.

Statewide navaid network of low-power omnirange (TVORs) will be set up by Minnesota's Department of Aeronautics. The agency decided to buy six TVORs following tests at the Austin Airport (AVIATION WEEK Feb. 8, p. 85). State and local governments will share installation expenses, but cities and industry will finance cost of operation and provide necessary manpower.

Military Air Transport Service set a safety record of more than 731,000 passengers airlifted without a fatality during the 17-month period ended May 31.

Bell Aircraft Corp., Ft. Worth, Tex., reports it received a record total of 41 commercial orders for Model 47G copters in the first quarter of 1954. Sales represent a total of $1.5 million, with 32 of the craft going to foreign buyers.

Navy has ordered an undisclosed number of Ryan Firebee jet-powered target planes, designated KDA-1, with deliveries planned to start late this spring. Navy will use KDA-1s to support fleet anti-aircraft, aerial gunnery and guided missile training.

Paul R. Braniff, 56, co-founder of Braniff Airways and founder of Oklahoma's first commercial airline, died last week in Oklahoma City. He was a brother of the late Thomas E. Braniff, who was killed in a private plane crash last January (AVIATION WEEK Jan. 18, p. 20).

Financial

Pan American World Airways reports net earnings of $568,931 for the first quarter of 1954, compared with a loss of $65,721 during the first three months of last year. Commercial revenues increased 4.6% to $36,937,000.

International

New supersonic jet fighter has been designed by Saab Aircraft Co. for the Swedish air force, is scheduled to follow the J-29 Flying Barrel on the company's Linkoping assembly lines in the distant future. To bridge the gap between the 650-mph. J-29 and Saab's new J-35 Dragon, Sweden plans to buy a modern jet fighter from a foreign producer.

Helio Courier, four-place lightplane developed for landings and takeoffs in small fields, will be produced and sold in Canada by Fleet Manufacturing Ltd., at Ft. Erie, Ont., under license by Helio Aircraft Corp., Boston.

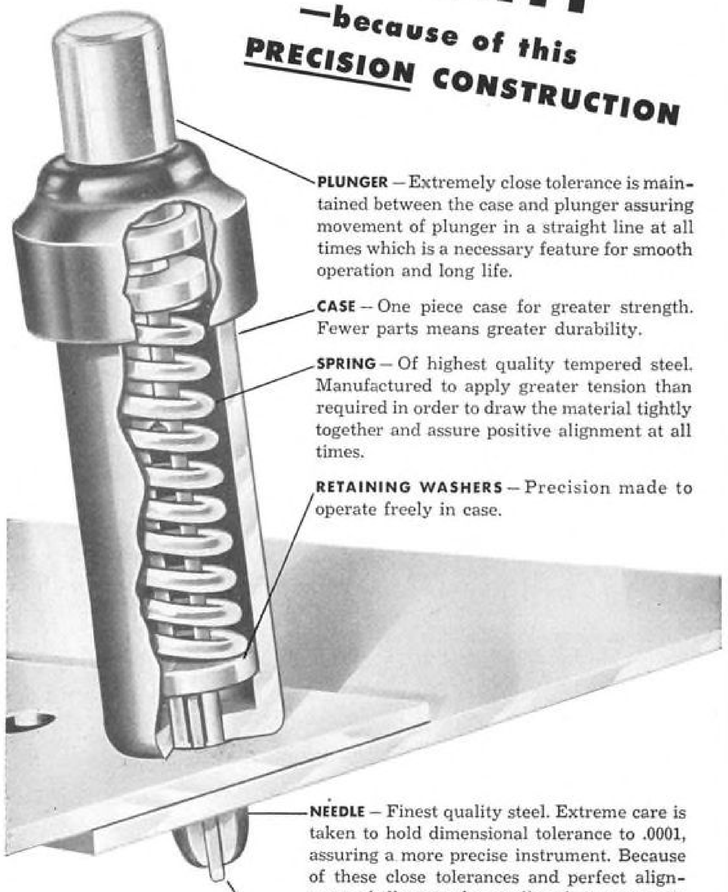
Canada's aircraft industry has private capital investments totaling $95 million—including more than $26 million from Britain, latest government estimates reveal. Backing these investments are millions in public funds, spent for special tools and construction facilities not otherwise available to the industry.

Canadian Aeronautical Institute has been formed to consolidate activities of all Canadian technical aviation groups. Allied with the Royal Aeronautical Society of England and the U. S. Institute of the Aeronautical Sciences, the new group has headquarters in Ottawa and branches initially in Toronto and Montreal.

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The Aviation Week

June 7, 1954

Headline News

Democrats Hit Airline Merger Plan.... 13
Airpower Policy Dissent Grows..... 15
Boeing Sets 707 Flight for July..... 15
Military Boosts Jet Fuel Demands..... 16
Board Sets Cause in AA 240 Crash..... 16
Copters Save Bennington Injured..... 17
B-58 to Fly in 1957..... 17
New Braking Chute Is Retractable..... 18
Asphalt Wins House Nod for Runways.. 18
Kawasaki to Build AF Overhaul Base.. 18
House Unit Probes Airmail Trial..... 21
Royal Navy Gets Anti-Sub Gannet..... 21
Navaid Growth in 15 Nations..... 22
Maintenance Training Lags—Survey.... 25
Bunker Buys Martin Common..... 25

Aeronautical Engineering

Skylark Designed for Vertical Flight... 32
Forum: New Copter Designs..... 40

Production

Canadair's Plans for the Britannia..... 48
Engine Changes Help Navion..... 54

Avionics

GE Cuts Down Field-to-Factory Gap... 65
Low-Cost Radar Combines 4 Jobs..... 71

Equipment

New Hoses Meet Jet Aircraft Needs.... 75

Aviation Safety

CAB Report on AA Albany Crash..... 92

Air Transport

TWA Coach Revenues Top First-Class..107
Court Backs State Tax on Braniff.....110
CAB May Act Soon on Balboa Route...110
CAB Proposes New Crew Limit.....112
Board Reports on NAL DC-6 Crash....114

Editorials

United's DC-7 Record.....122
Hawaii Is Air Minded.....122
Easier to Fly Than Kites!.....122

Departments

News Digest 7
Picture Page 9
Who's Where 11
Industry Observer 11
Washington Roundup 12
Letters 28
Thrust & Drag..... 47
Production Briefing 58
Navy Contracts 60
USAF Contracts 60
Fast Writeoffs 60
Filter Center 71
New Aviation Products 86
Also on the Market 91
CAB Orders 114
Shortlines 114
News Sidelights 120
Aviation Calendar 120

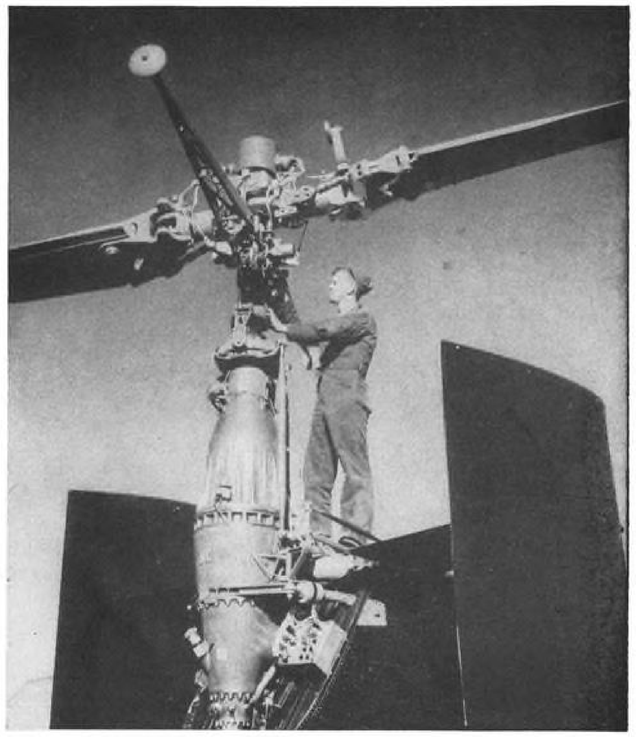
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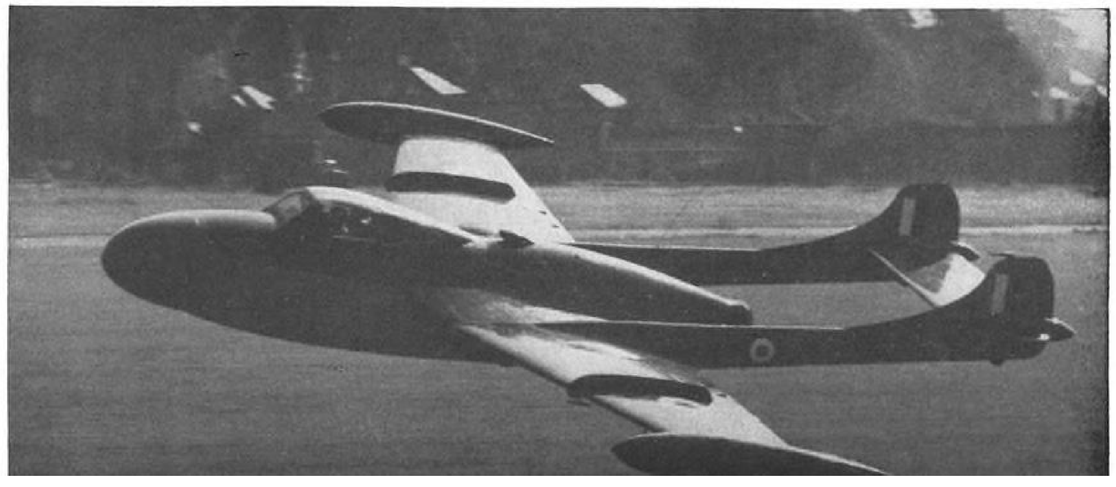
GRUMMAN F9F-6 COUGAR, sweptwing Navy jet, is pictured aloft for the first time in a tactical support role with a 1,000-lb. bomb under each wing. Cougar's prime armament consists of four nose-mounted 20-mm. cannon. Nose boom is for flight tests only.

New Developments In Military Aircraft Here and Abroad



BELL XHSL-1 anti-sub helicopter's rear rotor mechanism towers over technician, showing comparative size. The tandem rotorcraft has folding blades to facilitate stowage aboard ships, is powered by a single 1,900-hp. P&WA R2800-50 piston engine. A number of HSLs are being produced at Ft. Worth, Tex., for the U. S. and British navies.

DH VENOM N.F. 3 all-weather fighter, powered by a de Havilland Ghost jet, features numerous changes over earlier N.F. 2, including newer radar, improved flying controls and a redesigned cockpit canopy that gives the two-man crew better visibility.

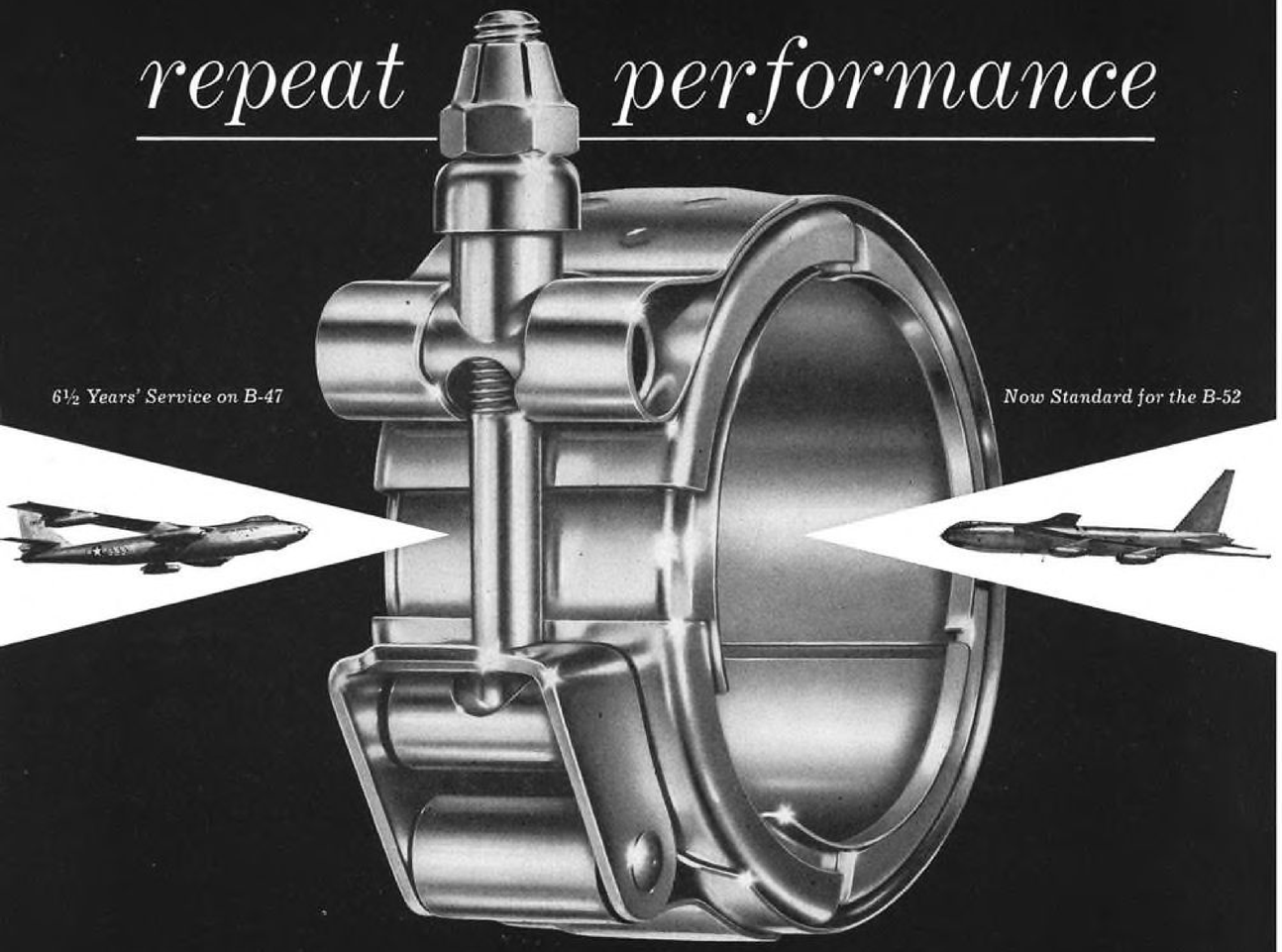


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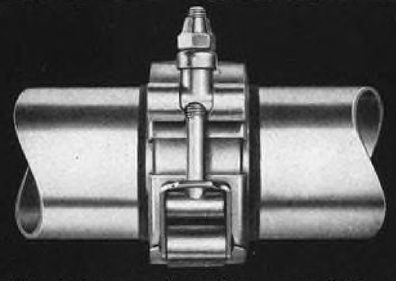
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WHO'S WHERE

In the Front Office

Walter G. Bain, vice president and executive assistant for Republic Aviation Corp., last week became general manager of the Farmingdale, N. Y., company, taking over a job handled by President **Mundy I. Peale.**

F. E. Howe is new executive vice president of Central Airlines. **John L. Blackwell** has been appointed vice president-operations, **D. S. Vaughan**, maintenance director.

William L. Keating has been elected vice president-operations of Transocean Air Lines.

Robert R. Miller has been promoted to assistant to the president of Northrop Aircraft, Inc., Hawthorne, Calif.

Changes

R. C. McGuire, former structures and systems development engineer for American Airlines, has joined Eastern Air Lines as assistant to the vice president-engineering.

Victor Z. Brink has become assistant general manager of Ford Motor Co.'s Aircraft Engine Division at Chicago, succeeding **Ben D. Mills**, who has been appointed assistant general manager of the Special Products Division, Detroit.

Edward I. Brown has joined Vickers, Inc., as chief aircraft products engineer of the equipment maker's El Segundo (Calif.) Division. **Thomas B. Doe, Jr.**, is new master mechanic for the company's Detroit, Omaha and Joplin, Mo., plants.

Walter Venghaus has been named manufacturing manager of Flight Refueling, Inc., Baltimore, succeeding **Robert J. Schoonmaker**, who resigned.

John W. Carson has been moved up by Continental Aviation & Engineering Corp., Detroit, to quality control manager of the Manufacturing and Research Divisions.

Adam C. Wolz has retired as purchasing agent and traffic manager for United Aircraft Corp.'s Hamilton Standard Division, Windsor Locks, Conn.

Norman L. Winter has been appointed director of Sperry Gyroscope Co.'s federal department, Great Neck, N. Y.

John C. Cunningham has become public relations officer for Percival Aircraft, Ltd., Luton Airport, England.

Rankin H. McDaniel has been promoted by Solar Aircraft Co. to general production superintendent of the Manufacturing Division, San Diego. Other division changes: **L. C. Rothchild**, assistant general production superintendent; **C. F. Grantham**, production superintendent for Building 13.

Honors and Elections

George F. Chapline, vice president and general manager of Fairchild Engine & Airplane Corp.'s Engine Division, has accepted sponsorship of the Aeronautic Production Forum to be held by the Society of Automotive Engineers next April in New York.

Col. Willard W. Millikan, holder of the cross-country speed record for jet aircraft (AVIATION WEEK Jan. 11, p. 7), has received the William J. McGough Memorial Award from the American Legion's Air Service Post 501 in New York.

INDUSTRY OBSERVER

▶ Convair's XF2Y Sea Dart now is flying with two Westinghouse J46 turbojets replacing the pair of J34s used for original tests. The twin J46s provide a total of about 12,000 lb. thrust for the delta-wing, water-based fighter, an increase of more than 3,000 lb. thrust over the J34 installation.

▶ **De Havilland's Gyron axial-flow turbojet is now producing about 15,000 lb. thrust on the test stand but it eventually is aimed at a 20,000-lb. rating. Gyron has a five-stage compressor using extremely advanced aerodynamic blade design and providing better than 25 deg. centigrade temperature rise for each compressor stage. Mass airflow is about 300 lb. per second. Gyron uses two turbine wheels and overall engine diameter is about 40 in.**

▶ Piasecki's program to get the H-21 helicopter back into flying status received a severe setback recently when the test model lost a blade during flight tests at Edwards AFB, Calif. The test model H-21 incorporated 27 modifications ordered by USAF when it grounded the H-21s last February (AVIATION WEEK Feb. 22, p. 15).

▶ **Westinghouse definitely will move all of its aircraft gas turbine activities to the huge government-owned plant at Kansas City and will use its present jet engine facilities near Philadelphia for other purposes.**

▶ Douglas, Lockheed, Convair, Boeing and Martin all are working on design study proposals for a high-altitude jet tanker requested by USAF (AVIATION WEEK May 17, p. 10). Both the Boeing B-52 and the Convair B-58 will require aerial refueling for long-range missions.

▶ **Convair has awarded two more sub-system contracts in its XB-58 Hustler supersonic bomber development program (Aviation Week May 24, p. 13). Aircraft electrical power system will be provided by Westinghouse Small Motors Division at Lima, Ohio, and the photo-reconnaissance system will be developed by Fairchild Camera and Instrument Corp. at Syosset, N. Y.**

▶ Bristol Aeroplane Co. has a development program for its Olympus split-compressor turbojet aimed to carry its output to 17,000 lb. static thrust. Original version of the Olympus was type tested at 9,750 lb. static thrust. An advanced model now is running on test stand at about 12,000 lb. static thrust.

▶ **Douglas Aircraft has engaged the Washington consulting firm of Ray and Ray to study the transport helicopter and its potential market. Report will cover engineering problems and sales outlook.**

▶ Helicopter manufacturers increasingly are becoming annoyed at unwillingness of major aircraft engine manufacturers to develop powerplants specifically designed for helicopter installations.

▶ **USAF flatly denies British reports recently published in a London aviation magazine that its units in Europe will use 112 Hawker Hunters to be financed under the offshore procurement program. The Hunters will be flown by units of European air forces participating in NATO.**

▶ Burnelli Loadmaster transport was tested recently by Fairchild's Airplane Division at Hagerstown, Md. Fairchild spokesman says company has no plans to build a Loadmaster-type transport.

▶ **Navy attributes higher operating costs for transport aircraft to increase in cost of high octane gas and the use of more four-engine aircraft. Cost of aviation gas for Navy increased from 16 cents per gallon in 1953 to an estimated cost of 19 cents in 1955.**

▶ USAF auditors, for the first six months of fiscal 1954, have reported actual and recommended reductions in contract costs of approximately $248 million. Air Force also reports that major contracts remain active for 3½ to 4 years.

▶ **Jet operation flying hours for the Air National Guard will increase 233% during fiscal 1955.**

▶ United Air Lines order of 25 DC-7s with auxiliary parts from Douglas Aircraft represents an investment of $58 million.

Washington Roundup

Air Policy Review

Split in the Air Coordinating Committee over federal financial aid for development of testing of a local service prototype aircraft was the principal difference between the report as accepted by President Eisenhower May 26 and the recommendations (AVIATION WEEK May 3, p. 12).

Civil Aeronautics Board, Army, Navy and State Department favored the aid proposal while Commerce, Air Force and Post Office Department voted against it, Commerce Undersecretary Robert Murray told senators.

The disputed prototype aid recommendation states:

"The federal government should, by appropriate means, provide financial aid for the development and testing of a local service prototype."

Italian Rebuttal

Strong reaction came from the Italian embassy following criticism of the Fiat F-86K contract in a report of offshore procurement made by Sens. Symington and Bridges (AVIATION WEEK May 31, p. 15).

Points made by the Italians include:

• Manufacture of the first F-86Ks is "uneconomical" because of the "learning curve" in any manufacturing process. Payments cover more than just the aircraft and include standardization in tools, materials and equipment on American standards and training of skilled labor.

• The two senators did not visit Fiat facilities, relied on a one-day inspection trip by committee aides. USAF and Foreign Operations Administration, agencies approving the Fiat contract, investigated the program for two years.

• Statement that 72% of the Fiat workers are Communists is inaccurate. It also is unfair because it infers that since the CGIL union at Fiat is Red-controlled all members are Communists.

Policy Instrument

U. S. airpower is being used as an instrument of national policy in South America, just as it was in the Berlin airlift—with no shooting. Air Force transports are hauling arms to Honduras and Nicaragua from Brookley AFB, Mobile, Ala.

On Nicaraguan Army Day three B-36 bombers from Carswell AFB, Ft. Worth, Tex., went on a nonstop training flight over the cities of Managua, Leon, Granada and Matagalpa. Pentagon observers offered no comment on the significance of the trip, but pointed out that it was done with approval of State Department. All this followed by a few days shipment of 1,900 tons of arms to Guatemala from behind the Iron Curtain.

Jet Education

Faced with serious complaints and lawsuit problems at airports where jets operate, USAF has launched educational program to promote better understanding of jet pilot's problems. Classes will be held at Craig AFB, Selma, Ala., and Moody AFB, Valdosta, Ga.

First students will include 12 men drawn from Civil Aeronautics Administration and Civil Aeronautics Board and 12 airline pilots, who will take one-week indoctrination course. CAA Administrator F. B. Lee will be included in senior officers' jet instrument flying course, which will give him up to 20 hr. flight time in T-33.

Object is to leave government agency and airline staffs with complete background on traffic control, holding and navigational problems of jet flight.

Airport Incorporation

The Administration's plan to incorporate Washington National Airport is confronted with opposition by General Accounting Office, as well as airlines, making enactment this session unlikely. GAO is independent of the Executive Branch, reporting directly to Congress.

"It has taken Congress nine years since the passage of the Government Corporation Control Act to reduce the plethora of government corporations to the present number," GAO attorney Owen Kane says. He argues that efficiency and economy can be accomplished at the National Airport without incorporating it.

Stuart Tipton, general counsel of Air Transport Assn., is urging postponement of action until the Administration has worked out the details of incorporation, including the working capital fund to be set up and the value to be placed on the corporation. These factors, he pointed out, will have an effect on the fees to be charged airlines. "We would like to see what we are 'getting in for,'" he says.

Military Rates

Defense Department is not urging legislation authorizing the airlines to offer free or reduced rates on military business, claiming that Civil Aeronautics Board already has authority to exempt carriers from tariff regulations.

However, the department has indicated it will fight repeal of a provision in the 1940 Transportation Act allowing rails to bargain on military business. Airlines complain that the rails have used this to undercut them on defense contracts.

The airlines, however, don't want a similar provision extended to the airline field, contending it only would create more chaos. Commerce Department is taking the position that Congress should vote on the proposal to repeal the rails' authority to offer reduced rates before consideration is given to applying this authority to airlines.

New Guard Standards

General tightening of Air National Guard standards is indicated by new personnel testing program to start in September. Similar to USAF evaluation systems, tests will aim to get best-qualified man in every technical job.

USAF will have strong voice in results because tests will be supervised by their air instructors appointed under Continental Air Command. Exams will be given twice a year in each career field, keeping each commanding officer fully posted on skill of men, their suitability for their jobs and qualifications to advance.

Interim Weapon

One of the main factors in the recent debate over the future of the XB-58 supersonic bomber development program was feeling among top USAF planners that essentially it is an interim weapon to bridge the gap between current subsonic bombers and the ultimate development of nuclear-powered military aircraft and intercontinental missiles with atomic and hydrogen bomb warheads.

—Washington staff

AVIATION WEEK VOL. 60, NO. 23 JUNE 7, 1954

Democrats Score Airline Merger Proposal

- **Senators charge Administration program would let big trunklines gobble up their smaller competitors.**
- **But Murray says new plan would strengthen the air transport industry, not turn it over to a few giants.**

By Katherine Johnsen

The Administration's program to reduce "uneconomic airline duplication of service" by encouraging mergers drew charges from Democrats of favoritism to "bigger and bigger business" when it was presented to Senate Interstate and Foreign Commerce Committee by Commerce Undersecretary for Transportation Robert Murray.

The program calls for "prompt action by industry and government to effect route modifications, mergers and other adjustments required to strengthen the industry and give it the fullest possible opportunity for meeting a reasonable schedule for subsidy withdrawal," Murray testified.

► **'Chosen Instruments'**—Sen. George Smathers declared the Administration is giving the signal for small trunk airlines "to be gobbled up immediately by the big trunklines." Smathers proposed, instead, that the smaller lines be given "better stops" so they might become economic operations.

He suggested the Administration's course would lead "to a system of chosen instruments."

Sen. Mike Monroney wondered "if we are going to have Pan American World Airways as a 'chosen instrument,' and knock out Trans World Airlines in the North Atlantic and have one line in the Pacific."

He pointed to "the abominable service" given over monopoly routes in the railroad field, and declared: "We want to keep small business alive in aviation. . . . It is the small boys coming in with new ideas that makes for economic progress."

► **Diluted Strength**—Murray staunchly defended the Administration's program, stating there is no intention "to limit service to the public" or turn the air transportation field over to "a few giants." Granting new stops to smaller airlines, as well as mergers, he said, would be considered by Civil Aeronautics Board in reworking the airline route pattern.

"But there is only so much business," he observed, and more than two carriers over a route "tends to dilute strength."

Smathers said this plan would "not only not permit any new lines but would limit the number of existing lines (on a route) to two."

Sen. Andrew Schoeppel supported Murray and volunteered that "it cannot be fairly inferred" that the Administration has any intention "to close the door" to new enterprise, which has the right to apply to CAB and have its case decided on its merits.

► **McCarran Fight**—Murray opposed a complete rewrite of aviation law, as proposed by the omnibus McCarran Bill. He recommended that the 1938 Civil Aeronautics Act be revised with amendments.

Changes implementing the policies proposed in the Air Coordinating Committee's report (AVIATION WEEK May 3, p. 12), he reported, will be submitted to Congress for action in the near future.

Murray endorsed the McCarran Bill's proposal to require certification of irregular and contract air carriers but vigorously opposed its plan to abolish CAB and Civil Aeronautics Administration. The McCarran measure would turn over the functions of the two agencies, except aviation safety, to a seven-man civil aeronautics authority. Safety investigations would be made by an independent five-man air safety board.

The proposed reorganization, Murray said, "would impair government efficiency and economy. . . . It would be most unwise to place major executive and operating responsibilities, such as those now exercised by the CAA, in an agency independent of direct presidential supervision and control."

Such functions as operation of the federal airways, administration of the federal-aid airport program, operation of control towers and safety enforcement programs, he argued, are "properly the responsibility of an executive department and should be performed by some officers responsible to the President, rather than by an independent authority."



MURRAY: No plans for a few giants.

► **Control Problem**—Re-establishment of an independent air safety board, he said, "would merely result in additional expense, additional governmental personnel, additional problems of interagency relationships, without any significant offsetting advantages."

Pointing out that the McCarran Bill's provisions for certification of nonskeds and contract carriers are in line with the ACC recommendations, Murray added:

"The recent experience with nonscheduled operations points up the serious problem of attempting to apply one form of regulatory control to one portion of the industry, while permitting competition by other carriers which are not subject to similar control."

Other views expressed by the Undersecretary:

• **Experimental service.** Murray opposed the proposal for issuance of "experimental certificates" for new operations without a showing of "public convenience and necessity."

He insisted that such factors as the prospect for economic survival, the relationship of a proposed new service to the economic soundness of existing air transport operations and the merits of authorizing new carriers to provide new services should be given weight. He

maintained that CAB already has adequate authority to authorize new types of services.

• **Regulation of security issues.** "If the government takes on the final authority for determining the wisdom of a particular financing program," Murray declared, in opposing the McCarran proposal for government control of airline security issues, "it must by the same token assume some responsibility for any subsequent problems developing from such a program—including responsibility to alleviate such problems through subsidy. . . .

"It would be preferable to place the carriers clearly on notice that the government will not rescue them from financial difficulties rather than attempt, through security regulation, to 'second guess' the wisdom of managerial decisions."

• **Permanent local service certificates.** The duration of certificates should remain discretionary with CAB, Murray argued, in opposing the McCarran proposal for permanent certificates for local service airlines.

"Commerce Department recognizes, of course," he said, "the desirability of giving all carriers the degree of stability provided by permanent certificates wherever justified and at the earliest date possible.

"However, we believe that this should be accomplished within the CAB's existing authority to determine the appropriate duration of any given certificates on the basis of evidence specifically relating to its particular service."

• **CAB control of international rates,** proposed in the McCarran Bill and recommended in the ACC report, was supported by the Undersecretary.

• **Federal jurisdiction over safety** strongly was endorsed by Murray, who commented that "aviation, by its nature, does not lend itself to separate safety regulation by different states."

He objected to provisions in the McCarran Bill reserving for the states a measure of "control of operations in air navigation wholly intrastate in character."

• **Private fliers.** Murray approved provisions for safety regulation of private fliers "in a less exacting manner than is required for commercial operations." He opposed provisions permitting private fliers to do all mechanical work on their own aircraft "without regard to their fitness to perform such work."

Other witnesses on the McCarran measure:

• **John Allen,** Assistant Postmaster General, who urged legislation making it clear that the award of a certificate to transport mail does not carry with it a "right" to subsidy support.

"Cases have arisen in the past where new carrier service was not made available for mail use simply because of the relationship of a mail certificate to the right to claim subsidy," he testified.

Allen also asked for legislation that would limit mail rates to the "reasonable and necessary cost to the air carrier of performing mail service, plus a fair return." He objected that mail rates set by CAB appear to be too high.

"We find . . . that the average yield per ton-mile to domestic trunkline carriers for freight service is approximately 22 cents, compared to an average yield of approximately 50 cents for the transportation of mail.

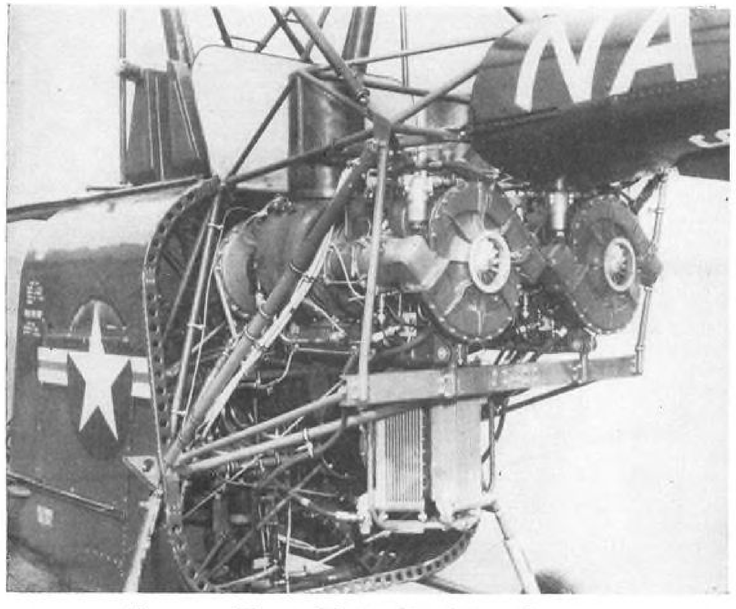
"We find also that under certain tariffs the airfreight rates on certain items, where the handling would appear to be more burdensome to the carrier than the handling of a sack of mail, are lower than the charge made to the post office. For example, for moving furniture that has not been crated, the charge between New York and Los Angeles is approximately 35 cents per ton mile."

• **Roger Lewis,** Assistant Secretary of the Air Force, who spoke for the Department of Defense, asked that it be made clear in legislation that irregular and air contract carriers, as well as scheduled airlines, may perform charter and special services for the military services.

• **William Wright,** representing the Solicitor, Department of Labor, urged that a provision be written into aviation law providing "that no airline shall—by rules, contract or otherwise—limit in any way its liability for personal injury or death of its passengers and that any attempt at such limitation shall be void and of no effect."

He reported the government has paid compensation costs totaling more than $5.4 million to the dependents of 70 federal employes who have been injured in airline crashes over the past five years.





Kaman Tests Twin-Turbine Copter

First photos of Kaman HTK-1 intermeshing copter fitted with two side-by-side Boeing 502-2 turbines, a joint Army-Navy project that flew for the first time last Mar. 26. The twin turbines, detailed in closeup, produce 380 total hp., compared with the 240 hp. delivered by the single Lycoming 0-435 piston engine normally powering the HTK. The combined weight of the Boeing engines does not exceed that of the Lycoming. The HTK-1 can be flown with the turbines operating simultaneously or on either engine.

Airpower Policy Dissent Grows

Rumblings of discontent with the Administration's airpower program continue on Capitol Hill.

A top Republican, Sen. Alexander Wiley, has joined in the skepticism that the "new look" program is adequate in view of developments in the Asian theatre. Wiley, chairman of the Senate's Foreign Relations Committee, declared in a major foreign policy address:

"I have doubts as to the adequacy of the defense establishment under the new circumstances in which we find ourselves. . . .

"I doubt that we can be smug concerning our Air Force when, from the latest Soviet air parade, we learned that they now apparently not only have the equivalent of our B-47 bombers, but the equivalent of our B-52 intercontinental jet bomber as well."

Wiley also was skeptical of the "new look's" three-division reduction in Army strength (which entailed a cutback in airlift wings) "at the very same time when our responsibilities are increasing, rather than decreasing, throughout the world."

►**No Increase**—A showdown on the "new look" program will come when the Senate, in the near future, takes up the appropriation request to finance the program in fiscal 1955. Senate Appropriations Military Subcommittee has completed hearings on the measure.

Sen. Homer Ferguson, subcommittee chairman, flatly has discounted any possibility that the Administration will seek additional funds to the $11.2 billion it originally recommended for the Air Force. The House reduced this to $10.8 billion (AVIATION WEEK May 3, p. 16).

"I wish to make it clear on the record that I have no evidence to indicate that there will be an application or evidence presented for a deficiency bill to increase the amount of the present requests," Ferguson declared. He qualified, however, that "the military situation . . . is not static."

Ferguson's statement was made after Sen. Burnet Maybank, a member of the Military Appropriations Subcommittee, anticipated an additional request by the Administration as a result of recent developments in Indo-China.

When the request is made, Maybank said, "I shall again take up the question of adequate appropriations for the Army and of moving forward the Air Force program as fast as those in charge feel it can be moved forward."

►**Repercussions**—The Armed Forces Day speech of USAF Chief of Staff Gen. Nathan Twining, pointing to Soviet airpower advances (AVIATION WEEK May 24, p. 14), has had these repercussions on Capitol Hill:

• Maybank, in a floor speech, declared: "I regret that Gen. Twining . . . and others cannot tell the American people what they think about the so-called 'new look' as proposed by the President, who, after all, is supposed to be in charge."

• Rep. Clair Engle observed: "Only a year ago, Secretary of Defense Charles Wilson shrugged off the Russian air force with the remark that it was a defensive air force, made up of fighter planes and inferior to our Air Force in offensive weapons. Some members of Congress, moreover, ridiculed pictures of Russian heavy bombers that appeared in the American press last February.

"It was not so easy to dismiss reports from our diplomatic representatives in Moscow of the heavy bombers that flew over Moscow on May Day this year . . .

"We shall be fortunate if nothing bigger than war in Indo-China writes on this Administration the verdict that war in Korea wrote on the Louis Johnson administration."

►**Challenge**—Sen. John Kennedy also challenged the Administration's airpower program. He declared: "Today, when the Soviet Union possesses many thousand more first-class jets than the United States and its combined allies, when its best planes have proven in Korea to be the equal, if not superior, of our fighters at normal combat altitude, when it possesses long-range bombers with which to loose devastation upon American cities and, most important of all, when it possesses the atomic and hydrogen bombs capable of leveling the urban and industrial might of our nation, it is unthinkable that our basic policies appear to underestimate the strength of the enemy and its gains in thermonuclear developments.

"Proposed improvements in our continental defense are not comparable to improvements in the enemy's capacity to penetrate that defense . . ."

Last F-86F

Last F-86F Sabre to be built by North American Aviation has rolled off the assembly line at NAA's Los Angeles plant, making way for increased production of the F-100 Super Sabre.

The company still is producing its later-model F-86D all-weather interceptor at Los Angeles and F-86H fighter-bomber at the Columbus, Ohio, plant.

North American manufacturing manager Ralph Rudd says the F-86F jet fighter-bomber cost less in man-hours per pound during two years of production than the simpler, propeller-driven F-51 in World War II.

Boeing Sets 707's First Flight for July

Boeing Airplane Co.'s 707 jet tanker-transport prototype will make its first flight soon after July 1, the company says.

Rework of damage suffered by the craft during taxi trials at Renton Airport, Wash., May 21 is well underway (AVIATION WEEK May 31, p. 13).

►**'Minor' Mishap**—Failure of a landing gear attachment fitting because of secondary loads imposed by deflection is given as the reason for the mishap, described as "minor" by Boeing. The particular attachment involved is being redesigned, Maynard L. Pennell, chief project engineer-aircraft, reports.

He says no primary wing or fuselage structure was affected and none of the 4,000 gal. of fuel aboard was spilled. No tank leaks have been noticed, and the engine pods virtually were undamaged.

►**No Warning**—A. M. (Tex) Johnston, Boeing chief of flight test, reports: "We were taxiing at low speed when the plane's attitude changed. We immediately cut the engines, although we didn't know what had happened."

Johnston says the 707's acceleration is "terrific." "From a standing start to high speed it accelerated like an F-86."

He also praises the 707's steering, brake effectiveness and visibility. Engine response, with the hydro-mechanical controls, is "very good," he adds.

Military Boosts Jet Fuel Demands

Defense estimates wartime need at 2 million barrels daily, sets peak peace requirement at 300,000.

A long war fought with supersonic planes, would require 2 million barrels of jet fuel a day for all aircraft, Defense Department estimates.

Peacetime requirements for the United States alone will run to about 240,000 barrels a day in fiscal 1956 as more jet aircraft are added to the armed forces.

▶**Major Problem**—Figures disclosed by USAF Col. J. H. Baughn before the American Petroleum Institute indicate that the problem of meeting military requirements for jet fuel stands as one of the major jobs facing the oil industry in the next few years.

The demand for aviation gasoline, Baughn says, is expected to increase through 1955 or 1956 and then start a gradual decline as reciprocating engines give way to jets. However, U.S. civilian and foreign requirements for gasoline are estimated by the Petroleum Administration for Defense to increase continually, offsetting the cut in U.S. military needs.

▶**Jet Fuel Use**—Forecasting that U.S. military planes will need a peak of 132,000 barrels a day of aviation gasoline in 1955 or 1956 and then reduce the demand to about 95,000 barrels a day in 1962, Baughn says:

"The primary reason we believe the future U.S. military aviation gasoline requirements will be so high is that we are still purchasing and will continue to use large transport and support-type aircraft which are large consumers of high octane aviation gasolines.

"For example, just the transport-type aircraft are now consuming 45% of all aviation gasoline in the military. In fiscal 1956 we estimate that the transport-type aircraft alone will consume 60% of all aviation gasoline in the military."

▶**Rapid Increase**—Emphasizing the importance of planning to meet huge jet fuel requirements, Baughn points out that at the end of World War II, the requirement for this type of fuel was only about 100 barrels a day for use on experimental projects.

By fiscal 1950 this climbed to 11,000 barrels a day and to 81,000 barrels by 1953, an increase of 600% in three years.

"U.S. military jet fuel requirements," Baughn says, "are expected to continue this rapid ascent to about 240,000 barrels per day in fiscal 1956, an increase of 200% over fiscal year 1953 or 2,000% over fiscal year 1950.

"It is expected to level off at about 250,000 to 300,000 barrels per day if the situation doesn't change materially.

"Foreign jet requirements are about 50,000 barrels per day and can be expected to increase to about 125,000 barrels per day by 1960. This will bring total worldwide jet requirements from a current 200,000 barrels per day to at least 400,000 barrels per day by 1960."

▶**Industry Problem**—Thirsty jet engines, Baughn says, pose a fuel problem of new magnitude for the petroleum industry. He reports that planes with reciprocating engines use anywhere from five to 1,000 gallons of gasoline an hour, but jet powerplants step up this rate to 400 to 2,500 gallons an hour.

"One of our largest type jet aircraft, he says, "will consume in one hour the same quantity of petroleum which is consumed by the average automobile in three years."

▶**Jet War Needs**—In case of war, Baughn says, worldwide aviation gasoline requirements, including fuel for civilian planes, are estimated to double present consumption, putting the demand "in the neighborhood" of 500,000 barrels a day.

"On the other hand," he continues, "worldwide requirements of jet fuel will be about 400,000 barrels per day at the beginning of the war and will increase to 1,500,000 barrels per day if the war continues for any length of time.

"If and when we start using supersonic jet aircraft, the figures are even more startling. We visualize that the requirements under these conditions might easily be 600,000 barrels per day for a long-drawn-out conflict."

He says his figures are not based on any known war plan, but are the estimates used by Defense Department.

Other facts on aviation fuel disclosed by Baughn:

- Big future need is synthetic oil for lubricating jet engines. Only one company so far has met rigid specifications. Other producers are sought for mobilization purposes.
- Defense Department will spend $600 million in fiscal 1954 for aviation fuel, 60% of all the money paid out for petroleum products.
- Estimates for fiscal 1955 are that these figures will climb to $650 million.
- USAF is expected to spend 80% and the Navy 20% of the total for aviation fuel in fiscal 1955.
- From fiscal 1954 to 1955, USAF requirements for jet fuel will climb more than 60%. Navy need will grow almost 30%.
- Department of Defense jet fuel requirement for fiscal 1955 will be 70 million barrels, down from the 83-million-barrel guess in an earlier estimate.

Comet Tests

(McGraw-Hill World News)

London—The most likely reasons for the de Havilland Comet's last two fatal crashes currently appear to involve either the cabin pressurization system, the power controls or a combination of both.

All current flights being made in the jet transport are without pressurization. Soon a sealed Comet fuselage will be submerged in a water tank, where it will be subjected to varying pressure differentials over a considerable period (AVIATION WEEK May 31, p. 17).

The latter test will enable study of this particular type of fatigue on skin structure, also will show development of any leaks. Since the Comet normally flies much higher than any other type airliner, its range of pressure differential is much greater than that of other transports.

Board Sets Cause In AA 240 Crash

Probable cause of American Airlines Convair 240 crash near Buffalo, N. Y., Jan. 20 is attributed by Civil Aeronautics Board to:

- Mechanical failure of the torquemeter boost pump that automatically feathered the left propeller immediately after becoming airborne.
- Use of an incorrect procedure for unfeathering that resulted from the "ambiguity of the instruction for unfeathering," contained in AA's manual.

The aircraft made a wheels-up forced landing in a sparsely wooded field one mile south of Buffalo Airport shortly after takeoff on an Albany-St. Louis flight. Crew and several of the 21 passengers were injured but none fatally.

Board investigators found that immediately after takeoff the left propeller automatically feathered due to fatigue failure of the torquemeter boost pump. When the pilot attempted to restart the left engine, CAB reports, "it is indicated that he held the feathering button to the unfeather position longer than two seconds" required.

"It is very probable that had the correct unfeathering procedure been used at this time, the engine was capable of restarting and would have done so," the Board says.



FROM STRICKEN CARRIER Bennington, copters evacuated about 50 injured sailors . . .



TO HOSPITAL at Newport, R. I. Here a Piasecki HUP is unloaded near the facility.

Copters Save Bennington Injured

Four helicopters, operating a shuttle between the carrier Bennington and Newport (R. I.) Naval Hospital, evacuated about 50 seriously injured men from the ship after it was rocked by explosions 75 mi. off the coast of New England.

Aircraft consisted of two Sikorsky HO4Ss from the Coast Guard Air Rescue Station at Salem, Mass., and two Piasecki HUPs from the Naval Air Station at South Weymouth, Mass.

The explosions occurred about 6:30 a.m., and the carrier immediately headed for the Naval Air Station at Quonset Point, R. I. At about 10 a.m., the helicopters started their shuttle and continued operations until the Bennington reached its dock at 12:30.

▶**Skipper Praised**—Navy spokesmen credit the helicopters with saving the lives of some men who would have died if not removed promptly to the hospital. The copters landed in Newport on a vacant lot adjacent to the hospital.

Decision of the Bennington's skipper, Capt. William F. Raborn, to continue launching aircraft after the explosion won high praise from his fellow officers. About 20 jet fighters were in the air when the blast took place.

Without knowing the extent of the damage, Raborn ordered flight deck operations to continue and the planes dispatched to Quonset and other Naval Air Stations.

Captain Raborn was able to clear the ship of 40 pilots and more than $15 million worth of planes.

Turboprop Beats Jet For Airlines: Bristol

(McGraw-Hill World News)

London—The turboprop is the engine best suited for commercial airplanes and the purejet least useful, says Bristol Aeroplane Co.'s director and chief engineer, Dr. A. E. Russell.

Russell sees the turboprop as powering a substantial proportion of all airline transports. He believes that "when the excitement of a new form of propulsion has abated," the turboprop's greater potential capacity for airline use will be realized.

For any given duty the turboprop will be smaller, lighter, more economic and versatile than any other kind of engine, Russell says.

B-58 Program

- **New bomber scheduled for test flights in '57.**
- **AF asks $99 million in pre-production funds.**

Convair's supersonic Hustler (AVIATION WEEK May 24, p. 13), the B-58 delta-wing bomber, is expected to reach the flight test stage during 1957, according to Air Force testimony before Congress.

The USAF fiscal 1955 budget request contains an item of $99 million in pre-production funds to speed the manufacturing phase of "a new aircraft, a new engine, and four major electronic component sub-systems."

The aircraft is understood to be the B-58; the engine General Electric's J79 turbojet, and the electronic components are the bombing and navigation system, autopilot and control system for the Hustler project.

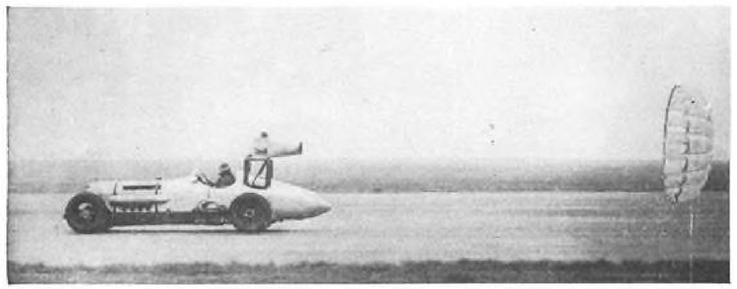
▶**Accelerated Production**—USAF budget officers said the $99 million will be spent on the following activities to accelerate the production phase of this specific aircraft and its major sub-systems:

- Conversion of experimental designs to production drawings.
- Necessary surveys and studies concerning appropriate tools and tooling required for production quantities.
- Designing and constructing limited quantities of jigs, dies, fixtures and other production devices and aids to be used by both the prime contractor and major subcontractors.
- Procurement of long-lead-time components for a limited number of early production items.

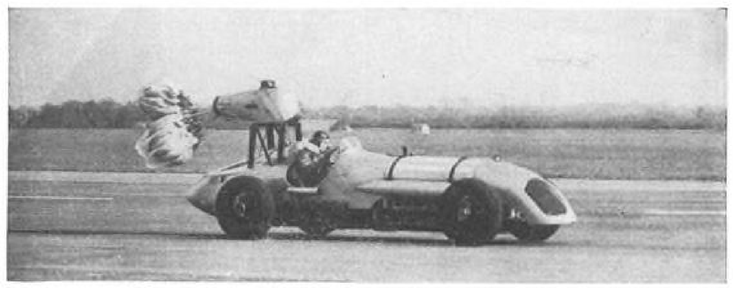
"By applying pre-production funds," USAF explained, "it is possible to introduce new aircraft and equipments a year or more earlier than would otherwise be possible. This is done without contractually obligating the government to a definite projected production program.

"Similarly, small quantities of these new items can be produced at substantially lower costs when built with production tooling rather than handmaking the initial models. There is also the advantage of prototype models being similar to subsequent production models."

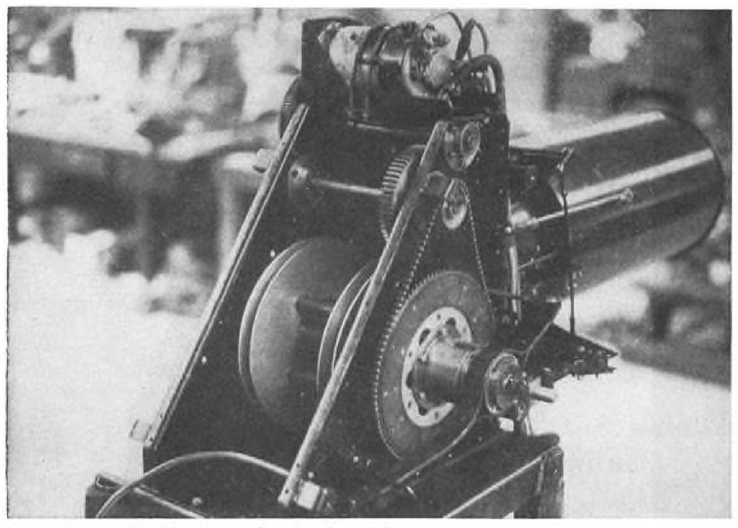
Describing the Air Force's fiscal 1955 pre-production budget request, Brig. Gen. Thomas P. Gerrity told congressmen: "We are requesting funds for initial production engineering, the tools, dies and fixtures for a new aircraft that will be available for flight sometime during 1957."



FULLY EXTENDED eight-foot ring-slot chute trails behind housing atop rear of racer.



CHUTE CLUSTER retracts automatically into telescoping cylinder after slowing car.



MECHANISM UNCOVERED, showing drum (foreground) and the chute stowage cylinder.

New Braking Chute Is Retractable

London—An automatically retractable braking chute for jet aircraft that can be used hundreds of times without replacement, according to the designer, has been tested in this country.

G. Q. Parachute Co., Ltd., Woking, Surrey, demonstrated its new device atop a racing car that was driven up and down a runway at more than 100 mph.

►**Mechanism**—One or more chutes are stowed in a two-piece cylinder, the rear part of which telescopes over the forward section when the canopy is ejected by a spring-loaded piston.

Once the pilot pushes the release button, the action is automatic. The chute unwinds, slows the aircraft and, when air pressure on the chute is eased, a switch is activated causing an electrically operated drum to wind in the canopy.

Asphalt Wins House Nod in Runway Fight

Air Force has been directed to use asphalt on all "non-critical" areas of airfields by the House Armed Services Investigating Subcommittee, which conducted hearings on the relative merits of asphalt and concrete.

USAF had insisted on concrete (AVIATION WEEK Mar. 8, p. 22).

The subcommittee's unanimous decision holds that "asphalt has a definite place in the airfield program and is suitable for many large non-critical areas on airfields."

Greater use of asphalt in the projected programs of USAF, subcommittee chairman William Hess estimates, would result in a saving of $50 million. "I base that on testimony that concrete pavement costs approximately 1.5 times as much as asphalt," he says.

Hess adds: "Of course, we have found that there are some places called 'critical areas' where only concrete will serve the purpose. I hope the Air Force does not take advantage of that finding to expand 'critical areas' so that they cover the whole field. There are large areas on a field which are used only a small portion of the time by airplanes taking off and landing. No plush pavement is required for that purpose.

"In my opinion, this is the time to take greater regard for the burden on our taxpayers. Fifty-million dollars—saved on the ground—would buy a lot of planes. Fifty-million dollars annually will do more good in the air than on the ground. We want a great Air Force in the air."

Kawasaki to Build AF Jet Overhaul Facility

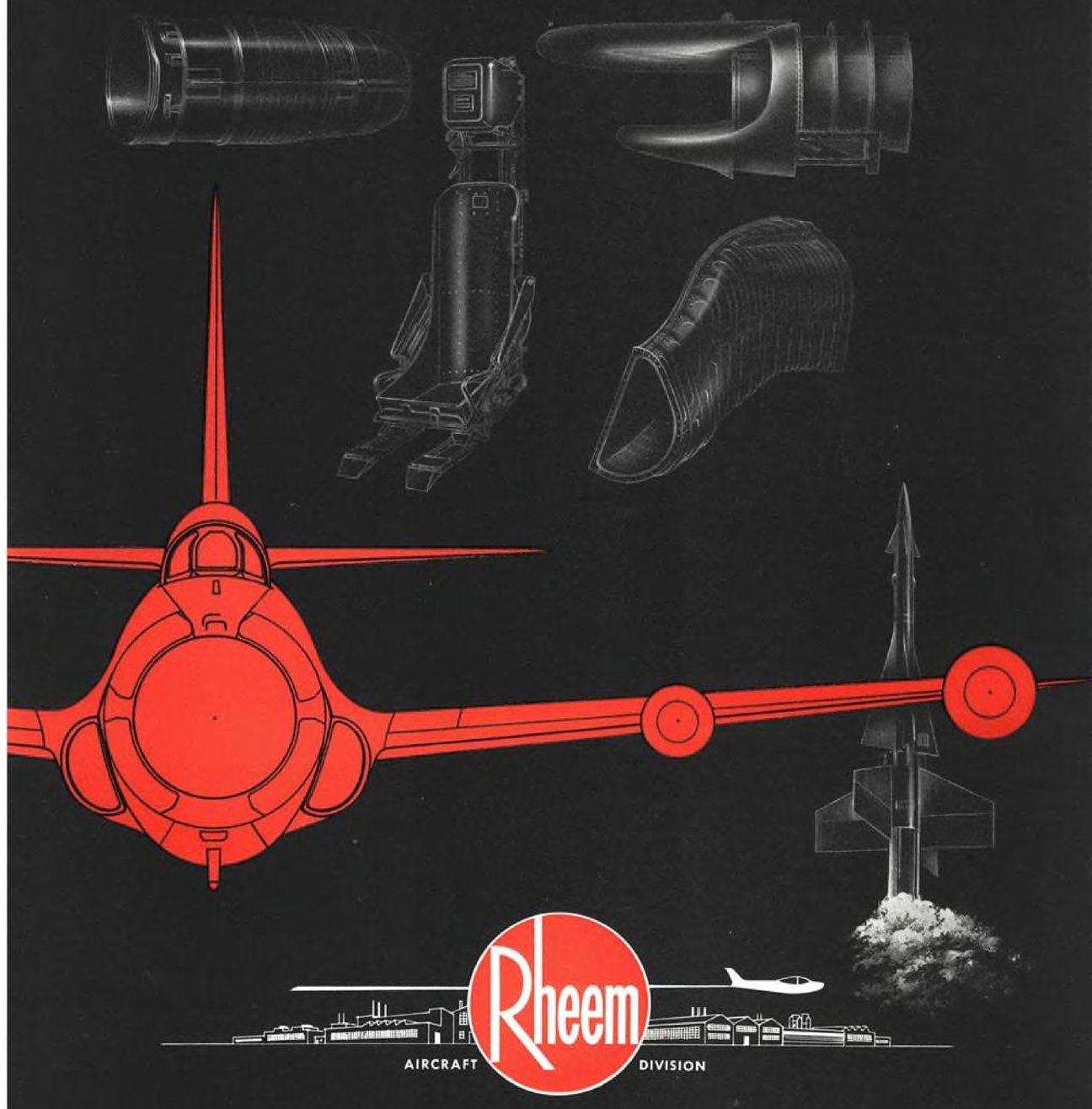
Far East Air Forces Logistic Forces has awarded Kawasaki Aircraft Co., Ltd., a contract to establish a facility to overhaul U. S. jet engines used by FEAF in Japan.

The jet engine program is one of many projects being carried on by the U. S. government to facilitate military operations and to assist in the economic recovery of Japan.

Lockheed Aircraft Service-Overseas, Inc., and Kawasaki negotiated a contract several weeks ago whereby the U. S. company would furnish technical assistance to Kawasaki in the overhaul of jet engines and airframes and in the manufacture of certain Lockheed-designed aircraft and jet engines used by the Air Force (AVIATION WEEK Mar. 8, p. 7).

The contract has been approved by the U. S. government and will be up for consideration by the Japanese government shortly.

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House Unit Probes Airmail Experiment

The House Post Office Investigating Subcommittee is focusing attention on the issue of moving all first-class mail by air because of the experiment's impact on the transportation industry.

Rep. Katharine St. George, subcommittee chairman, says: "The effect of the current experiment in transporting first-class surface mail by air on a space available basis is reflected throughout the entire transportation field . . . The experiment has caused great concern on the part of railroads, which fear a wholesale diversion of first-class mail from rail to air transportation.

"The regularly scheduled airlines, now participating in the experiment, favor expansion of the program. Local service air carriers wish to be brought within the experiment in order to demonstrate their ability to transport such mail in great volume at reduced costs.

"The effect of this experiment on the industry has apparently been profound. It must necessarily receive close attention . . ."

▶ **Industry Views**—American Trucking Assn., as well as airline associations, support the shift of first-class mail to air. Highlights of statements to the subcommittee by different segments of the industry:

• **Association of American Railroads:** "The railroads doubt that there are many instances where present surface mail can be carried quicker and cheaper by air, bus, or truck than by rail. They are concerned by recent actions and publicity to the effect that substantial volumes of surface mail will or might soon be diverted from railroads to motor and air carriers . . . There is grave doubt as to whether railroads can move forward in the face of threats of wholesale diversions, with programed capital expenditures for improvement of railroad service for mail."

• **Air Transport Assn.** estimates the transport of all first-class mail by air, when delivery would be expedited, "would decrease the total operating revenues of the railroads by less than one-quarter of 1%."

• **American Trucking Assn.** recommends that "all non-local first-class mail be transported by air whenever this would advance delivery."

• **Air Coach Transport Assn.** declares that "most of the mail now being transported by surface can be more efficiently and economically transported by non-subsidized airlines" and urges legislation to permit bulk shipments by non-skeds, "separate and distinct from the service now being rendered by the scheduled airlines."

• **Independent Military Air Transport**

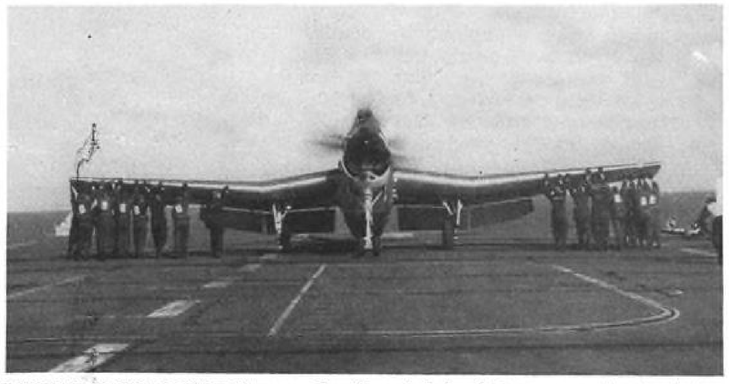


GEAR AND FLAPS DOWN, arresting hook lowered, Fairey Gannet anti-sub plane comes in for a carrier landing. Gannet has an Armstrong Siddeley Double Mamba turboprop engine. First planes are being delivered to the British Navy's Fleet Air Arm.

Royal Navy Gets Anti-Sub Gannet



DOUBLE-JOINT WING FOLD is highlighted as Gannet runs up one unit of its dual powerplant. Front four-blade coaxial Rotol propeller is turning, rear unit is feathered. Props are free contra-rotating (a Fairey conception), as distinct from geared method.



INVERTED GULL WINGS are another Gannet design feature, as are the plane's large flaps. Here pilot is running both units of Double Mamba engine. Production plan utilizes Fairey-developed "envelope jigging" method (Aviation Week Jan. 30, 1950, p. 27).

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—50 to +300°C Bearing Temp. . . .
0 to +1000°C Exhaust Temp.



MODEL 49B

MODEL 49B, 1⅞" case to AND 10403
—50 to +300°C Cylinder Temp. . . .
0 to +1000°C Exhaust Temp.



MODEL 76B

MODEL 76B dual, 2¾" case to AND 10401
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MODEL 47B, 1⅞" case to AND 10403
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MODEL 77B

MODEL 77B dual, 2¾" case to AND 10403
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+30 to +230°F Oil Temp. . . .
+100 to +300°C Cylinder Temp.

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Assn. complains that "unless arrangements are made for movement of first-class mail on a plane-load basis, the Post Office Department will have failed in determining how and in what manner greater economy and efficiency can be achieved."

• **Civil Aeronautics Board** supports the utilization of local service lines in shipments of surface mail.

• **National Postal Transport Assn.**, representing 30,000 postal workers, expresses "grave doubts as to the legality of transporting three-cent first-class mail by air except in emergencies." Objecting to the curtailment of in-transit distribution of mail on railroads, the association complains that "the flying experiment, which further curtails distribution in transit, tends to accentuate this problem."

CAA Reports Navaid Growth in 15 Nations

Substantial progress in standardization of flying aids is being made on airways throughout the free world, three Civil Aeronautics Administration officials report after a recent tour of 15 countries.

"Best example of progress these days is the growing number of VORs which are appearing on world airways," says Frank C. Stone, administrator of CAA's International Region.

▶ **ICAO Standard**—"This is the short-range navigational aid adopted by the International Civil Aviation Organization as standard, and it is the aid with which most of our 70,000 mi. of U.S. airways now are equipped," CAA's international chief says.

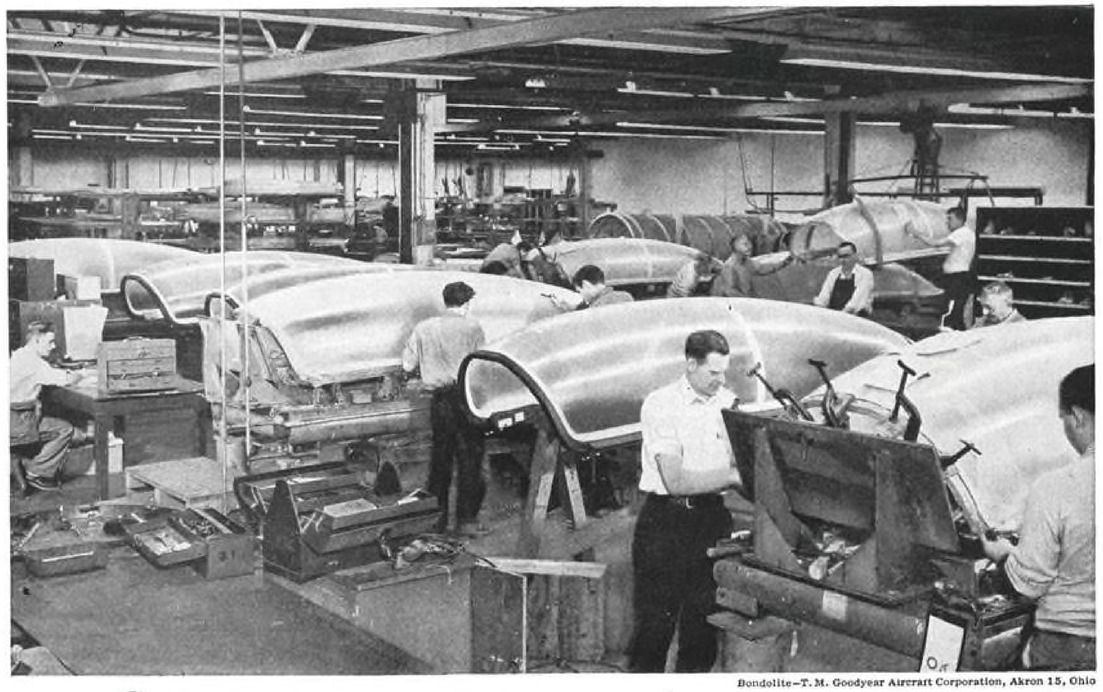
"In Europe, North Africa and West Asia, there are now 33 VOR ranges either in operation or in various stages of installation, and the program for the next fiscal year calls for some 38 more."

Stone was accompanied by Kirby L. Brannon, CAA communications and radio specialist, and George S. Moore, chief of CAA's Scheduled Operations Branch.

▶ **No Big Problems**—Major progress has been made in communications, according to Brannon, although standardization of equipment and methods is not as pronounced in this field.

"Whereas the United States is shifting almost completely to very high frequency radio communications for air-to-ground operations, both the very high and the high frequency systems are in operation abroad," he says.

"U.S. International carriers, however, are equipped to use either, so no major problem exists. Fast and dependable communication on the ground between major traffic points now is the principal problem to be solved."



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



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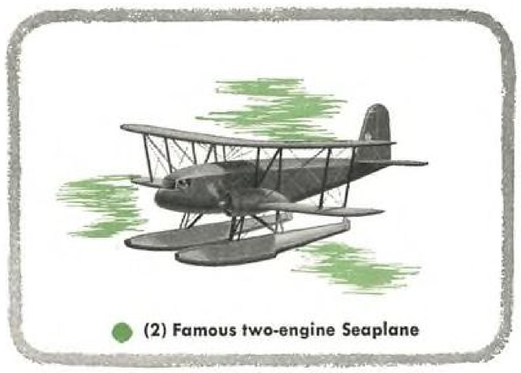
GOODYEAR AIRCRAFT

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Plants at Akron, Ohio and Litchfield Park, Arizona



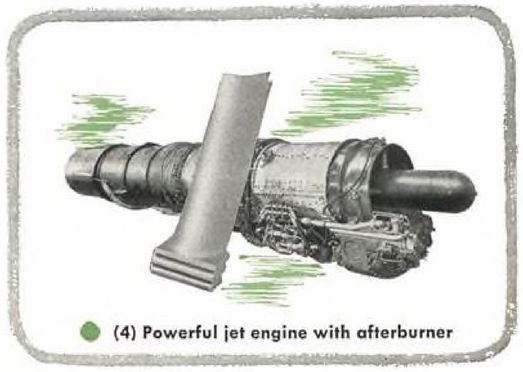
(1) French Fighter of World War I



(2) Famous two-engine Seaplane



(3) New Navy interceptor



(4) Powerful jet engine with afterburner

Performance made the aircraft in panels 1 and 2 noteworthy in their day. The famous French Nieuport Scout (panel 1) was a tricky, highly maneuverable fighter of World War I days. The bulky Curtiss Wright Condor (panel 2) with its two 700 h.p. engines, could pull a heavy load through the skies. In panels 3 and 4 are two modern performers . . . the Douglas F4D Skyray interceptor and the famous Westinghouse J-46 engine with afterburner. Blades for the J-46 were manufactured by a technique with an outstanding record in the metalworking field . . . the Microcast process of precision investment casting.

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Maintenance Training Lags, Survey Shows

A survey of 32 of the largest commercial airlines reveals that only seven are training apprentices in maintenance and repair, Department of Labor reports.

Labor's Bureau of Apprenticeship during 1953 conducted a campaign to encourage development of additional training for maintenance personnel in the air transport industry. Twelve additional carriers now are considering establishing apprentice training programs.

Most of the carriers provide short-term training in specialized aspects of maintenance and repair, Labor says.

► **Employment Gains**—The department points out that employment in air transport has increased 10-fold in the last 20 years. Airlines employed 104,000 persons in January 1954, compared with 10,000 in 1934.

"As a result of the continuing expansion of air transportation, coupled with increasing complexity of planes and equipment," Labor reports, "there will be an increasing need for aircraft mechanics and other trained maintenance personnel.

"Such workers now comprise roughly one-third of all airline employes. Moreover, a considerable number of aircraft mechanics are needed to service aircraft operated by business organizations for their own use and also to maintain the planes that are used for forest fire control, crop dusting, and other agricultural service.

"Aircraft and engine mechanics have been in short supply for several years and this trade is listed in the Department of Labor's list of critical occupations."

► **Advantages**—Labor cites these advantages of an apprentice training program: "One of the larger airlines with a long-time apprenticeship program reports that the value of this type of training is becoming increasingly apparent. A high proportion of the mechanics currently employed by this carrier are products of its own apprenticeship program.

"Moreover, the all-around training provided during apprenticeship has proved to be very helpful in the development of supervisory personnel. Most of the key officials in the carrier's maintenance department are former apprentices."

Bunker Buys Block Of Martin Common

Biggest stock transactions recorded during March within the aviation industry was the acquisition by George N. Bunker, board chairman and president of Glenn L. Martin Co., of 217,053 Martin common stock shares through the Wealden Co., Securities & Exchange Commission reports.

Bunker holds 1,900 common shares personally and 217,153 shares through the Wealden Co. John L. Sullivan, director, bought 2,000 common shares, bringing his total to 3,000. J. B. Wharton, Jr., officer, bought 4,000 common shares, his total common holdings.

Other stock transactions included:
American Airlines: P. G. Larie, officer,



Air-India International Gets Super Connie

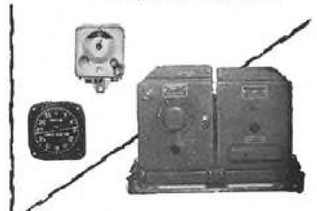
Here is the first of Air-India International's Lockheed Super Constellations en route to India with a stopover scheduled in Amsterdam, where a special galley will be installed. The plane will go into service on the Bombay-Calcutta-London route, carrying 59-63 first-class passengers. Air India recently increased its Wright Turbo Compound-powered Super Connie order from two to five planes. In addition to India-U.K. service, the planes may be used on new routes. A strong rumor indicates that the airline will extend the Nairobi route to West Africa, South America and the U. S., Lockheed reports. The new Super Connies will supplement four Connies now flying on the airline's long-range routes. These may be assigned to India-Japan and India-Kenya services, according to the transport manufacturer, indicating further expansion.

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sold 200 common shares, his total holdings.

Bell Aircraft Corp.: Julius J. Domonkos, officer, sold 800 common shares leaving him 1,000 total.

Bendix Aviation Corp.: Malcolm P. Ferguson, officer, bought 300 common shares making his total 1,263; C. S. Harding Mott, director, sold 6,000 common shares held through the C. S. Mott Foundation, leaving him 10,000 shares.

Boeing Airplane Co.: William M. Allen, president, acquired as compensation 148 common shares bringing his total to 3,848; Wellwood E. Beall, officer, acquired as compensation 104 common shares making his total 996.

Capital Airlines: James W. Austin, officer, bought 1,100 common shares making his total 10,000; Thomas D. Neelands, Jr., director, bought 200 common shares bringing his total to 3,200.

Consolidated Vultee Aircraft Corp.: Edmund Burke, officer, sold 100 common shares, his total holdings; John Hertz, director, acquired through Lehman Bros., 9,400 common shares making his total 9,500.

Curtiss-Wright Corp.: William T. Lake, officer, bought 100 common shares bringing his total to 300.

Eastern Air Lines: Stuyvesant Peabody, Jr., director, sold 400 common shares leaving him 500; Laurance S. Rockefeller, director, bought 6,060 common shares making his total 80,000.

General Dynamics Corp.: Carleton Shugg, officer, bought 625 common shares and sold 500 common leaving him 1,625 total.

Lear Inc.: Harold R. Boyer, director, bought 500 common shares, his total common holdings. William P. Lear, director, sold 26,500 common shares, leaving him 409,462 common total, and transferred 8,000 additional shares held through a trust as part payment for real estate; of this holding, he retains 30,750 common shares. Charles Luckman, director, bought 1,000 common shares, his total common holdings.

Lockheed Aircraft Corp.: K. V. Sampson, officer, bought 950 capital shares making his total 1,732; L. W. Wulfekuhler, officer, bought 1,500 capital shares.

McDonnell Aircraft Corp.: Garrett C. Covington, Jr., officer, sold 200 common shares leaving him 1,950 total; Thomas G. Rutledge, director, sold 200 common shares, his total common holding.

National Aviation Corp.: Frederick F. Robinson, officer, sold 200 common shares leaving him 300 total.

North American Aviation Inc.: James H. Kindelberger, board chairman, bought 500 capital shares bringing his total to 1,750.

Northwest Airlines Inc.: Wheelock Whitney, director, bought 100 4.6% preference stock shares making his total 700.

Pan American World Airways: Sherman M. Fairchild, director, sold 2,000 common shares leaving him 11,700 total.

Ryan Aeronautical Co.: Emtor Inc. bought 500 common shares making total holdings of 84,000 shares.

Seaboard & Western Airlines Inc.: Carl D. Brell, officer, sold 300 common shares leaving him 30,825 total; Wallace P. Neth, director, disposed of 500 common shares held jointly with J. G. Neth leaving him with 28,049 of that type holding; Arthur V. Norden, officer, sold 700 common shares leaving him 33,521 total.

Solar Aircraft Co.: Ewart W. Goodwin, director, redeemed 200 preferred shares, his total holdings.

Sperry Corp.: Bert T. Oakley, officer, sold 300 common shares, his total holdings.

United Air Lines: R. F. Ahrens, officer, sold 100 common shares leaving him 552 total; S. P. Martin, officer, sold 200 common shares, his total common holdings.

United Aircraft Corp.: Frederick O. Detweiler, officer, bought 1,112 common shares bringing his total to 1,612; Charles J. McCarthy, officer, bought 1,000 common shares making his total 1,180; Joseph P. Ripley, director, bought 500 common shares bringing his total to 1,500, and William R. Robbins, officer, bought 4,000 common shares making his total 5,300.

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LETTERS

GCA Vet Speaks

Being one of the oldest GCA men still active in air traffic control, I appreciated your backing up the Biggs Field GCA unit in your Letters column May 10. I have taught GCA, worked as an operator, and done some field experimental work on it.

Brother Pooley's informant was all wet. The GCA course at Keesler AFB, Miss., is 12 weeks long, and the operator usually goes through the Control Tower Operator's Course and/or the Air Traffic Control Operator's Course before even entering GCA school.

As far as the 370-degree turn, I have no idea whether or not this is the reason the turn was given, but number of times we have told a ship to "Make a 720-degree turn to the right (or left) for identification," and I am quite cognizant of the fact that there are only 360 degrees in a circle.

Quite often we have an aircraft turn, for example, right from 090 degrees to 360 degrees. We do this because we know that most pilots will normally turn to the left to arrive at the northerly heading, so we can safely assume that the "blip" which makes the unusual turn, is the one we are directing.

Mr. Pooley mentions watching pilots making GCA landings when ceilings were as low as 200 ft. He ought to check his Radio Facility Chart and he would find that most Air Force bases have a minimum of 200 ft. There is nothing unusual about that.

Back in 1945, when I first got into GCA, there were no published minimums. We used to bring the ship right onto the deck, and we have even given slight corrections after he hit the deck, while he was still in the first half of the runway. Check some of the old Army Air Force records on GCA runs at the old GCA school at Ft. Dix Army Air Base (now McGuire AFB, N. J.) the last of 1944 and the first of 1945.

You hit the nail right on the head when you mentioned the USAF-CAA feud. Look for the same situation in the area of Tampa, Fla., concerning who will have the jurisdiction of the traffic around Tampa Municipal and MacDill AFB. As usual, CAA doesn't believe radar traffic control is here to stay, except for monitoring ILS (ugh!!).

By the way, the final controller (I notice he was the most experienced man) is the logical man to give the instructions which were given to the B-36. That would indicate to me that the man who was giving the "wave-off" was a lot more qualified for his job than Mr. Pooley is to judge what is a good or bad "run."

For obvious reasons, I wouldn't care to be quoted, by name, on any of the foregoing —afraid the USAF might not appreciate my slant on it. I will admit I am a little bitter about the way CAA, as a whole, has handled this radar air traffic control problem. They sure are missing a good bet. We are proving that, every day, in the Air Force. We can handle it safer, faster and with less confusion thanks to radar, and I hate like heck to see somebody go off "half-cocked" and critize it when they apparently know nothing about it.

R. P.
USAF

(The writer's name is omitted by Aviation Week, *as he requests.—*Ed.

Tribute to Gen. Van

For many years I have been a fervent reader and admirer of your publication, but never have taken the time to congratulate you and your staff on the excellence of your efforts with Aviation Week. However, at this time I am writing you for a favor, and at the same time want to compliment you on your good book.

The favor really isn't such, but merely a respectful request for a glossy print copy of the photograph that is on page 16 of





The skill of a World War I pilot's flying was mostly an intuitive feel of his plane. Nowadays, supersonic speeds, tight formations, and hazardous night flying require more than flying by the seat of your pants.
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your Apr. 12 issue. That picture had more punch than 20 editorials concerning the fight for airpower. I knew General Van as all of us must have one way or the other, and would treasure a copy of this photograph, if you could make one available.

Be assured your courtesies will be appreciated.

THOMAS F. STACK, National Director
Air Force Assn.
1424 K St., N. W.
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Air Revolution

Captain Rickenbacker's prediction that tourist class or coach service is certain to replace the so-called first-class market as a primary source of revenue for airlines may, as you said in your editorial of May 10, confound some parts of the airline industry.

There are, however, approximately 70 international operators to whom these views are not quite that new or startling. The operators of scheduled international services are quite cognizant of this as far back as the IATA Traffic Conferences at Cannes in 1952, and I believe that you had at the time a copy of the statement by their chairman, Mr. Dennis Handover, that the agreement on tourist fares reached there represented "almost an economic revolution in air transport."

Mr. Handover went on to point out that "by the time these services have been put fully into operation the major portion of international air passenger traffic will be carried on tourist rather than first-class flights and the economic basis of the industry will be mass rather than de luxe transport."

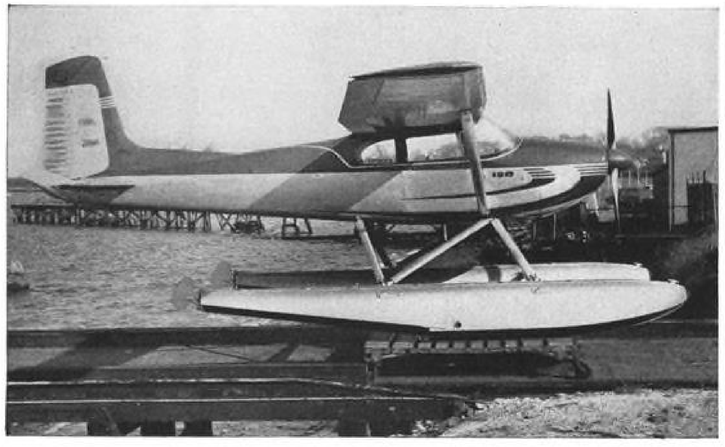
These views and all of the further conclusions which can be drawn from them, have been reiterated many times in the interim and the IATA conferences have now extended their international tourist services to cover virtually all of the globe.

All of this will, of course, be known to you, but I feel that the magnitude of the revolution which has taken place in air transportation on a global basis through the orderly and democratic processes of the IATA conferences may not be sufficiently realized.

S. RALPH COHEN
Public Relations Officer
International Air Transport Assn.
Montreal 3, Canada

NEWS Edo NOTES

NEW LOWER COST FLOATS ANNOUNCED



Good news for charter operators and seaplane owners comes from Edo. For aircraft in the Cessna 180 class (2500-2700 pounds gross weight as a landplane), a new float with improved performance and increased buoyancy has been developed and is now on the market.

Known as model 2870 (2870-pound displacement per float), the new floats replace model 2425. They have new, gracefully curving bow section and greatly improved rubber bow bumpers, easily removed. They retain the famed Edo fluted bottom for maximum performance. Rudder control is also greatly improved.

Despite these improvements and increased displacement, the 2870's are priced at $3,995—$1,605 less than last year's price on the 2425's.

Edo CORPORATION
Since 1925 COLLEGE POINT, NEW YORK

Support for Soaring

We were very pleased to see the editorial in AVIATION WEEK, May 3, 1954, "We Can't Afford a Soaring Team?", and I am quite sure that it will be a big help in raising funds for the International Team. We will keep you informed on the results we have with this drive, as well as to send you other details once the team is a sure thing.

PAUL A. SCHWEIZER, Secretary
Soaring Society of America
Elmira, N. Y.

Keeping Engineers

We appreciate the permission to reprint the article on "How to Get and Hold Your Engineers" taken from the Feb. 1, 1954 issue of AVIATION WEEK (p. 35).

G. E. RANDALL, Manager
Technical Information Branch
Aro, Inc.,
Tullahoma, Tenn.

Tube Reliability

I would like to express my appreciation for the accurate coverage Phil Klass gave my talk on aircraft electron tube reliability Mar. 22 in AVIATION WEEK (p. 34).

A number of requests for copies of the original paper have been received, all of them referring to AVIATION WEEK. I feel sure that his article has materially contributed to a clearer understanding of the problem of reliable tubes for guided missiles.

R. E. LANIER
Reliability Design Group
Chance Vought Aircraft, Inc.
Dallas, Tex.

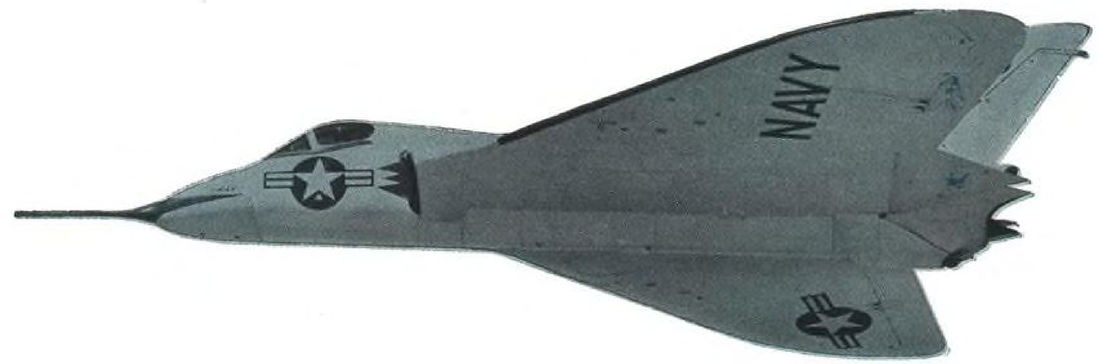
Praise

We are all very pleased with the way David Anderton's article on All American was written and presented in the May 10 AVIATION WEEK. He did a splendid job in a workmanlike manner and deserves special commendation.

CHARLES W. WENDT, President
All American Engineering Co.
Sussex County Airport
Georgetown, Del.

(The writer ordered 1,000 reprints of the article.—ED.)

Who designed and built the Afterburner Temperature Control for the record-breaking Douglas F4D Skyray?



The Afterburner Temperature Control on the Westinghouse J 40 turbojet which powered the history-making U. S. Navy's Skyray is a development of the Aircraft Products Division of Manning, Maxwell & Moore, Inc.

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We emphasize system design which adheres to developed components whenever practicable — design which requires no modification of the basic jet engine governing system.

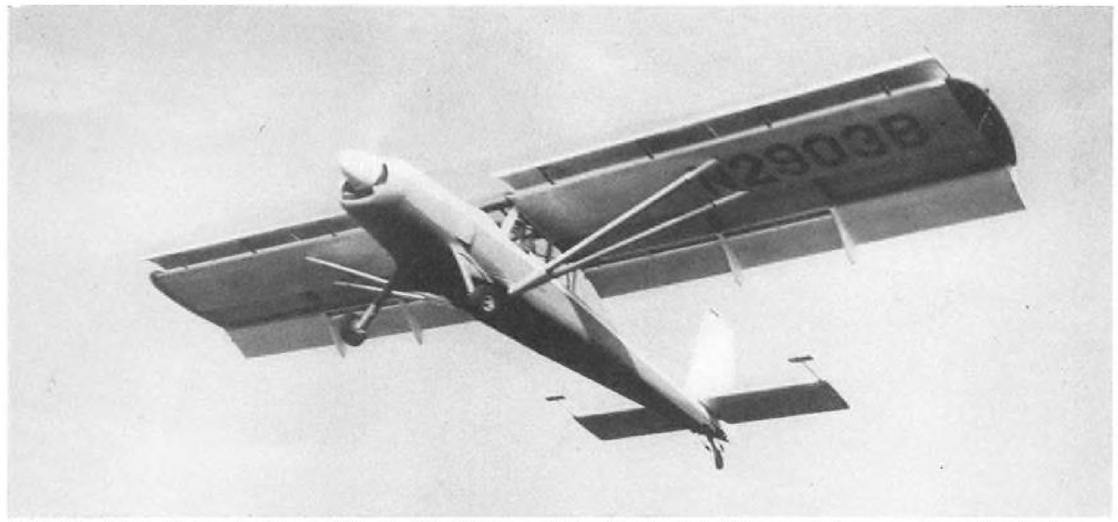
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Your inquiry is invited.

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SKYLARK SRX-1 climbs out of short field with high-lift flaps and shrouds extended. Note mass balance on all-movable elevator.

Skylark Designed for Vertical Flight

Robertson aircraft combines unconventional ideas to get unusual performance; Army to pay for certification tests.

By David A. Anderton

The sleek but conventional lines of the Robertson Skylark SRX-1 hide a collection of unconventional ideas which the designers believe will give vertical-flight performance to a fixed-wing airplane.

• **The ideas:** A high-lift wing using a combination of flap and slat to produce a flight-tested maximum lift coefficient above five; an unusual control system independent of relative forward speed; a different application of gas turbines for propulsion.

• **The designers:** Sparkplug of Robertson Development Corp. is 27-yr. old James Robertson, son of the late W. B. Robertson who designed the famed Monocoupe of the late '20s. Associated with him is a young and enthusiastic group of part-time engineers and technicians who designed and built the prototype Skylark.

• **The planes:** Skylark SRX-1 is a five-place prototype, built as a flying test-bed for the aerodynamic principles in the design. It has completed about 58 hr. of flight time. Next step is certification tests, and after that, Robertson plans limited production of a pair of airplanes based on the SRX-1 and powered by reciprocating engines. Ultimate goal of the program is a turbo-prop-powered plane capable of taking off and landing in zero distance.

Certification tests will be paid for by Army Transportation Corps under a unique agreement just negotiated with Robertson. Army purchases flight time on the Skylark prototype, thus gets necessary test data for evaluation.

▶ **Performance**—The prototype Skylark is powered by a 260-hp. Continental engine. With a normal useful load of 1,250 lb., the plane has established these performance marks, used as the basis for the company's performance guarantees:

• Takeoff and landing distance, 100 ft.; takeoff over a 50-ft. obstacle, 350 ft.; landing distance over a 50-ft. obstacle, 300 ft.

• Cruising speed at 10,000 ft. and 75% power, 150 mph.

• Maximum speed, level flight, 163 mph.

• Minimum speed, level flight, power on, 24 mph.

• Power-off lift coefficient, 5.0 plus.

▶ **Theme With Variations**—With this kind of test data to build on, Robertson has planned three production airplanes to follow in logical succession. Sharing a basic airframe, the three differ in details of wing area and propulsion system.

• **Model SRN** is the basic production model powered by a 360-hp. reciprocating engine. Landing gear is fixed, and wing area is 240 sq. ft. Normal gross weight is 3,500 lb. Chief design consideration was short-field performance.

• **Model SRC** is the same airplane as SRN, but with half the wing area and retractable landing gear. Chief design consideration was highspeed cruise with reasonable landing and takeoff distance.

• **Model SGTC** is the turboprop-powered airplane which Robertson believes will be capable of vertical performance. The common airframe has been designed around the propulsion system for this airplane. Production of the SGTC will be deferred, the firm says, until the propulsion system has been adequately developed.

▶ **Design Elements**—Robertson says that there are four practical considerations in obtaining vertical flight performance, and that they govern the design of the Skylark project. First, the thrust must exceed the gross weight of the airplane. Second, the design must have a high-lift wing capable of using the propeller slipstream velocity. Third, controls have to be independent of the relative wind. Fourth, the ground attitude angle has to be greater than the hovering attitude.

Solving the thrust problem was quite easy. Robertson says that the high thrust-weight ratio of the gas turbine made it the natural choice. But how many engines to use and where on the aircraft to locate them took more study.

The group concluded that paired engines driving counter-rotating coaxial propellers would be the answer. This way, a pilot could shut down one engine and cruise on the other at its best specific fuel consumption; in addition, there would be a margin of saftey—should an engine quit on takeoff—that might not be available if the engines were individually mounted outboard on the wings.

Performance estimates using gas turbine power were so outstanding that Robertson decided that the same configuration powered by a reciprocating engine would have excellent performance. This led to the decision to design the airframe for both kinds of powerplants.

▶ **Powerplant Elements**—Continental-built Turbomeca Artouste 2 gas turbines are planned for the Skylark SGTC. A Continental GSO-526 reciprocating engine, driving a Hartzell 100-in. prop, powers the prototype.

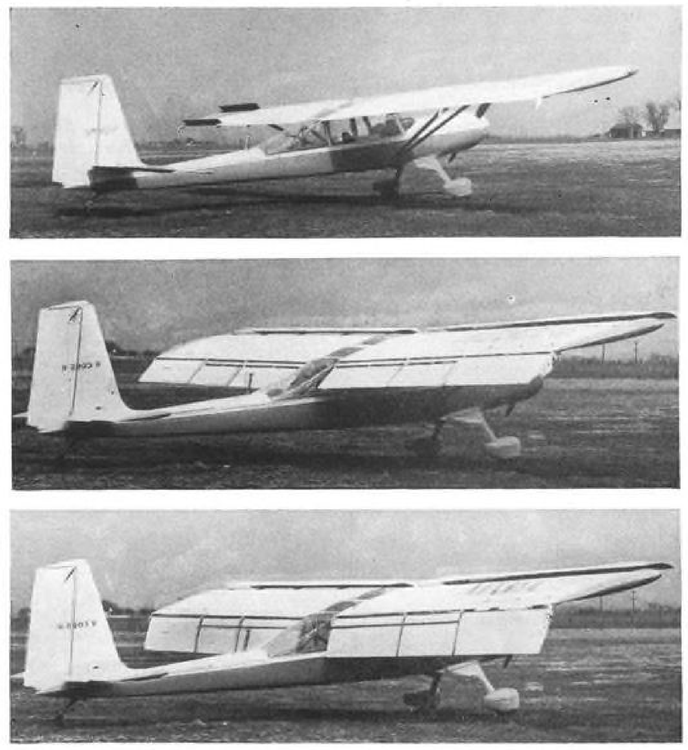
Static thrust on the prototype has been measured at about six pounds per horsepower.

The unusual feature of the gas turbine powerplant is that it does double duty as an element of the control system. By varying the collective pitch between the clockwise and counter-clockwise props, a torque is produced on the airframe. This torque—equal to the net difference between the two prop torques—increases in effectiveness as forward speed decreases and reaches a maximum at zero forward speed. This torque supplements the spoiler lateral control system.

There's one other different idea in the powerplant: a declutching system to separate props from engine drive. In case both engines fail during final approach, the pilot can descend with the props in autorotation and let them windmill to a high rpm. Just before touchdown he can throw the props into high pitch and use the inertia of the system to give him temporary thrust and control.

▶ **High-Lift Devices**—Robertson wanted to get maximum effectiveness out of the wing; to do this, the wing must have a large section wetted by the slipstream. Further, it must be stall-resistant and should develop its high lift coefficients at a relatively low angle of attack.

In addition to all this, the wing has to be as clean as possible so that its drag is minimized. This established a set of limits for wing loading, because a wing large enough to have high-lift



SKYLARK WING shows tandem spoilers extended (top), high-lift flaps and shroud in takeoff position (middle) and extended for landing (bottom).

Skylark Performance Characteristics

Sea Level Standard Conditions
No Wind

	Prototype Model SRX-1	Production Model		
		Model SRN	Model SRC	Model SGTC
Rated horsepower	260	360	360	800
Wing area (sq. ft.)	240	240	120	120
V/dive	185 mph.	255 mph.	298 mph.	352 mph. (800 hp.)
V/max (level flight)	163 " 1	218 "	253 "	335 " (800 hp.)
V/cruise (10,000) (75% power)	150 " 1	200 "	233 "	254 " (360 hp.)
V/cruise (sea level) (75% power)	152 " 1	178 "	208 "	232 " (360 hp.)
V/min (power off)	29 " 1	29 "	41 "	41 "
V/min (power on)	24 " 1	24 "	34 "	0 "
Takeoff distance (ground run)	100 ft.[1]	100 ft.	250 ft.	vertical
Takeoff distance over 50 ft. obs.	350 " 1	350 "	510 "	flight
Landing distance (ground run)	100 " 1	100 "	230 "	operation
Landing distance over 50 ft. obs.	300 " 1	300 "	500 "	
Cruising range (20% fuel reserve)	300 naut. mi.	600 naut. mi.	600 naut. mi.	600 naut. mi.
Endurance (20% fuel reserve)	5 hr.	8 hr.	8 hr.	2.8 hr.
Fuel capacity	40 gal.	100 gal.	100 gal.	150 gal. (plus tip tanks)
Empty weight	2,250 lb.	2,250 lb.	2,250 lb.	1,950 lb.
Useful load (normal)	1,250 "	1,250 "	1,250 "	1,550 "
Gross weight (normal)	3,500 "	3,500 "	3,500 "	3,500 "
Useful load (utility)	4,000 "	4,000 "	4,000 "	4,300 "
Gross weight (utility)	6,250 "	6,250 "	6,250 "	6,250 "

[1] *This performance established by flight test.*

characteristics alone would be prohibitively oversize. Thus the design path leads to extensive use of high lift devices with a moderate wing area.

Robertson argues that there is really no need for using any more wing area than can be kept in the slipstream, because the greatest demand for lift is in the takeoff, landing and hovering conditions. He says that a small, heavily loaded wing—and he is thinking of wing loadings around 29 psf. when he says "heavy"—appears attractive because it maximizes cruise performance and will still give, because of the high lift coefficients, normal landing and takeoff speeds.

But there is a strong argument for going to a lighter wing loading, something on the order of 15 psf. With this loading, as on the prototype airplane, extremely short landings and takeoff can be made, and the minimum flight speed gets very low.

The solution: Use two sets of wings to provide two different airplane designs with the same basic fuselage. Robertson has done that; each wing has an identical section and chord so that they are interchangeable on a given fuselage, but wing "N" has 240 sq. ft. area and gives a normal wing loading around 14.5 psf., and wing "C" has 120 sq. ft. area and has a 29-psf. wing loading.

► **Flap Details**—High lift on the Robertson wing is accomplished by the RDC flap, designed to be the most effective trailing-edge device which could be produced by current, simple techniques.

The RDC flap combines the Fowler with the double-slotted flap. Retracted, it fairs into the wing with almost no increase in drag; extended, it is equivalent to a 40%-chord double-slotted Fowler flap deflected through 70 deg.

Such a large flap gives high negative pitching moments when extended and high loads during the extension. To balance this, Robertson developed a slat or shroud with a 30% wing chord. Normally retracted, the shroud extends forward about 28% of the chord and upward relative to the wing for the Skylark's landing and takeoff.

The shroud balances about 80% of the flap pitching moments, so that a normal size horizontal tail can be used, and the balancing tail load need not be unduly high, thus making more total lift available for landing. But the shroud also provides these advantages:

- **Prevents stall** up to 41 deg. angle of attack.
- **Increases actual lift** by increasing the wing area 28%.
- **Increases lift coefficient** by increasing flow velocity over the wing.
- **Acts as a flap servo** to feed back its own forward air loads into the flap extension system through a mechanical linkage. High flap loads are overcome mostly by the shroud loads.

Robertson has shown a flight-test maximum lift coefficient of 5.25 based on the original unflapped wing area of the Skylark.

► **Control System**—An airplane with an extreme speed range requires unconventional controls, and the Skylark is no exception. Longitudinal and directional controls are all-movable surfaces hinged at the quarter-chord line; lateral control system is spoilers plus the use of different prop pitch.

The prototype Skylark was built with fixed fin and movable rudder of large chord, but production airplanes will have the all-movable surface. Both surfaces are equipped with anti-balance tabs to give the pilot a stick force for feel. Both surfaces have mass balances to prevent highspeed flutter, and tabs also have mass balance.

Robertson says that one of the reasons for the excellent lowspeed control characteristics obtained in flight tests of the prototype has been the slipstream. Calculations indicate that the upper third of the theoretical slipstream cylinder wets the tail surfaces. If the plane is standing still on the



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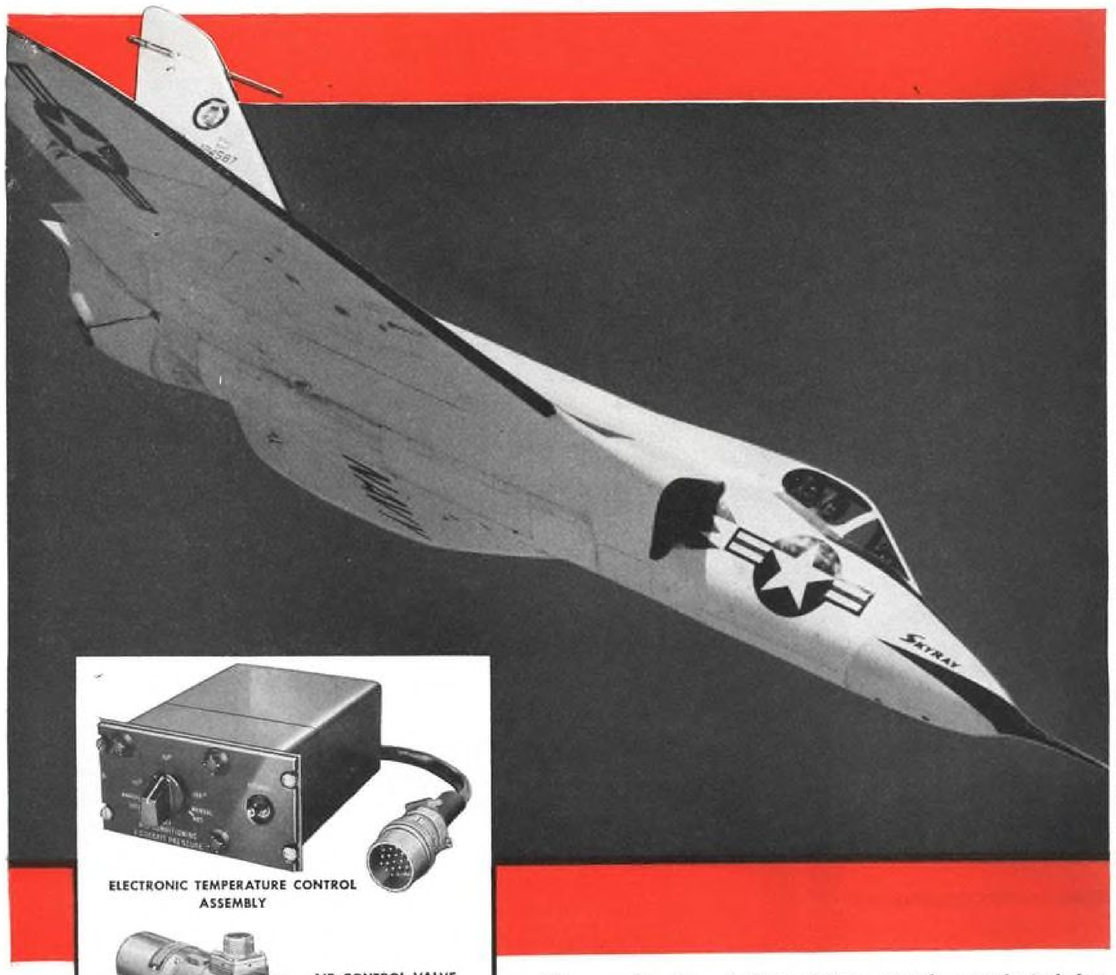
TEMPERATURES MADE TO ORDER

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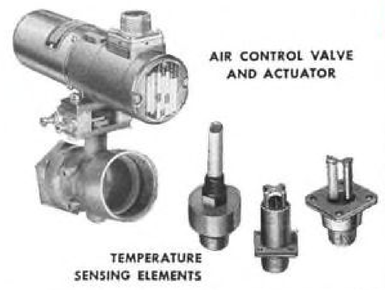
BARBER COLMAN Aircraft Controls

compact, lightweight assembly for accurate temperature control on new Douglas F4D-1

Outside air temperature changes come fast to the F4D-1 Skyray, which is capable of climbing to 50,000 feet and operating aloft at supersonic speeds. To maintain a constantly comfortable cockpit climate in this swift interceptor, a greatly improved electronic temperature control system has been developed by Barber-Colman engineers working in close co-operation with Douglas Aircraft Company. This system includes new high-response sensing elements, lightweight air control valve and actuator, and an exceptionally compact control unit which is an integral part of the instrument panel. Total component weight of the system is only 7.3 lbs. Whenever you have need for highly dependable temperature controls, specifically designed to the particular needs of your application, consult Barber-Colman Company.



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ground under full power, the slipstream velocity at the tail is 38 mph. Extra assistance comes from the long tail length, corresponding to 320% of the mean aerodynamic chord.

▶ **Spoiler System**—Robertson selected a spoiler control because he wanted to use the entire trailing edge of the wing for flaps. He found that a trailing-edge spoiler was very responsive, but lacked effectiveness; a forward spoiler was effective, but there was an unacceptable time lag between application of control and response.

The answer seemed to be two spoilers on a side, and that was chosen for the final configuration. Spoilers are mounted at 30% and 90% positions of the wing chord.

There is a trick in the location of the rear spoiler, because its position has been selected to open the gap between flap and wing when the flaps are down. This reduces the flap lift increment. Flight tests on the prototype have shown the response in roll and control effectiveness to increase with flap deflection, so that ample lateral control is available right down to the 25-mph. minimum speed of the prototype Skylark.

Below this speed, Robertson suggests that a second spoiler pair within the slipstream, plus the differential pitch control on the props, should take effective lateral control right down to zero airspeed.

Stick forces with the spoilers have seemed satisfactory, Robertson reports. The gradient is favorable in clean and high lift conditions, and increase slightly when shrouds are extended.

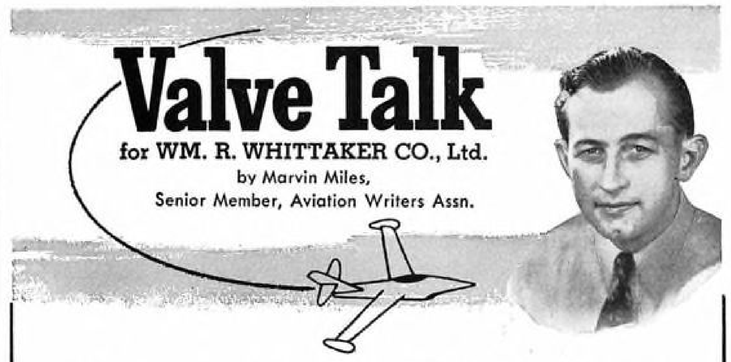
A gust lock has been developed by Robertson to enable a pilot to make abrupt descents without increasing his forward speed, or to make taxiing easier under high wind conditions. If he suddenly wants less lift, he actuates the gust lock and both spoilers on both wings are raised to 45-deg. deflection. Lateral control still is available because the full deflection of the spoilers is 80 deg. and only 45 deg. is used in the "gust lock" condition.

▶ **Construction**—The interior design of the Skylark is conventional and simple, by which two features Robertson hopes to keep first cost and maintenance costs to a minimum.

Fuselage is steel tubing forward, for impact resistance in the case of a crash landing, and the rear fuselage is monocoque. Tail surfaces are built-up sheet metal construction.

Although the prototype uses conventional landing gear, both models SRC and SGTC—which have the small wing area—will have bicycle landing gear with outriggers in the wings. The reason: to enable the pilot to raise the nose to takeoff attitude with the eleva-

(Advertisement)



Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.

One morning early in 1940 I opened the paper to gaze upon a photo I shall never forget. It showed a man in a business suit, white shirt, dark tie and hat seated nonchalantly on the front end of an open-air tubular rig that floated just above the heads of several spectators at Bridgeport, Conn.

"Inventor Igor I. Sikorsky demonstrates direct-lift flying craft of his own design," the caption explained.

It seems incredible that this occurred but 14 years ago, for in these few fast-moving years this phase of the industry has boomed to great importance.

Sikorsky, of course, is the recognized "father" of the helicopter industry in the United States—an industry that has grown from his original VS-300 (first flown in September, 1939) to a field of 17 manufacturers turning out everything from tiny, single-place ships to giant tandem-rotor craft accommodating 40 troops.

The Aircraft Industries Association estimates the nation's manufacturers have produced approximately 3000 helicopters in the last seven years, since the first eggbeater was certificated, and says employment in the field last year was about 14,000 persons with an annual payroll of approximately $52,000,000.

It's intriguing to look into the past, to see reproductions of "aerial screw" sketches by Leonardo da Vinci (1483), the complicated and cumbersome dreams of Adolphe D. Lambertye (1818), Sir George Cayley (1843), Gustave D'Amecourt (1861), Enrico Forlanini (1877) . . .

And to study the early 20th Century wheel-and-paddle inventions of Charles Renard, Paul Cornu, Louis Breguet, Emile Berliner and J. C. H. Ellehammer. The strange craft of these far-seeing pioneers took the first feeble jumps in this great saga, struggling off the earth for a few feet.

As the years went on, the parade of success and failure inched ahead until Juan de la Cierva of Spain opened new vistas in 1923 with his autogiro, the rotary wing craft that relied not on direct power to turn its blades, but on the relative air stream. Later Pitcairn and Kellett were to refine the autogiro principle in the United States.

As I look back there is a void in my memory between the autogiro that brought gasps from spectators at the National Air Races in 1929, and the 1940 picture of Sikorsky's VS-300.

Somehow I missed the fact that Focke-Achgelis in Germany had produced in 1937 a controllable, twin-rotor ship that stayed aloft an hour and 20 minutes, attained 76 m.p.h. and 11,243 feet.

Then, on May 6, 1941, Sikorsky took the VS-300 aloft and stayed airborne for one hour, 32 minutes and 30 seconds, a new world record.

Since then the chuf-chuf-chuf of the rotary wing has become familiar in Korea, in air mail and express schedules, in utility uses such as power line inspection and mapping flights and in passenger operations as well.

You can't fail to be impressed by the "mad palm trees" when you ride with an Air Force rescue outfit, or fly on and off a carrier with the Navy, or bounce through the tight-schedule, pogo-stick operation of an air mail flight, or see the Belgian countryside on a regular passenger hop with Sabena Airlines.

Who are the outstanding men in this flourishing industry? Igor Sikorsky, engineering manager of Sikorsky Aircraft, whose interest in vertical flight dates back to the turn of the century; Lawrence D. (Larry) Bell, president of Bell Aircraft, who added helicopter production to that of fighters and research aircraft; Frank Piasecki; board chairman of Piasecki Helicopter Corp., builder of large rotary wing craft for military transport; Stanley Hiller, Jr., president of Hiller Helicopters, advocate of low-cost, easy-to-fly craft for both military and civilian use.

In addition to the companies represented by these men, there are many other firms in the helicopter field: American Helicopter (Fairchild), Autogiro Co., Cessna Aircraft, Doman Helicopters, Eastern Rotorcraft, Gyrodyne Co., Hughes Aircraft, Jacobs Engine Co., Kaman Aircraft, Kellett Aircraft, McCulloch Motors, McDonnell Aircraft, Rotor-Craft Corp., among others.

Whittaker applauds these men and these firms who have refined an ancient dream, developed it to amazing practicality, adapted it for use in both war and peace in a wide variety of services.

The helicopter will never replace the airplane — or the automobile, as many visionaries have predicted. Nor will it be outmoded by the convertiplane. Its future lies in commercial airway operations and in private use as well as in military applications — a future assured by unparalleled versatility.



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Bristol Syncroverter Switches are non-resonant, wide-frequency, low noise-level, precision synchronous inverters or rectifiers, with two SPDT or one DPDT switching action.

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EXCITATION REQUIREMENTS: 0.5 va or less with a-c up to 500 cycles. The Syncroverter will operate normally under sine wave, square wave, pulse, or special wave shape excitation currents; also applicable to plate circuit operation.

FREQUENCY: Operated on a-c of fixed or variable frequency: response up to 3500 cycles.

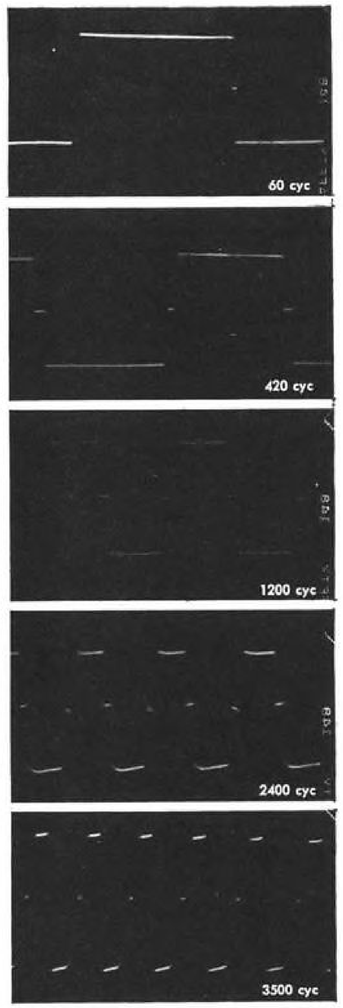
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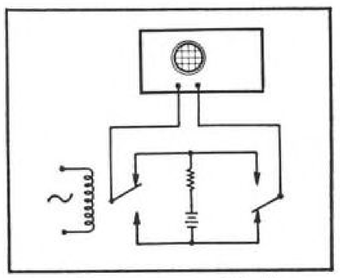
Bristol Syncroverter Switches are available with either "make-before-break" or "break-before-make" switching action. They are reliable in the microvolt and microampere ranges. Cases are hermetically sealed.

If you have an application requiring a high-quality synchronous rectifier or inverter, write to The Bristol Company, 130 Bristol Rd., Waterbury 20, Conn., outlining your requirements. We can help you.

*Trade Mark



OSCILLOSCOPE PATTERNS photographed during DPDT switching of a typical Syncroverter at various frequencies in circuit shown.



CIRCUIT of Syncroverter and Oscilloscope during the above test.

4.22

BRISTOL

FINE PRECISION INSTRUMENTS FOR OVER 60 YEARS

tor while the plane is on the ground.

With one common airframe, the cost differential between models will be the cost differential of the powerplants. Right now, with hand-built gas turbines, this figure is about $26,000; but there are indications that the differential will be reduced to about $12,000 with production turbines.

Robertson is looking toward a figure of $50,000 as a first cost for the first vertical-flight model; with production turbine engines, he expects that the cost of the aircraft will drop to about $35,000.

► **Next Step**—When Robertson completes the program for the Army, he will have a prototype Skylark certificated by the CAA, plus one leg up on an application for the Army Transportation Corps.

Production of the first two models—to be powered by reciprocating engines—is slated to begin this month. Concurrent with this, Robertson will run a series of development tests with the aircraft and with models to optimize the design of the vertical-flight job. (For example, shroud position was found by extrapolation from available data; benefits might be gained by carrying out systematic tests of the shroud plus wing.)

After that, Robertson looks to the expanding market for business and executive planes as one natural spot for the Skylark. He believes that the size, cost, economy and safety features of the airplane will make it worth careful consideration by prospective business buyers.

New Hygrometer for Upper-Air Humidity

Increased accuracy and reliability in upper-air measurements of humidity are indicated as a result of performance studies on a new electric hygrometer developed at the National Bureau of Standards.

NBS humidity research is part of a program sponsored by the Aerology branch of the Navy's Bureau of Aeronautics. The hygrometer development was started because of the need for better accuracy in upper-air measurements.

Current types of hygrometers are limited in response rate, particularly at low temperatures. Balloons now ascend at 1,000 fpm., and higher rates are expected. Furthermore, most of the flight is at low temperatures. This combination of factors made a new hygrometer a necessity.

NBS scientists Arnold Wexler and Albert Krinsky led a group in the Mechanical Instruments Lab in the development work.

V.S.P.

What do YOU know about the vectored slipstream principle?

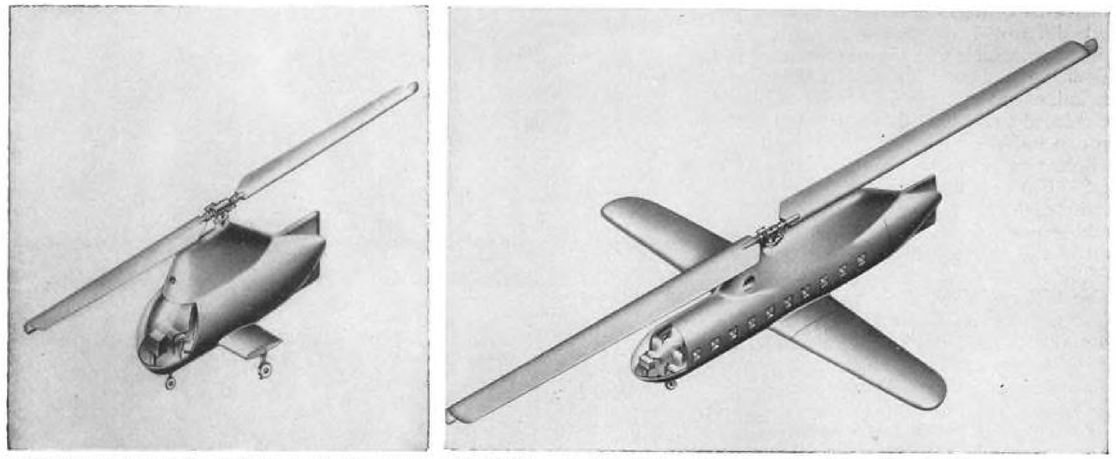
If you are one of a select group of men that can offer valuable contributions to its application and effects, why not look into Fairchild's career opportunities?

You probably know that Fairchild is now producing the C-123 *Avitruc,* as well as the world-famous C-119 *Flying Boxcar.* But did you know that reconnaisance aircraft . . . jet fighters . . . and jet bombers and transports are on the drawing boards too? These diversified, stimulating assignments increase the inventive challenge to Fairchild's team of qualified aerodynamicists.

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LASKOWITZ STUDIES: L15H-1 small jet copter; and L180C, twin-jet, highspeed transport copter seating 21-28 passengers.

Designs Aim at Copter Drawbacks

The pressure-jet principle is the answer to most of the current complaints in helicopter design, believes I. B. Laskowitz, a Brooklyn consulting engineer.

To back up this contention, Laskowitz has designed a family of helicopters and compound aircraft in which a turbojet engine is used to drive a rotor and to provide forward propulsion.

The designs are claimed to solve these four helicopter problems:

- Complexity and its near-relative, cost.
- Tough maintenance.
- Excessive vibration.
- Forward-speed limitations.

Operating Cycle

Previous pressure-jet cycles generally have used the air bled from the gas turbine or from an engine-driven compressor to supply the energy. Laskowitz chose to use the exhaust directly from the turbojet unit and to valve it to the rotor for lift or through a conventional exhaust nozzle to provide forward thrust.

The rotor operates in two phases: either as a helicopter rotor, when it is being driven by the thrust from the pressure jets at its tips, or as an autogyro rotor, when it is autorotating in forward flight.

One additional duty—steering—is performed by the exhaust. The "rudder" pedals operate a valve which bleeds the exhaust through steering nozzles located on the aft sides of the fuselage.

Four Models

There are four current designs in the group Laskowitz has proposed. Two are small and carry pilot and passenger; the other pair are transports with 21-28-passenger capacity plus crew.

All four models feature manual or automatic control of collective pitch. They also are designed for the optional use of afterburners with the engine.

Control system is conventional; models have cyclic-pitch stick and a collective-pitch stick which operates a swashplate to alter the rotor blade angles.

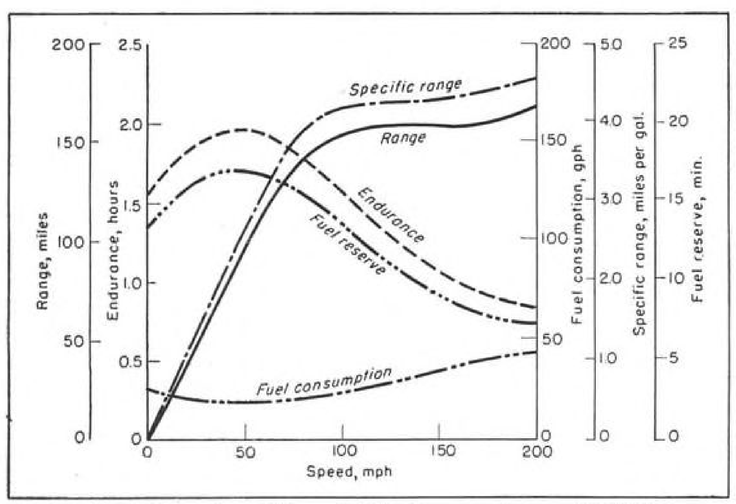
Laskowitz says that proper material selection will solve the problem of a rotor design which must withstand the high temperatures of the turbojet exhaust. For the case of vertical flight, the horsepower required is considerably less than that for level flight at maximum speed, and so the exhaust temperature is less than 1,000F.

Laskowitz proposes the use of Inconel X for the rotor blades; fatigue strength of the material is very nearly a maximum at that temperature, and creep is relatively unimportant.

One Bearing

Only one main bearing is required for the rotor, he says, and the design eliminates gear boxes, propellers, tail rotors and long lengths of highspeed shafting and their associated bearings. He believes these factors should pay off in reduced first cost, in maintenance cost and in reduced vibration.

There is a spherical joint at the root ends



PERFORMANCE in hovering and forward flight of compound-powered L15C-1.

I. B. Laskowitz is a graduate engineer with degrees from Cooper Union. He has worked on the development problems of rotary-wing aircraft for about 25 years, including research and windtunnel tests at the New York University Daniel Guggenheim School of Aeronautics.

Laskowitz is a licensed professional engineer, and a member of the National Society of Professional Engineers, the American Society of Mechanical Engineers, the Institute of the Aeronautical Sciences and the American Helicopter Society.



SILASTIC Stays Elastic

By using a Silastic* diaphragm, Haydon Switch, Inc., of Waterbury, Conn., has produced a hermetically sealed snap-action switch that weighs only about half an ounce and gives maximum life and reliability. It also operates with less than half the effort required by standard "aircraft quality" switches.

The Silastic diaphragm remains so flexible that the operating force on the actuator need not exceed 32 ounces even at —90 F. Fatigue problems and subsequent unreliability associated with metal diaphragms are also eliminated. Operational life in the range of a million cycles is far in excess of the best metal diaphragms or bellows.

Accelerated permeability tests indicate that an effective hermetic seal is maintained for more than 10 years. Internal pressures up to 100 psi have failed to produce leakage or rupture, and no change in the diaphragms has been observed even after 72 hours' immersion in salt, fresh, or soda water, or in automotive or AN-0-6 aircraft oil.

Originally designed for aircraft, fire control and guided missile service, the new miniature switch is being applied to domestic and commercial washing machines, machine tools and other equipment exposed to liquids or moisture.

That's the kind of performance that has established Silastic as an ideal diaphragm material where pressures must be maintained despite temperature extremes, weathering and oxidation, or in contact with a variety of oils and chemicals. Silastic is also unique among resilient dielectric materials because it combines high thermal conductivity with excellent resistance to moisture, corona, and to fatigue.

That's why, if you need a rubberlike material that retains its dielectric properties and its resilience at temperatures from —100 to 500 F. it pays to consider Silastic first.

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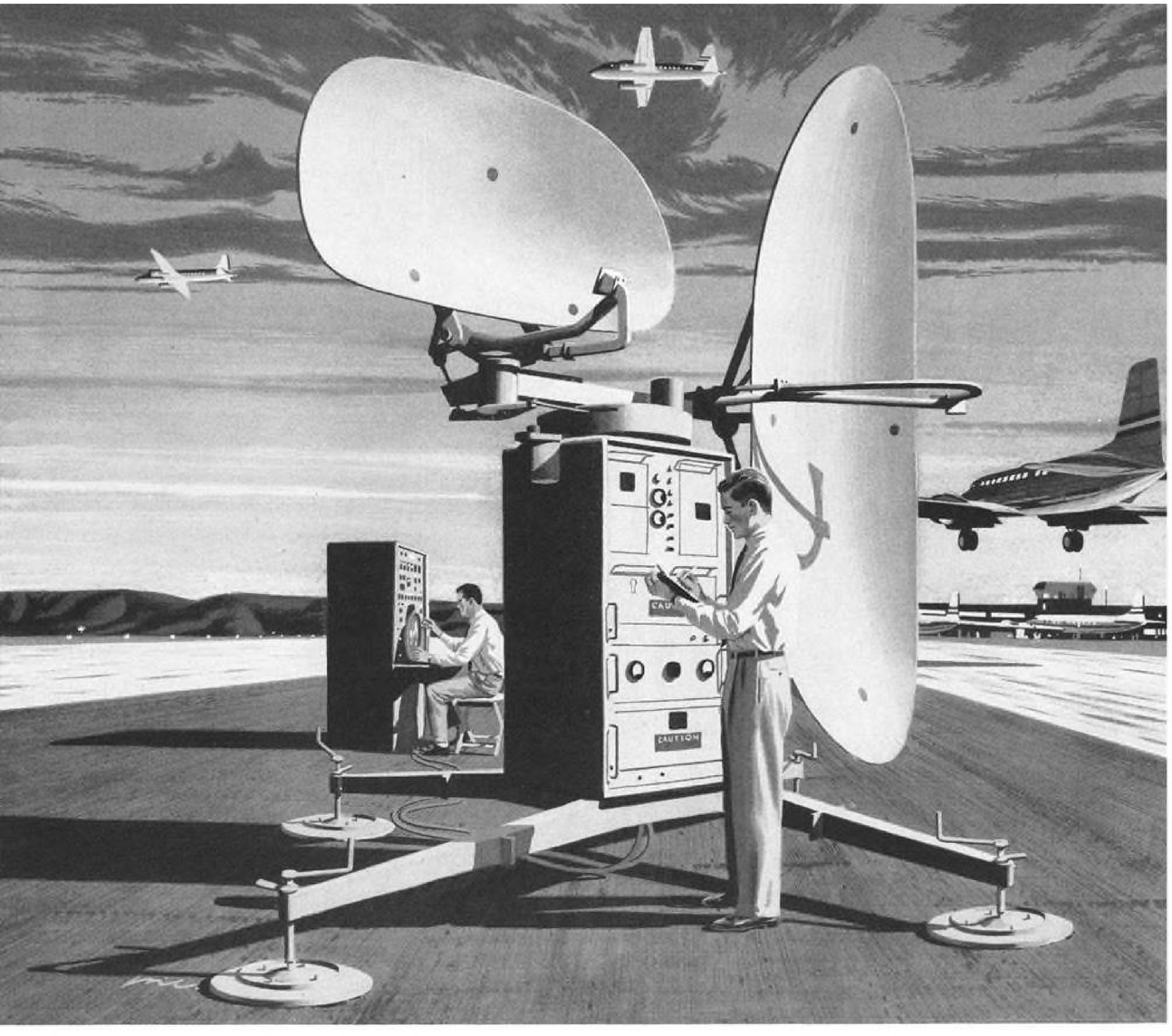
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Gilfillan Announces World's First 4-in-1 Radar

New Gilfillan GCA Quadradar provides Surveillance, Final Approach, Height-Finding and Airport Taxi—four radar functions in a simple one-scope equipment weighing less than 1800 pounds.

For the first time, the complete answer to radar traffic control in one light-weight low-cost equipment—the new Gilfillan GCA Quadradar.
One scope provides four radar functions at the turn of a switch—surveillance, final approach, height-finding, airport taxi control.
Superior to all previous GCA radars in altitude, azimuth and range coverage. The full 30° scan of both azimuth and elevation beams is displayed on the new Gilfillan Beta Scan Azel indicator—and the final approach range extended to 20 miles. The new Beta Azel display combined with height-finding to 50,000 feet in a 20-mile slant range provides advantages never before possible with one equipment.

ONE SCOPE

4 Radar Functions at the Turn of a Switch

1. Surveillance: Sharp presentation of smallest aircraft in 20-mile radius to 10,000 feet, large aircraft in 40-mile radius.

2. Final Approach: New Beta Azel Scope gives precision display in 20-mile sector with 30° azimuth-elevation beam.

3. Height Finding: Accurate altitude information to 50,000 feet at 20 miles.

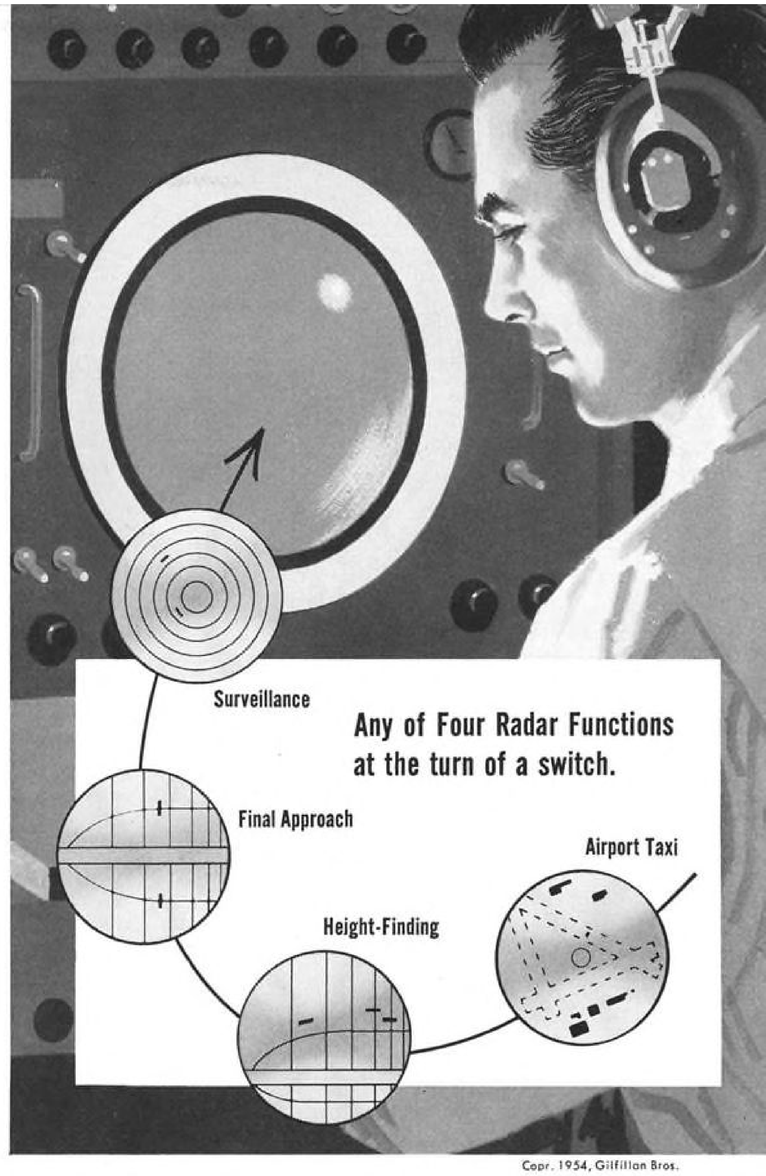
4. Airport Taxi: Needle-sharp presentation of runways, taxiing aircraft, field obstructions.

TACTICAL ADVANTAGES

The new Gilfillan GCA Quadradar weighs less than 1800 pounds, is 12 feet high. Air-transportable by cargo plane or helicopter. Assembles for operation within 3 hours; 50-60 cycle operation; weather-protected; remotable up to 10,000 feet. For the first time, complete, efficient radar control is available for advanced emergency airstrips.

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Complete specifications and detailed advantages in brochure available now. Includes information on simple maintenance, proven components, ease of integrating training. Address Gilfillan Bros., Dept. AW-6, 1815 Venice Blvd., Los Angeles, Calif.



Copr. 1954, Gilfillan Bros.

MULTIPLE RUNWAY COVERAGE

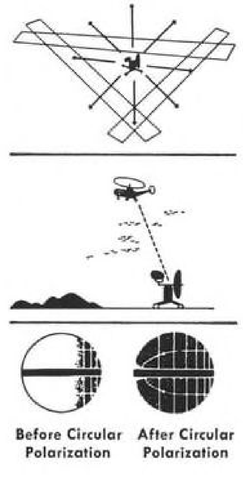
Located near the junction of two or more runways, the Gilfillan GCA Quadradar provides multiple runway coverage without relocating equipment and without expensive turntables. Antennas rotate electrically through 360°, can be set to align instantly with desired runway.

SAFE HELICOPTER LANDINGS

With 30° scan, new Gilfillan GCA Quadradar handles steep-angle helicopter approaches from any direction.

CLEAR, CLUTTER-FREE DISPLAY

X-band throughout, Gilfillan's GCA Quadradar scope presents sharp display. Built-in circular polarization eliminates rain or snow clutter.



PROVEN EQUIPMENT

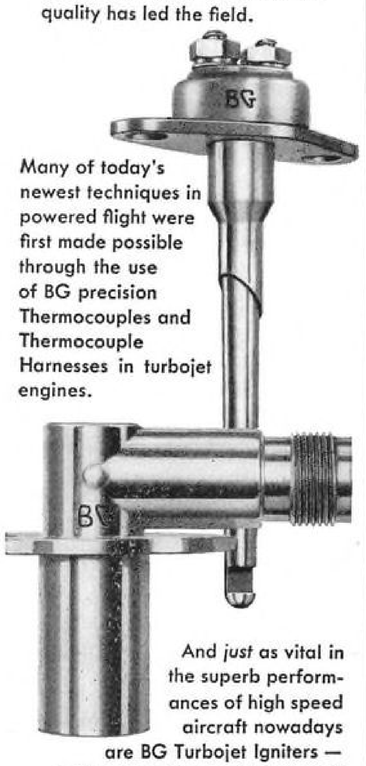
It should be emphasized that the new Gilfillan GCA Quadradar is proven practical equipment based on more than 12 years of Gilfillan concentrated experience and research in GCA radar. The Gilfillan GCA Quadradar is composed of Gilfillan-developed components of known dependability, proven in world-wide service and found reliable under the most adverse conditions — plus improvements and refinements based on the experience of 200 Gilfillan field engineers around the world.

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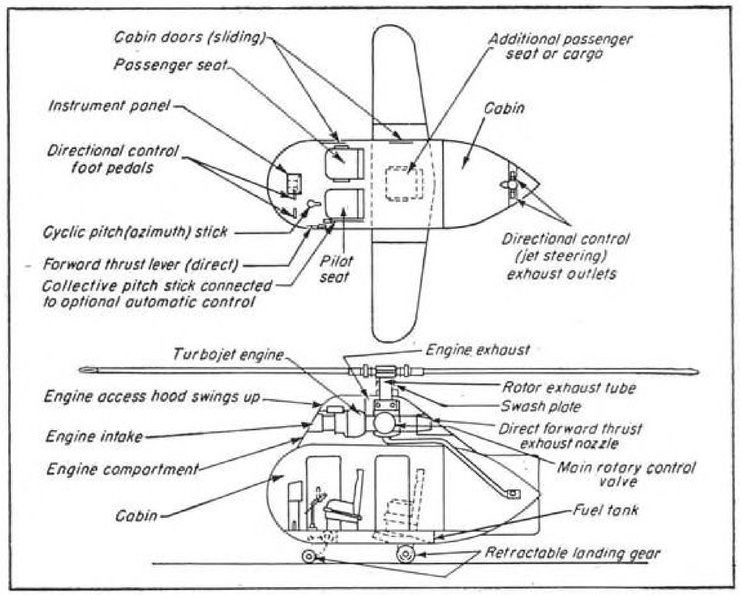
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INBOARD PROFILE and cabin arrangement of jet-powered compound L15C-1.

of the rotor blade for flapping and drag-hinge motion.

Rotor blades are hinged in all designs, and the compound copters can have folding wings. These features will save storage space for both types.

Two-Place Craft

Both small aircraft are powered by a Continental-built Turbomeca Palas turbojet rated at 265 lb. thrust. Rotors are two-bladed and 30-ft. dia. Gross weight of both designs is 1,500 lb.

The small copter, Model L15H-1, weighs in at 802 lb. empty and has a 698-lb. useful load. Maximum speed has been estimated at 160 mph. and maximum range at 163 mi.

The compound Model L15C-1 has a fixed wing with a 16-ft. span. Empty weight is 850 lb., and useful load is 650 lb. Laskowitz has calculated the maximum speed to be 210 mph. with a maximum range of 169 miles.

The highspeed transport copter, Model L180H, is powered by a pair of turbojet engines of 1,360 lb. thrust each. The original design was planned around the Westinghouse J30 engine. The two-blade rotor is 104 ft. dia. Gross weight is 18,000 lb., empty weight is 10,056 lb., and useful load is 7,944 lb.

Pilot, co-pilot and 21 to 28 passengers can be accommodated. Range with the smaller load is 207 mi.; with the larger load it is 133 mi.

Maximum speed is estimated at 200 mph. Single-engine operation with full load will reduce flight speed but will maintain the same maximum ranges as with twin-engine operation, says Laskowitz.

The compound transport model L180C is basically the same size, with a higher empty weight of 10,830 lb. Useful load is 7,170 lb. Same crew and passenger accommodations are available.

Top speed is calculated at 300 mph., maximum range at 316 mi. for the smaller load and 146 mi. for the 28-passenger version.

Higher speeds and ranges are obtained in each case with the compound aircraft at the cost of the extra fixed wing.

Because of the small time spent in vertical flight or hovering flight, Laskowitz has computed that any large heat losses through the rotor would not appreciably affect the overall flight efficiency.

Patents have been issued and are pending on the copters and compound craft.—DAA

Lockheed Plans Major B-47 Mod Program

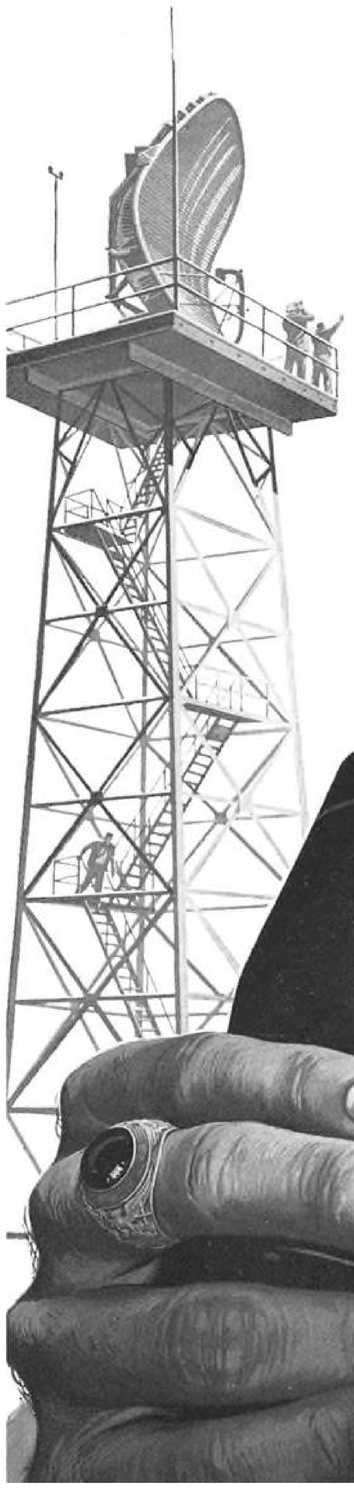
Burbank, Calif.—Plans for a major B-47 jet bomber modification program are under way at Lockheed Aircraft Corp.'s Georgia Division, Robert E. Gross, president of the aircraft firm, reports.

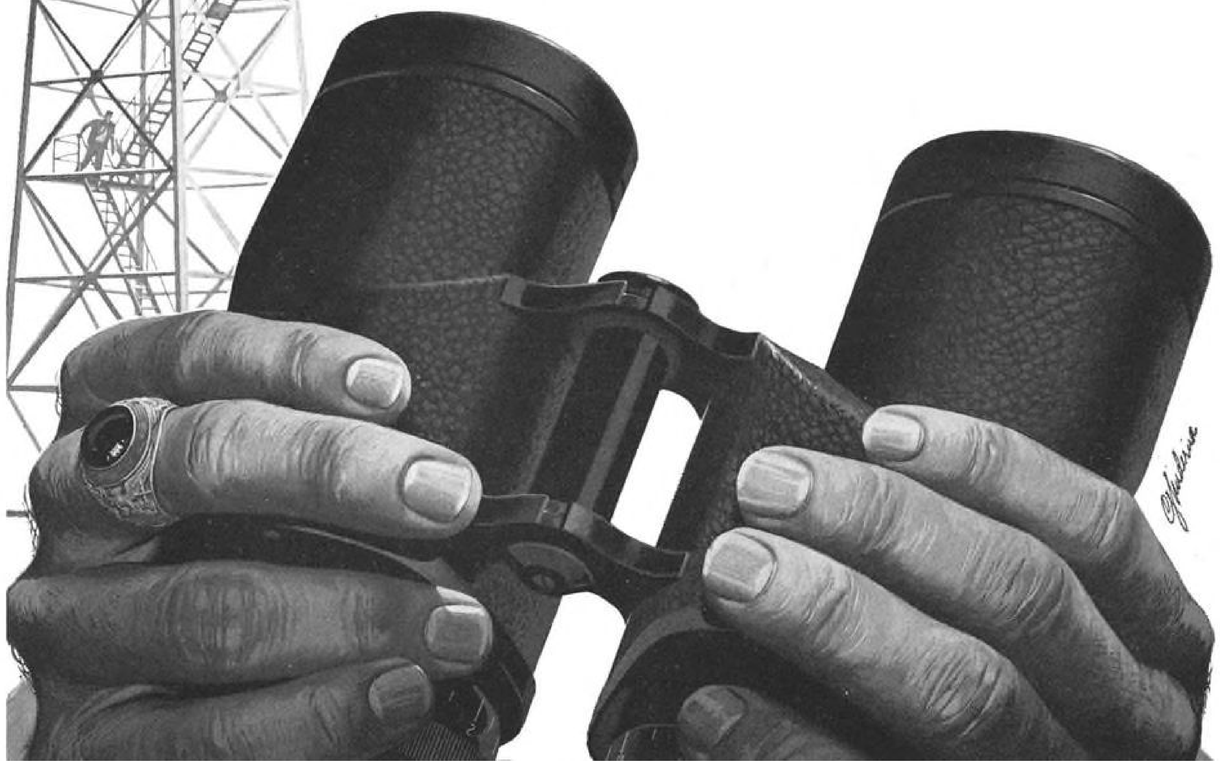
The program is scheduled to run from August 1954 through January 1957, with first re-deliveries of the bomber starting early next year. Value of the project is not revealed.

The Marietta, Ga., aircraft plant is operated for USAF by Lockheed.

"This modification program will provide the Air Force with the latest type of Stratojets," says D. J. Haughton, vice president and general manager of the Georgia Division. He adds that this is another important step in diversification of manufacturing operations at the southern plant. "It will help assure stability of employment well into 1956," he says.

Modification program includes manufacture and installation of various struc-





XB-62 SECRET

SNARK XB-62, new pilotless bomber of the U. S. Air Force, is the culmination of more than seven years of development by Northrop Aircraft, Inc., pioneer company in the field of guided missiles. It is a deadly team-mate for the long-range Northrop Scorpion F-89 all-weather interceptor which now stands guard in great numbers along our borders, and in the far north astride the polar air routes to America's heartland. Like the F-89, the secret SNARK is another spectacular product built by the precision team of Northrop men and machines. Each day, the output of other Northrop products, such as target planes, optical range finders and ordnance equipment, adds still greater strength to the defense of our nation.

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tures and systems items that will bring B-47s up to the latest configurations. Regular cyclical maintenance plan—IRAN (inspection and replacement as necessary)—will be used.

Lockheed currently is producing B-47s at Marietta and is starting production on the turboprop C-130A cargo transport.

THRUST & DRAG

What's in a name? Boeing's new 707 jet transport has rejoiced in five during its career so far, and there probably will be others when the customers buy it. Starting as Model 367-80, shortened to "Dash Eighty" for the obvious reason, re-named "Project X" for the dramatic aspects of an undercover project, and officially carried as Model 707, at its christening it was launched under a twin designation: "Jet Stratotanker" and "Jet Stratoliner."

Two unusual features of the big transport deserve underlining. First is the registration number—N70700—which echoes the correct model number of the plane. Second is the color scheme of chocolate brown, canary yellow, silver and white trim. Isn't that going to stand out against the official Boeing backdrop of Mt. Rainier?

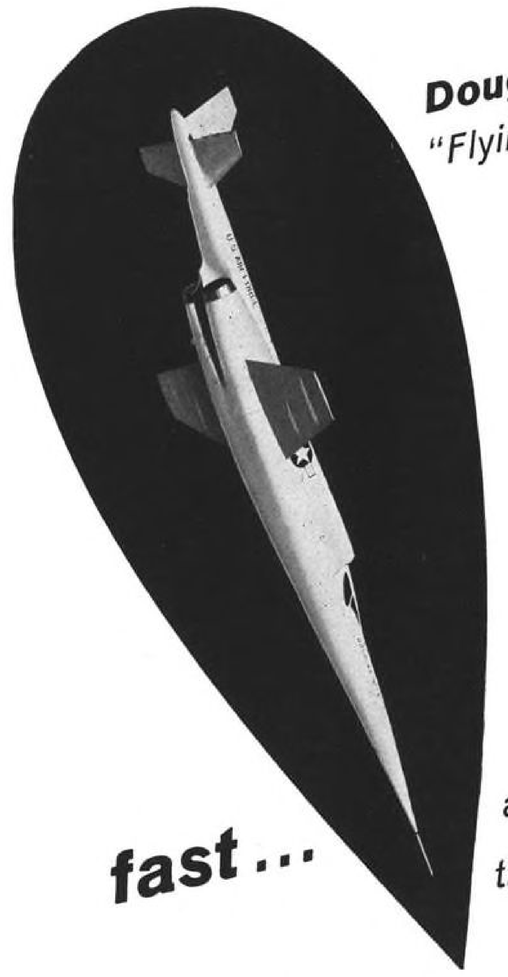
* * *

A Frenchman, M. Gabriel Voisin, has resurrected the claim that Clement Ader, also a Frenchman, made the first powered flight in 1889.

M. Voisin, who built many unusual aircraft during the first World War, says that the Wright brothers just added so much dead weight to their glider when they attached an engine. They never could have gotten off the ground without the help of the wind, he says. Furthermore, they worked for several years to increase the power of their engine, and when they finally succeeded in taking a plane off the ground under its own power in 1909, they used a French engine, says Voisin.

This argument and others like it have been going on for years now and will continue to be perpetuated. While most aviation enthusiasts would not contest the claim of the Wrights, the recurring specters of M. Ader and Russian inventor Mozhaiski (whose claim was related here Jan. 18) rise from time to time out of the dead past.

Personally, I'm in favor of letting M. Ader and Comrade Mozhaiski fight it out on whatever level they now operate, with the winner to have the sole right of contesting the claim made by the Wright brothers, of invalidating their painstaking research and tests, of denying that first tenuous grab at a solidifying air. —DAA



Douglas X-3
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Douglas designers specified Camloc fasteners for vital access points on their supersonic X-3 Flying Stiletto.

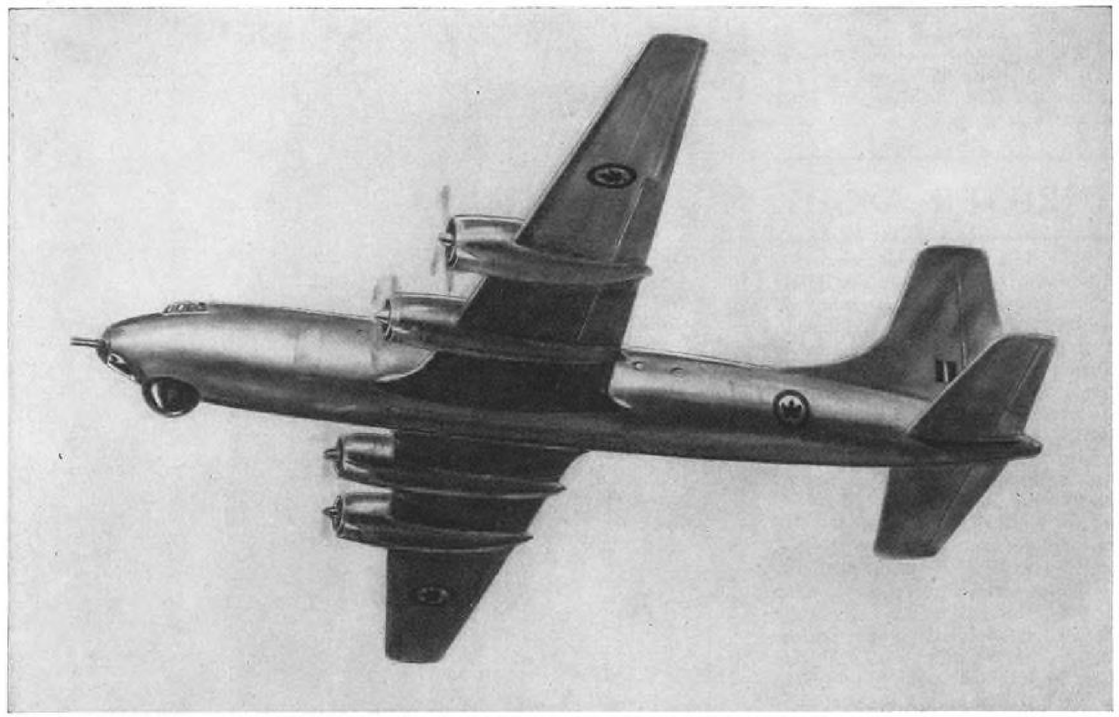
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MARITIME RECONNAISSANCE Britannia that Canadair is to build will look like this Aviation Week artist's conception.

How Canadair Will Build the Britannia

Preliminary work begins for conversion of Bristol transport design to RCAF patroller; this will be largest plane ever built in Canada.

By Irving Stone

Montreal—Canadair Ltd. is rolling up its sleeves for a huge engineering and production job. It is getting set to construct for the Royal Canadian Air Force a maritime reconnaissance (MR) version of the big Bristol Britannia transport.

This military version for long-endurance overwater patrol, also known as the Canadair CL-28, will be the largest aircraft ever produced in Canada.

► **Transport Possibilities**—While all efforts initially will be directed to the MR version, it is possible that other variants of the basic plane may be built by Canadair. AVIATION WEEK has learned that the RCAF has been considering the building of a military transport version as a replacement for its veteran, Canadair-built North Star.

It is entirely possible, too, that a civil version of the plane may enter the Canadair production picture within the next few years.

But both of these contingencies will depend on availability of suitable turboprop powerplants.

► **Planning Begins**—Canadair's liaison team is back only recently from its initial visit to Bristol Aeroplane Co. Ltd.'s Filton, England, headquarters. Engineering and production plans for the big patroller are far from being pinpointed at this writing, because a tremendous amount of exploratory work lies ahead for Canadair's design and shop groups. Yet the picture has sufficiently cleared for spotting general objectives and hurdles seen ahead.

The Canadian Department of Defense Production's license agreement with Bristol for the MR was signed at the end of February, with letter of intent to Canadair following a few weeks later. (AVIATION WEEK had predicted the MR production possibility more than a year ago, Mar. 23, 1953, p. 27.)

While Canadair has not announced schedules for building the MR version, AVIATION WEEK has learned from a reliable source that 50 planes will be built between now and 1961. Work will proceed under a five-phase program. Initially, one pre-production plane will be constructed to develop tooling and techniques. The succeeding planes will be production models covered by contracts for approximately groups of 12.

► **Same Wing**—Engineering already has started on design changes. The original design of the Britannia will be retained except where it is necessary to modify for adaption to military service and to accommodate the Wright Turbo Compound powerplant which will replace the Proteus turboprop.

In its design of the Britannia, Bristol engineers have done an excellent job in material distribution. Thus, the ratio of structure to gross weight is about 23-24%—a very favorable value.

Canadair hopes to retain the wing design virtually intact except for local changes to accommodate the new engine. The Britannia wing is uniformly tapered from centerline to tip and its primary structure consists of a box spar with shear web at 15% and 50% of the chord.

► **Tankage Sufficient**—Fuel tanks, all in the wing spar, consist of nine crash-proof flexible cells in each panel. Total capacity is 6,800 Imperial gallons (8,100 U.S. gal.). No more tankage will have to be added in the MR version, because the Proteus is reported to be not as economical as the Turbo Compound.

Also, gross weight of the MR (about 145,000 lb.) will be less than that of the Britannia Mark 300 (165,000 lb.), since the military equipment will weigh less than the normal passenger accommodations. Another consideration is that weight will be saved through the absence of pressurization in the MR version.

For emergency measures, the bomb bay might be adapted for some additional tankage.

► **Fuselage Changes**—Longest flow-time item in the construction of the MR will be the fuselage, since it will embody the major revisions.

Nose portion of the fuselage will be slightly shortened. To make room for military equipment below, the cockpit and its canopy will be raised, the latter affording better visibility. Aft of the new nose the fuselage lines will remain the same as on the Britannia. Aft fuselage will have many new openings for equipment stowage or release.

Windows will be retained where natural lighting is required and for lookout purposes.

Detail design of the fuselage floor will have to be changed to support the rails for military equipment carried. A portion of the cargo compartment underneath the floor will become the bomb bay.

Length of the fuselage will be the same as that of the Bristol Britannia Mark 100 (114 ft.). The later Mark 300 design, is longer than required for the MR version.

► **All-American**—In keeping with RCAF procurement policies, the MR will be produced as an "all-American" plane. This will apply not only to standards but to accessories as well (parts will be Canadian and U.S.).

The conversion job from British to American standards will be a big task. The Glenn L. Martin Co. was faced with the same job when it undertook the building of the English Electric Canberra as the USAF B-57A. Canadair will have a liaison team visit Martin to confer with its engineers on their experiences in converting the Canberra design to U.S. standards.

► **American Accessories**—Numerous accessories and pieces of equipment will have to be replaced—either with available items of Canadian or U.S. manufacture or, if not available, by equipment specially developed for the job. Or they may be obtained from English suppliers who may establish themselves in Canada to build the equipment. But these would have to have a bread-and-butter program, because the Canadair MR work would not be sufficient to sustain them.

Electronic gear will be obtained from manufacturers which have the required units in existence or, in special cases depending on military requirements, the electronic equipment may have to be obtained from programs now under development.

Canadair's function essentially will be to check out the electronic equipment, much the same as it has done for its F-86 and T-33 line. With the MR version, this job will be bigger, because more items of electronic equipment will be involved.

► **Hydraulic System**—The hydraulic system is a good example of one of the headaches involved in converting from British practice. Canadair's engineers won't discuss the matter except to say that modification is under consideration as a prime problem.

The Britannia uses a 4,000-psi. hydraulic system, primarily to actuate the landing gear. Other services—nose wheel steering, wheel brakes and control surface locking—operate at considerably reduced pressures.

It would seem that in keeping with the philosophy to have accessories built on this side of the water, that a 3,000-psi. system would be desirable to accom-

Will Canadair Construct a Commercial Britannia?

Will there be a commercial version of the Bristol Britannia built in Canada? This depends on two main factors:

- Will Bristol license Canadair to manufacture the commercial transport?
- Will there be a "suitable" turboprop engine available in quantities by 1958, when Canadair would have some airframes in which to install them?

Initially it was thought that commercial license rights would have been wrapped up in the same package with the military rights, but Bristol decided that the commercial aspect would have to be subject to separate negotiation. This may be because Bristol may now feel that it can sell the Britannia to Canadian interests, particularly since Trans-Canada Air Lines has bought the Vickers Viscount.

► **Bristol's Orders**—Bristol is now building 26 of the Britannias and there is a letter of intent for six more (Qantas Empire Airways). Short Bros. & Harland, Ltd., Belfast, is helping Bristol build the planes in order to speed deliveries. Under these circumstances Bristol may feel it a comparatively simple matter to add a Canadian order to those it already has.

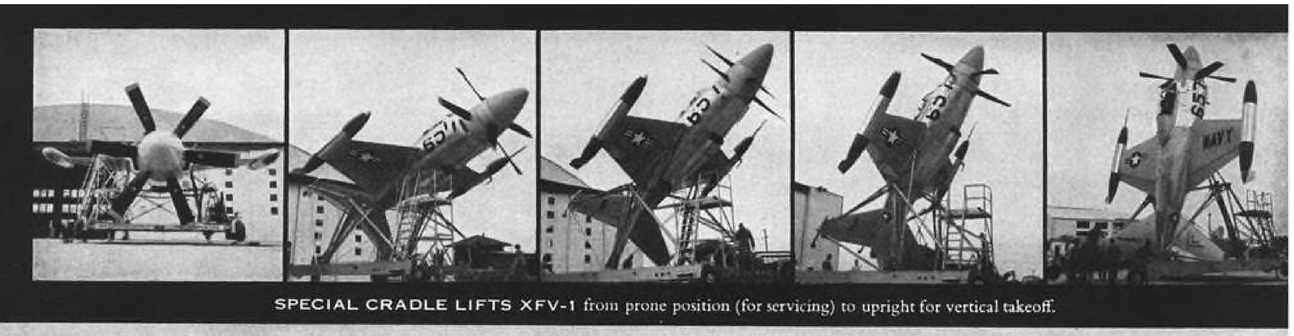
Bristol received a setback as a result of very severe damage to its second Britannia (first production plane) in an emergency landing. This left the company with no plane for certification tests and it will have to wait for the third unit for this job. The first Britannia had a Proteus engine with lower horsepower—not representative of the later series.

► **Turboprop Power**—The Turbo Compound is not now seen as the powerplant if the Britannia transport is built in Canada. It was selected for the MR version because in these missions the plane would be required to stay aloft for relatively long periods at relatively slow speeds and at fairly low altitudes. The Wright Turbo Compound fitted the job. It offers comparatively low fuel consumption, immediate availability and proven reliability of its basic piston engine.

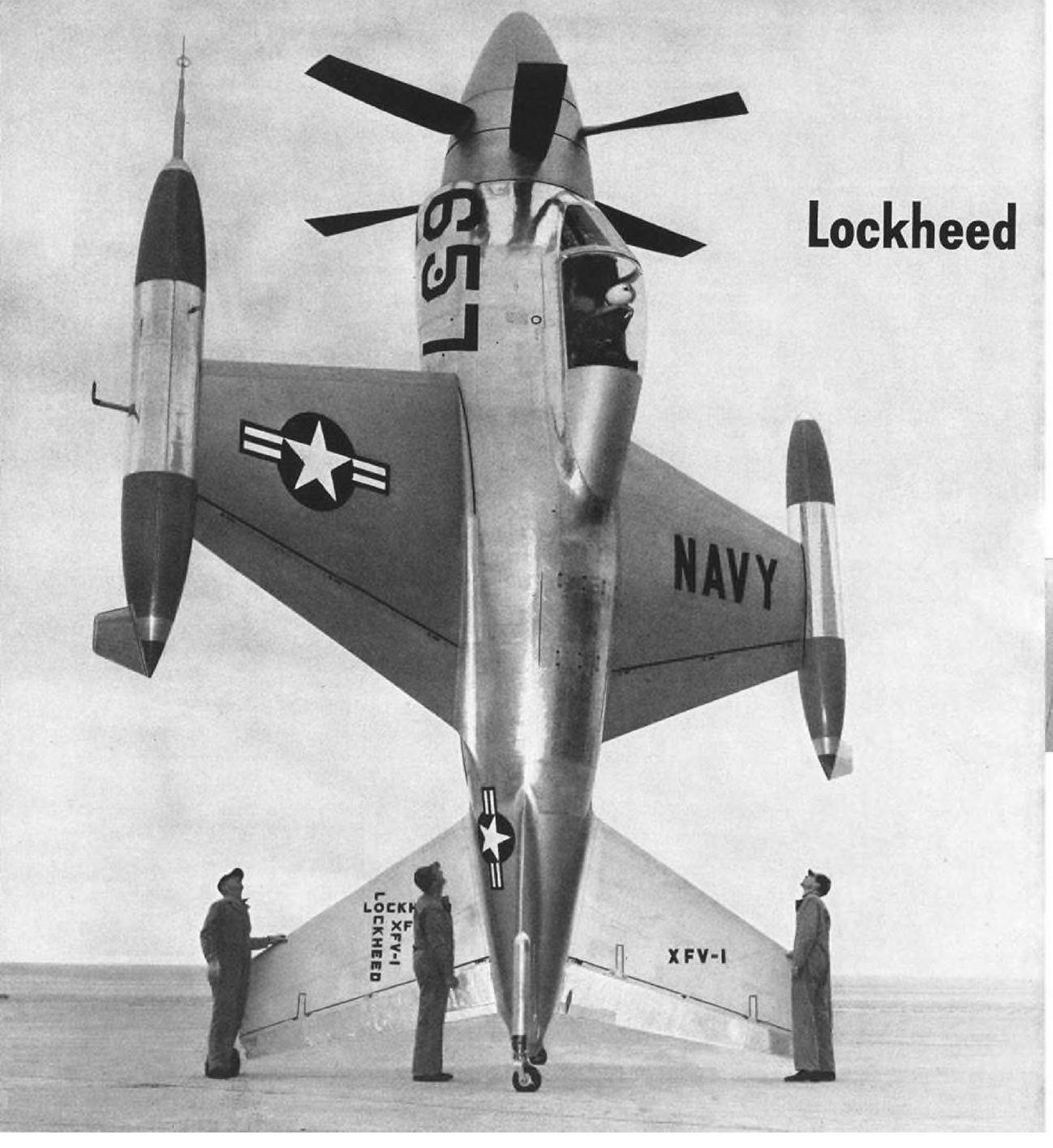
The feeling is that a turboprop engine will be the selection for a Canadian version of the Britannia since the Turbo Compound, despite its many favorable characteristics, would not be sufficient to give a plane the size and weight of a future Britannia the speed an operator might want for it—a cruise value of well over 400 mph., it is claimed.

An engine is under study at Bristol which may fill the bill (AVIATION WEEK Dec. 14, 1953, p. 32). This powerplant, probably still in the design stage, cannot be counted upon to exist before 1958, it is said.

The engine is a twin-spool turboprop configuration with a compressor capacity aimed at giving relatively high cruise power at high altitude. It would be a constant-power engine up to its critical altitude—say, about 16,000 ft.—with design cruise power for an operating altitude of about 35,000 ft. The design also is reported as affording reserve power for takeoff from a high-altitude airport or for conditions of high atmospheric temperatures at takeoff.

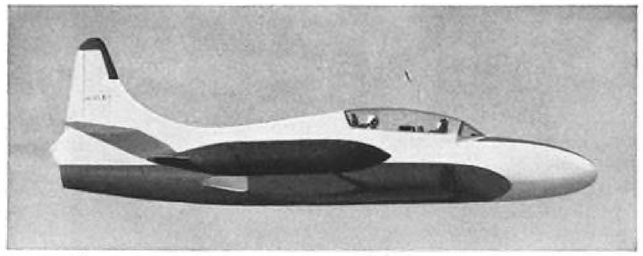


SPECIAL CRADLE LIFTS XFV-1 from prone position (for servicing) to upright for vertical takeoff.

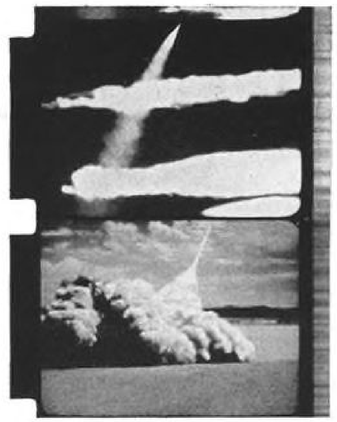


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Scientists Unveil Radical Forms of Flight

High-Speed Navy Fighter Takes Off Straight Up, Lands by Backing Straight Down on Its Tail

Today's biggest news in aviation is the Navy's XFV-1 built by Lockheed, a revolutionary new vertical-rising plane.

A powerful Allison turbo-prop engine with two jet turbines turning counter-rotating propellers lifts XFV-1 straight up, rocket fashion. It levels off for speeds in the 500-m.p.h. class, lands on its tail.

Many Lockheed "firsts" are built into this airplane. A ¼-scale model powered by a 76-h.p. electric motor was built and flown to test vertical ascent, transition into level flight, and landing. Careful weight control permitted completion of first prototype hundreds of pounds less than estimated weight for Navy requirements.

Unique 4-way tail serves as a single surface and jointly functions as elevator, aileron and rudder, using revolutionary interlocking controls.



SOUND ENGINEERING pays off with Lockheed P2V Navy patrol bomber. The famous Neptune has increased gross takeoff weight and boosted speed by adding powerful jet pods. Neptune's aerodynamic configuration, however, remains unchanged from original X model 11 years ago through the current 7 series.



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CANADAIR Sabre No. 1,000. Company's approach to Britannia will depend on whether production replacement is available for the F-86.

modate these accessories. The 3,000-psi. system has a proven record in the U. S. and Canada. The alternate scheme would be to use the British 4,000-psi. system and have the corresponding accessories built on this continent.

In Canadair's study of the adaptability of the 3,000-psi. system, weight and space requirements will have to be carefully considered, since lower pressures usually require larger components, lines, etc. Space will be particularly critical in landing gear housing area.

Another consideration that probably will influence Canadair's decision will be what it costs to redesign and rebuild the system in the Britannia.

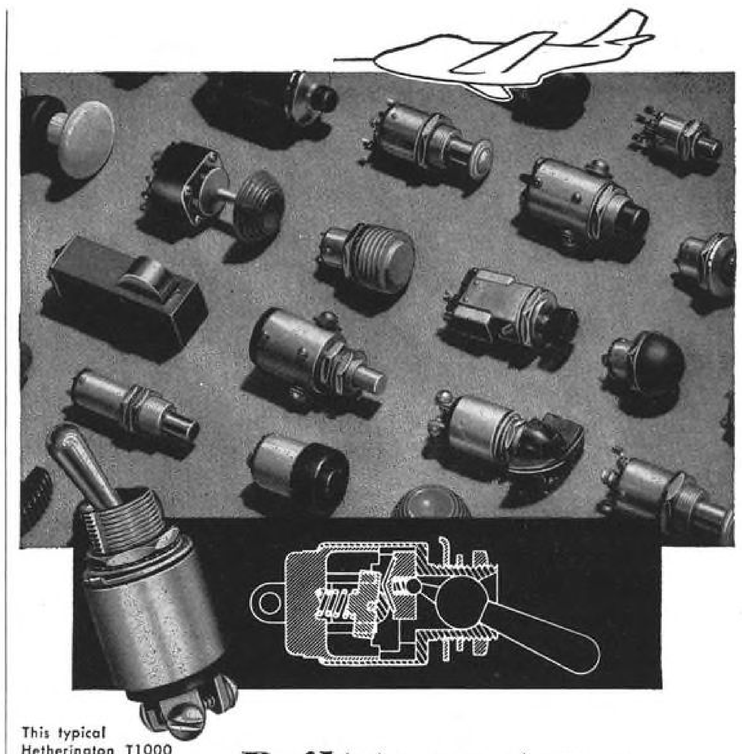
► **Tooling Look**—As engineering is progressively released over the next 20-24 months, construction of the pre-production plane will be stepped up to meet a completion date in the fall of 1956. First production parts will be coming out by next summer.

Canadair hopes to start direct labor in the tooling shop by the end of September, but there will not be a volume of tool work until next spring.

At this reading, the company plans to do all its own tooling. But if a production replacement (perhaps the F-100) comes along for the Canadair-built F-86, the tooling loads undoubtedly will pyramid and some may have to be subcontracted to meet both programs.

One of Canadair's big problems will be the reorientation of its tooling designers, planners, etc. Its production shops have been accustomed to mass-production tooling. Because the MR version is a peacetime job and a large plane involving a relatively small monthly rate, the thinking is that Canadair will have to go back to a prewar production approach.

This means that tooling men will have to become accustomed to "live on a smaller scale." This probably will involve the use of larger jigs in which



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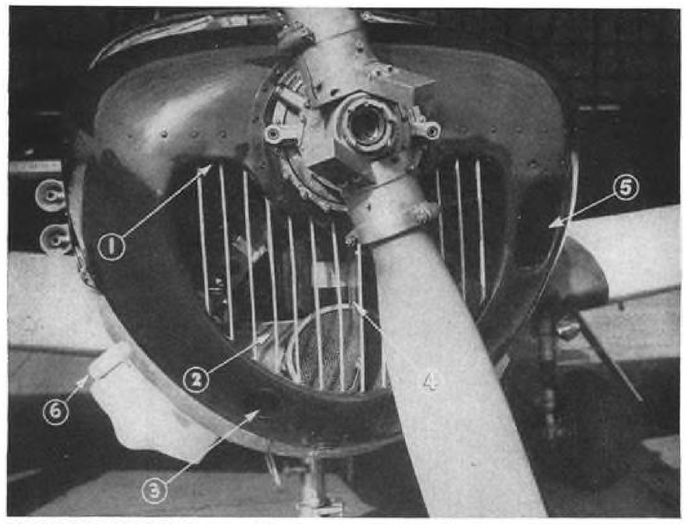
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Aviation Week Picture Brief



NAVION NOSE after modification shows: 1, enlarged grill and opening; 2, deflector pan; 3, cabin heater muff cold air intake; 4, air equalizer vane; 5, oil radiator air intake; 6, exhaust shroud hot air bleed.

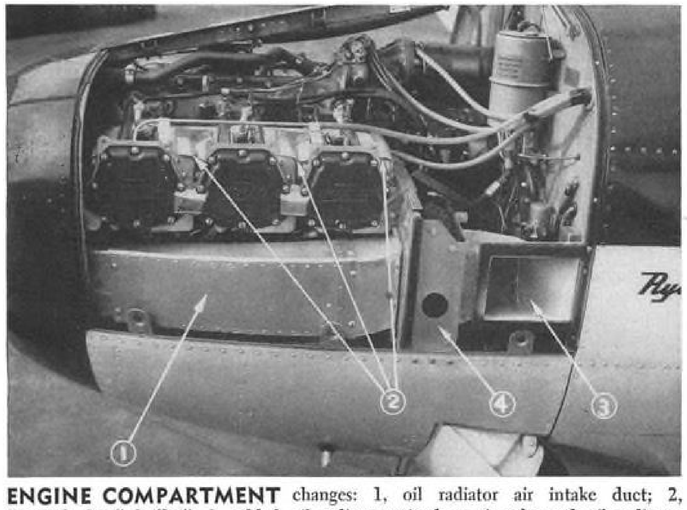
Engine Changes Help Navion

The problem: Eliminating powerplant overheating and detonation encountered in a Ryan Navion 260 business plane which was averaging less than 400 hr. between engine overhauls.

The client: The Tulsa (Okla.) Tribune, whose news and photo departments operate the Navion.

The answer: The airplane underwent several months of flight tests, engineering, modification and retest by Spartan Aircraft Co.'s Aviation Service Division, Municipal Airport, Tulsa. From the data accumulated, the engine cooling system was modified by diverting heat from the exhaust stacks, designing baffle and sealing clearances to effect "smooth air" and eliminating "lost air." Equipment was rearranged.

Spartan estimates the cost of the Tribune Navion modification at $968. Manufacture and installation of modification parts takes 10-15 days.



ENGINE COMPARTMENT changes: 1, oil radiator air intake duct; 2, "smooth flow" baffles"; 3, added oil radiator exit duct; 4, relocated oil radiator.

major components will be constructed, instead of using the former method of many jigs and many subassemblies. Utilization of this large type jig will be sufficient to meet the rate requirement for the MR, whereas enough men couldn't be placed around a corresponding jig on the mass-production F-86 line to do the job economically.

► **Handwork on Britannia**—Because of the relatively inexpensive tooling to be used, cost of the overall part may be higher than for comparable work on a mass-production line.

Another reason why costs of the airframe per pound may be higher than on a line such as Canadair's F-86 may be the design philosophy established by Bristol to save weight on the Britannia. Bristol, like others in England, follows the path of more handwork because of the relatively low production rate. Evidently they are willing to pay more in production costs to save a pound of airplane weight than Canadair or U.S. constructors normally would.

On the portion of the Britannia that Canadair will redesign for the MR version, this weight-saving philosophy may not be followed to the same degree as it has been by Bristol. It is likely that Canadair will find a middle ground between the Bristol extreme and factory cost considerations in Canada.

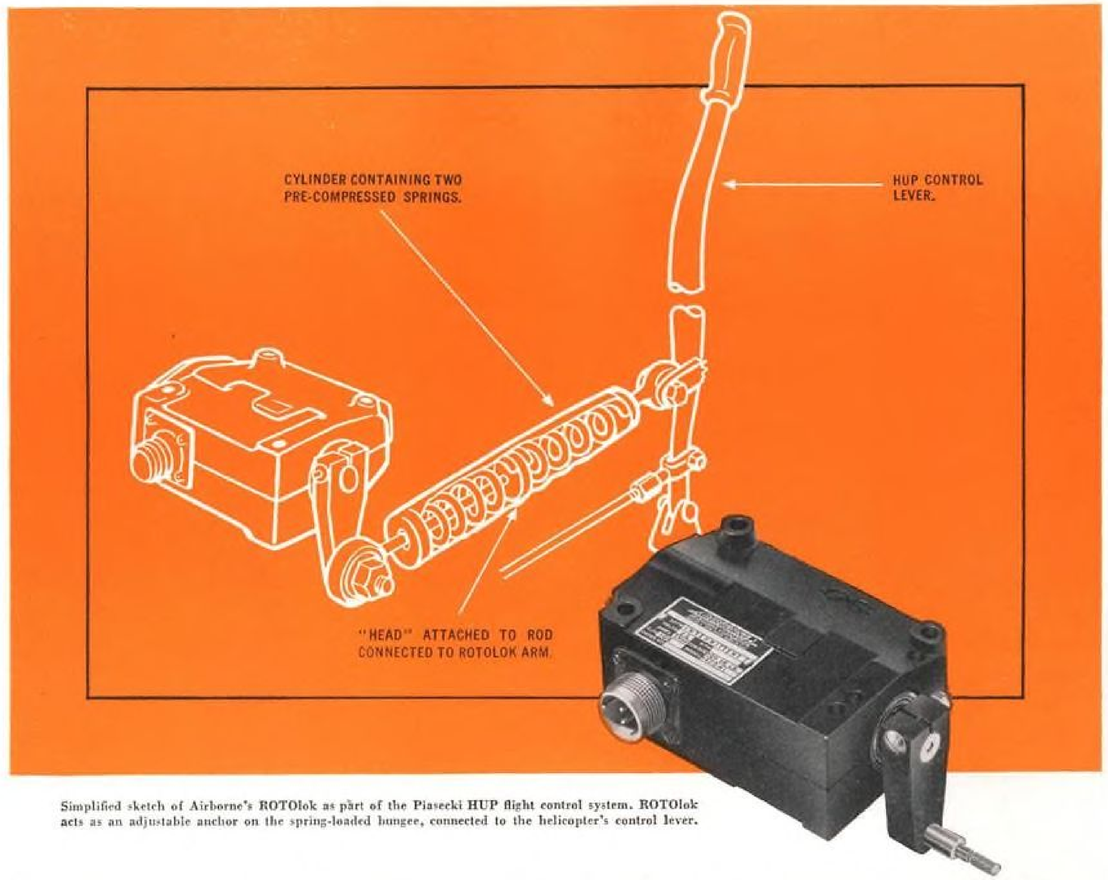
► **Subcontracting Small**—At this writing, Canadair does not contemplate an extensive subcontracting program because of the relatively small size of the order involved and the production rate. From a reliable source, AVIATION WEEK has learned that the RCAF may temporarily specify a delivery rate of about one MR version each month.

However, at this point it is reasonably sure that the landing gear and nose gear will be subcontracted.

Possibility of subcontracting the powerplant package is under consideration. The subcontractor would get the engine from Wright Aeronautical, package it in a nacelle and deliver it as a unit to Canadair. As presently treated in the U.S., this is a special shop job. But Canadair may do the job in its own shop if some slack sets in because a production replacement for the F-86 does not materialize.

Some detail machined parts also may be subcontracted, but it is likely that Canadair may consider it advisable to subcontract other machine work and keep the MR job in its own shop to establish better control to meet problems which probably will develop as a result of the newness of the project.

► **Tools, Production Area**—Construction of the MR probably will not involve more than $500,000 for new machine tools and processing equipment. A large share of this will be for retort and



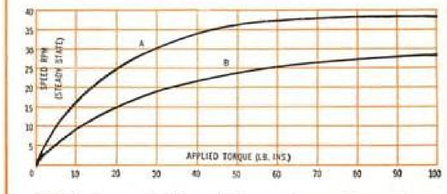
Simplified sketch of Airborne's ROTOlok as part of the Piasecki HUP flight control system. ROTOlok acts as an adjustable anchor on the spring-loaded bungee, connected to the helicopter's control lever.

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Current	.5 Amp. Max.	Size	4.6 x 3 x 1.8 in.
Duty	Continuous	Weight	2 lb. max.



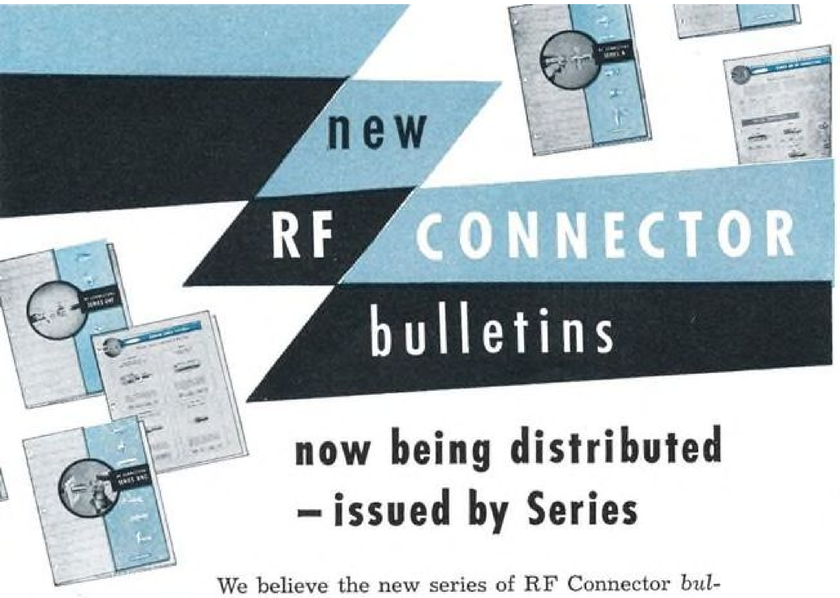
ROTOlok damper effect. Curve "A" represents speed-torque characteristics with a friction-lined damper; curve "B", with a metal-to-metal damper. ROTOlok is available with either.

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oven equipment for processing metal-to-metal bonding.

Another large item of expenditure will be for test equipment to check the MR's electronic gear.

The MR will be built in the same general area allotted to the T-36 before that plane contract was canceled. One problem will be to accommodate the longer span of the MR wing. Chances are either that the final assembly article will be run down the line at an angle or that Canadair will follow the Bristol scheme of pre-fitting the outer wing to the center section, then removing the outer panels, and reassembling them near the end of the final line. Instead of reassembling near the end of the final line, Canadair may reassemble the outer panels to the center section in the pre-flight hangar.

▶ **Coordinating Committee**—Canadair has established an 11-man joint coordinating committee composed of top engineering and manufacturing personnel to facilitate the solution of problems associated with the building of the MR, insuring that details requiring attention are delegated to the proper study group. It is considered an excellent vehicle for getting things done. Meetings of the joint committee will be a matter of record, and minutes will be distributed to insure efficient follow-up.

In its analysis of major potential trouble spots and the establishment of policy concerning them, the joint committee will take on such problems as the details of numbering systems to be used, revision of tolerances, decision on adhesive bonding and others.

Subjects recently considered by the joint committee include:

• **Redux bonding.** Considerable Redux bonding is used in the Britannia. Some of the bonded assemblies are very large —one part in the trailing edge is 32 ft. long.

Members of the joint coordinating committee have reviewed what Bristol has done with Redux metal-to-metal bonding and have sent liaison teams to several U. S. airframe builders who use adhesive bonding, to get their experience. After this survey is completed, Canadair will decide on the adhesive bonding system it will use and will install equipment accordingly.

Canadair considers Redux very good but wants to evaluate it thoroughly in comparison with other systems on such factors as dwell time as well as preparation for use.

Substitution of spotwelding for adhesive metal bonding for some of the flat parts also is being considered as a possibility in cutting costs.

• **Interchangeability.** Model specifications for the MR version will not specify interchangeability except by reference to a particular item. Inter-



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changeability probably will be held to an absolute minimum for the purpose of holding costs low on tooling.

• **Heat-treat facilities.** Length of rolled stringers in the MR is such that Canadair's heat-treat capacity could not handle them if they should have to be formed in the W (soft) condition. However, it is likely that these stringers will be able to be joggled, etc., in the T (hard) condition.

Bristol uses much sharper joggles than Canadair presently uses. Accordingly, this item is now under study.

• **Extrusions, forgings.** Bristol machines extruded bar and shapes to remove coarse grain outer material. Canadair is investigating this matter to determine whether it is an engineering or weight-saving requirement.

Bristol's method of testing forgings also is different from Canadair practice. This is being investigated in order that Canadair's method for this plane can be established.

• **Riveting.** It is likely that Canadair will use the automatic Erco riveting process to some degree. Erco riveting machines procured for the canceled T-36 program may be available.

• **Castings, impregnation.** Because of the large size of a number of castings in the MR, it is likely that Canadair will need larger equipment for impregnation.

PRODUCTION BRIEFING

► **Micro-Precision, Inc.,** maker of hydraulic controls and fuel injection equipment, has started production at its new 40-000-sq. ft. plant in Evanston, Ill. The firm was formerly located in Chicago.

► **Ryan Aeronautical Co.,** San Diego, has received a million-dollar contract for "a new type item" which puts the firm into "a new production field." The new contract is of a classified nature, involves fabrication of large amounts of stainless steel and aluminum with considerable welding used.

► **Tenney Engineering, Inc.,** has started full-scale production at its new plant at 1090 Springfield Rd., Union, N. J. The firm, which makes environmental test equipment, now is housed in a 30,000-sq. ft. building.

► **Zenith Plastics Co.,** Gardena, Calif., has consolidated all of its aircraft engineering and fabricating facilities into a new division known as Zenith Aircraft, in anticipation of greatly expanding use of reinforced plastics as a primary structural material in planes and missiles according to company spokesmen.

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Navy Contracts

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

B & H Instrument Co., Inc., Fort Worth, Tex., BH 112H-16 jet cal., tester, 22 ea., BH 374 heater probe assy., 123 ea., BH 375 heater probe assy., 24 ea., pubs., vandykes, $44,844.

Kay Electric Corp., Pine Brook, N. J., Kay Model 300 A microwave mega-nodes, each complete with standard power supply; spare parts, dwgs., publs., bill of material, $61,381.

Reaction Motors, Inc., Rockaway, N. J., fabricate (2) 75-gallon prototype liquid oxygen tanks designed under contract NOas 53-376, having an evaporation rate of from 1% to 5% per day at ambient sea level temperature; conduct evaporation rate tests, recheck evaporation rate; engineering services; dwgs., reports, $53,-117.

Ryan Aeronautical Co., San Diego, Calif., design, develop and furnish (1) flyable model of a doppler radar hovering indicator; engr. services, reports, $71,395.

Technographic Publications, Inc., New York, N. Y., (1) reproducible copy of revision pages to: (a) AN-16-30APR9-21, Handbook of Operation Instructions; (b) AN-16-30-APR9-12, Handbook of Service Instructions; (c) AN-16-30APR9-13, Handbook of Overhaul Instructions; (d) AN-16-30-APR9-24, Illustrated Parts Breakdown (reissue) to cover the AN/APR-9B equip, being manufactured under contracts, NOas 52-126, NOas 52-1037, NOas 53-655, with Aircraft Radio Corp.; NOas 52-963, NOas 51-696, NOas 52-1017, with Collins Radio Co.; NOas 52-701, with Loral Electronics Corp.; NOas 51-605, with Presto Recording Corp., $35,613.

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn., air turbine starter, BuAer model A-20, 157 ea., $341,-475; air turbine starter, BuAer Model PS300-4, 16 ea., $28,560.

John Addison Footwear, Inc., 84 Chestnut St., Marlboro, Mass., shoes, leather, flight, 17,000 pr., $91,375.

Adel Div., General Metals Corp., 10777 Van Owen St., Burbank, Calif., pumps for various aircraft, $59,529.

AiResearch Mfg. Co., 9851-9951 Sepulveda Blvd., Los Angeles, valve, 1½" hose fitting shutoff, 140 ea., $31,780.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., timer for P5M-1 aircraft and spare parts, 63 ea., $43,167.

General Lab. Associates, Inc., 17 E, Railroad St., Norwich, N. Y., spare parts for P&W J57-P7 engines, $32,219.

Gill Electric Mfg. Corp., P.O. Box 431, 624 West Citrus Ave., Redland, Calif., batteries, $134,614.

Grumman Aircraft Engr. Corp., Bethpage, Long Island, N. Y., maintenance parts for F9F aircraft, $86,757.

R. M. Hollingshead Corp., 840 Cooper Street, Camden 2, N. J., coating, solution, spraytype, 12,500 gal., $26,700.

Houdaille-Hershey Corp., 1500 Fisher Bldg., Detroit 2, damper assy. and spare parts, 21 ea., $29,955.

Walter Kidde & Co., Inc., 675 Main St., Belleville 9, N. J., fire extinguisher and upper assy. brackets, $33,787; cylinder, nonshatterable, 2,400 ea., $52,584.

Leland Electric Co., Div. of American Machine & Foundry Co., 1501 Webster St., Dayton, Ohio, inverter and spare parts, $1,045,303.

Lockheed Aircraft Corp., P.O. Box 551, Burbank, Calif., shock struts for PV-2 aircraft, 32 ea., $28,029.

Permoflux Corp., 4900 W. Grand Ave., Chicago 39, headset, 4,102 ea., $42,210.

Permutit Co., 330 W. 42nd St., New York 36, N. Y., kit, desalting, sea water, 3,200 ea., $36,672.

Roflan Co., Cor. Route 1 & Camp Meeting Rd., Topsfield, Mass., trailer, floodlight, portable, 52 ea., $80,893.

Sherwin-Williams Co., 325 N. Broad St., Philadelphia 7, primer, zinc chromate, 60,000 gal., $145,200.

Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn., parts for the accomplishment of ECP-HSD-37 AF MIPR 09-603-4-03A-, 6,000 ea., $34,020.

Pratt & Whitney Aircraft Div., United Aircraft Corp., East Hartford 8, Conn., spare parts used on P&W engines, $133,502; material for use on P&W engines, $283,-979; material for use on R4360-59 engines, $58,089; spare parts for support of P&W engines, $1,482,443; spare parts used on P&W engines, $280,651.

United Mfg. Co., Div. of United Advertising Corp., 41 Haig St., Hamden 14, Conn., stand, test, aircraft generator and assy., $112,459.

Weston Hydraulics Ltd., 10918 Burbank Blvd., North Hollywood, Calif., cylinder, hydraulic, $398,395.

Air Cruiser Co., Monmouth County Airport Highway 34, Wall Township, P. O. Box 180, Belmar, N. J., raft, pneumatic, 1,526 ea., $540,967.

Atlas Paint & Varnish Co., 32-50 Buffington Ave., Irvington 11, N. J., paint, fire-retardant, 21,000 gal., $36,015.



New Trainers Ready for RAF

A half-dozen completed Boulton Paul Balliol T.2 advanced trainers are seen lined up in the company's Wolverhampton factory awaiting delivery to the RAF. Other Balliols (left) undergo checking. Powered by a 1,245-hp. Rolls-Royce Merlin 25 piston engine, the Balliol has a 288-mph. top speed. Britain's Royal Navy is also using the trainers under designation Sea Balliol T.21 and the planes have been ordered by Ceylon.

USAF Contracts

Following is a lis tof recent USAF contracts announced by Air Materiel Command.

Allison Division, General Motors Corp., Indianapolis, spec. tools and ground handling equipment, $400,000.

Cessna Aircraft Corp., Wichita, preprod. implementation of T-37A aircraft, $988,005.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., indicator, pressure, torque type A, 19,809 ea., $100,059.

B. F. Goodrich Co., 804-4 Winters Bank Bldg., Dayton 2, wheel assy., landing, 145 ea., 1,000 ea., $851,200.

Heil Co., 3000 W. Montana St., Milwaukee 1, truck-water tank, 42 ea., $293,065.

Hycon Mfg. Co., 2961 E. Colorado St., Pasadena 8, Calif., aerial photographic camera, spare parts, 100 ea., $226,665.

Link Aviation, Inc., Binghamton, N. Y., radio range attachment for C-11 trainers, spare parts and revisions to handbook data, 188 ea., $865,063.

Glenn L. Martin Co., Baltimore 3, B-61A pilotless aircraft, spare parts and engineer. chgs., 181 ea., $14,355,988.

Northrop Aircraft, Inc., Hawthorne, Calif., F-89D airplanes, spare parts, spec. tools and ground handling equipment, $154,-$36,284.

Olympic Radio Television, Inc., 34-01 Thirty-Eighth Ave., Long Island City 1, N. Y., antenna AT-97/APN-12, 1,147 ea., $71,634.

Phebco, Inc., 3640 Woodland Ave., Baltimore 15, interference blanker, 12 ea., $28,-511.

Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky., chaff, type RR-44/AL, 50,000 ctns., chaff, type RR-39/AL, 28,435 ctns., $1,849,077.

Specialties, Inc., Skunks Misery Rd., Syosset, L. I., N. Y., spare parts for CAS-2 lens cone, $97,813.

Union Carbide & Carbon Co., Hayes Stellite Co. Div., Kokomo, Ind., facilities, prod. of jet engine components, $30,000.

Westinghouse Electric Corp., 32 N. Main St., Dayton, motor assy. and data, 667 ea., $44,301.

Fast Writeoffs

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

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

- **Cornelius Co.,** Minneapolis, aircraft parts, $39,753, 70%.
- **Zul Machine Works, Inc.,** Lindenhurst, N. Y., aircraft parts, $36,140, 70%.
- **Fairchild Aircraft Div., Fairchild Engine & Airplane Corp.,** Hagerstown, Md., aircraft, $35,335, 65%.
- **Fairchild Engine & Airplane Corp.,** Farmingdale & Valley Stream, Long Island, N. Y., aircraft parts, $35,969, 65%.
- **Curtiss-Wright Corp.,** Woodridge, N. J., aircraft parts, $56,799, 60%.
- **Mueller Co.,** Los Angeles, aircraft parts, $5,157, 65%.
- **Motorola, Inc.,** Phoenix, research and development in military electronics, $18,273, 65%.
- **Narmco Manufacturing Co.,** La Mesa, Calif., aircraft parts, $30,243, 70%.
- **Kearfott Manufacturing Corp.,** Newark, N. J., aircraft parts, $24,305, 70%.
- **Douglas Aircraft Co., Inc.,** El Segundo, Calif., aircraft, $39,244, 65%.
- **Swedlow Plastics Co.,** Los Angeles, aircraft components, $50,000, 45%.

REFRASIL INSULATION

for the shape of things to come!



REFRASIL IS ON THE JOB HERE!

The needle-nosed Douglas X-3 is a forerunner of superspeed aircraft which will soon prove to the world that the sky is no longer the limit! Blistering heat from the twin turbojets of the X-3 are safely insulated from pilot and surrounding structure by Refrasil Lightweight Removable Insulating Blankets, composed of *high silica batt* sandwiched between layers of high temperature foil. Let Refrasil insulate *your* hot jobs! If you require high performance insulation that can withstand temperatures up to 2000°F, you can depend on Refrasil to deliver the *protection* you need! HITCO engineering counsel is yours without obligation. Let's get together on finding new uses for Refrasil in *your* business!

WHAT FORM OF REFRASIL DO YOU NEED?

☐ Bulk Fiber ☐ Cordage ☐ Batt ☐ Sleeving ☐ Cloth ☐ Tape



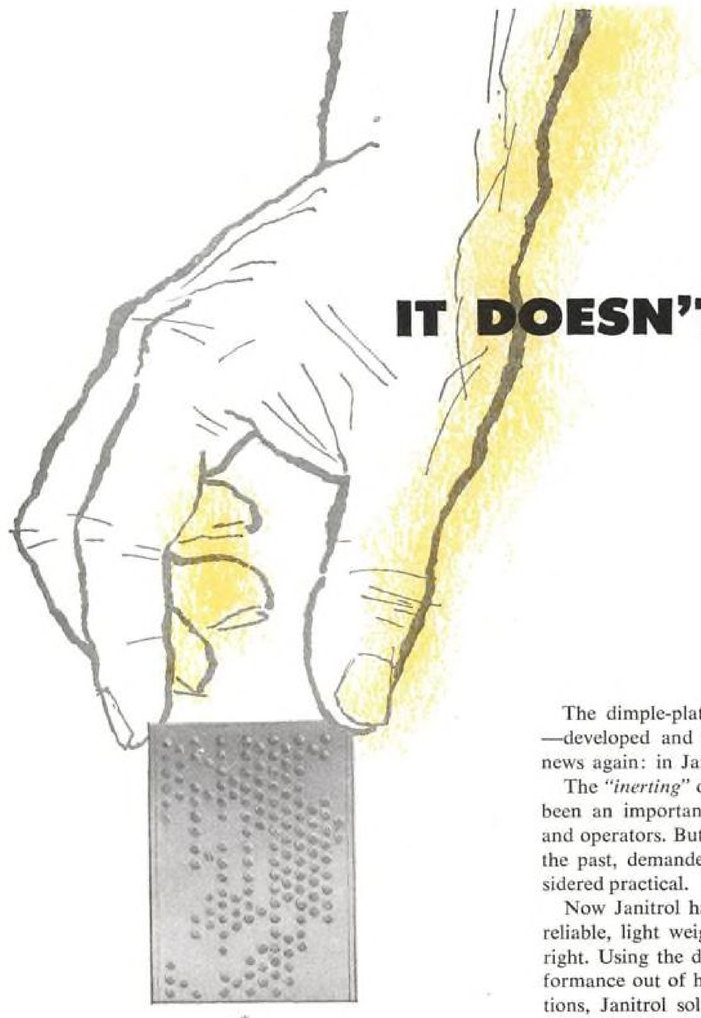
For free sample and literature, check below, clip to your letterhead and mail today!

Your Name _____ AW-1

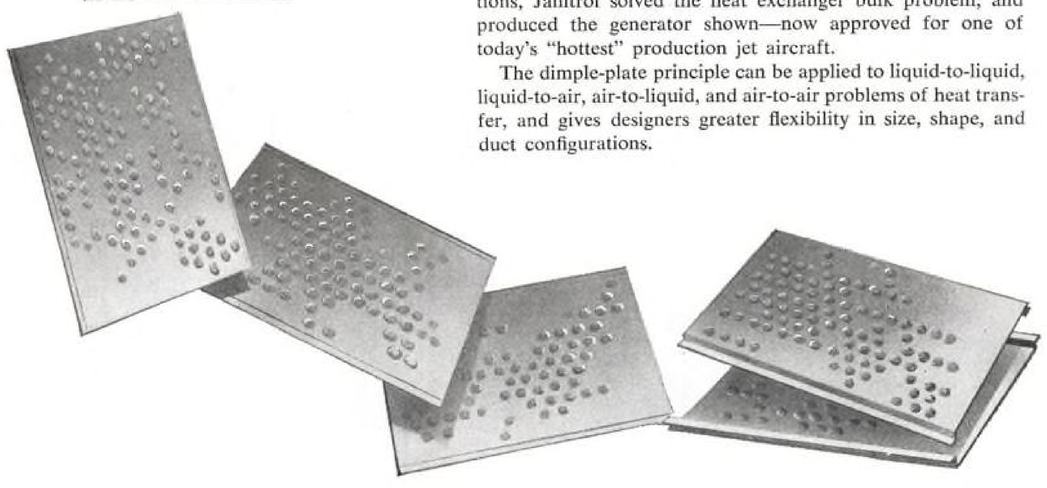
HITCO

H. I. THOMPSON FIBER GLASS CO.
(Formerly The H. I. Thompson Co.)
1733 Cordova St., Los Angeles 7, Calif.
Telephone REpublic 3-9161

WRITE OR CALL YOUR NEAREST REFRASIL REPRESENTATIVE: EASTERN - Fred W. Muhlenfeld, 6659 Loch Hill Road, Baltimore 12, Md., Valley 5-3135 • MIDWEST—Burnie L. Weddle, 3219 West 29th St., Indianapolis 22, Ind., Hickory 8685 • SOUTHWEST—Marshall Morris, 3513 South Drive, Fort Worth, Texas, Webster 2965 • Represented in Canada by RAILWAY & POWER ENGINEERING CORP.



IT DOESN'T TAKE LONG



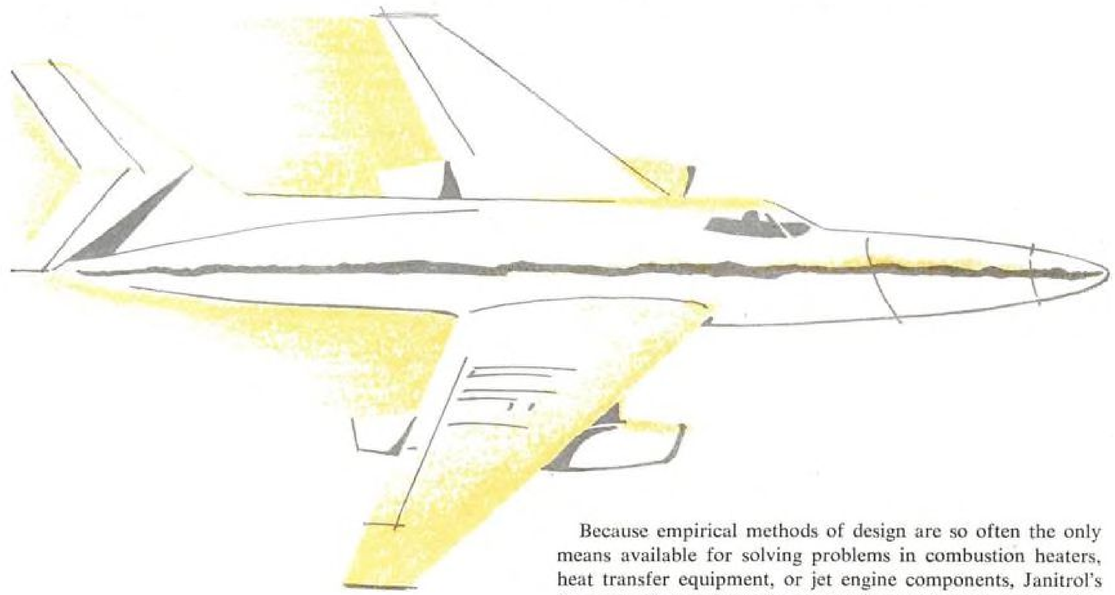
The dimple-plate principle of heat exchanger construction —developed and announced recently by Janitrol—is in the news again: in Janitrol's new Purge Gas Generator.

The *"inerting"* of fuel cells against fire or explosion has long been an important goal of safety-conscious aircraft builders and operators. But the heat exchange problem involved has, in the past, demanded units too large and too heavy to be considered practical.

Now Janitrol has done it simply and successfully, with the reliable, light weight Purge Gas Generator pictured at lower right. Using the dimple-plate principle, which gets higher performance out of high temperature alloys in lighter weight sections, Janitrol solved the heat exchanger bulk problem, and produced the generator shown—now approved for one of today's "hottest" production jet aircraft.

The dimple-plate principle can be applied to liquid-to-liquid, liquid-to-air, air-to-liquid, and air-to-air problems of heat transfer, and gives designers greater flexibility in size, shape, and duct configurations.

FOR JANITROL HEAT EXCHANGERS TO GO PLACES



Because empirical methods of design are so often the only means available for solving problems in combustion heaters, heat transfer equipment, or jet engine components, Janitrol's 37 years of experience in combustion equipment engineering, offers you a uniquely valuable "proven reserve" of information and manufacturing skills. Whether your problems are routine or pioneering, we invite you to phone or write your nearest Janitrol representative.

If you do not have a copy of "Heat in Harness," an interesting and fact-filled story of Surface Combustion developments, we'll be glad to send you one. Write, on your letterhead please.



14" x 16" x 24"

37 years experience in combustion engineering

Janitrol®

AIRCRAFT-AUTOMOTIVE DIVISION
SURFACE COMBUSTION CORPORATION
Columbus 16, Ohio

National Sales, Engineering, Production Headquarters, 400 Dublin Ave., Columbus 16, Ohio. District Engineering Offices: New York, 225 Broadway; Washington, D. C., 4650 East-West Highway; Kansas City, 2201 Grand Ave.; Ft. Worth, 2509 West Berry St.; Hollywood, Calif., 7046 Hollywood Blvd.; Columbus, Ohio, 400 Dublin Ave. Executive Offices: 2375 Dorr St., Toledo 1, Ohio.



Over 700 top-drawer engineers turn flights of fancy into facts...

Imagination runs riot at AC—as riotous as cold, hard, engineering facts permit.

Here, the imagination of more than 700 carefully chosen engineers (from more than 150 different colleges and universities) daily translates dreams into new defenses for America.

AC's success in this field is a matter of record—a record of which we are justly proud. Such products, now being built, as the "A" series Gun-Bomb-Rocket Sights—A-1A Bombing Navigational Computers—T-38 Skysweeper Fire Control Systems are examples of AC's unusual ability to handle the toughest electro-mechanical jobs—from development and design straight through final assembly, testing and service in the field.

AC is always ready, willing and more than able to put imagination to work for you on *new* defense problems—the tougher the better. Let AC prove, once more, its ability to turn out top-quality material for the Armed Forces—on or ahead of schedule—at assembly line savings.

A—A group of AC engineers at work in part of the Military Products Engineering Section at Flint. B—A section of AC's Military Products Engineering at the Milwaukee plant. C—Plant layout engineers in Flint see to it that effective grouping of machinery and equipment is utilized to insure greatest economy and efficiency in manufacturing.

GM GENERAL MOTORS GM GOOD MANAGEMENT

AC QUALITY PRODUCTS

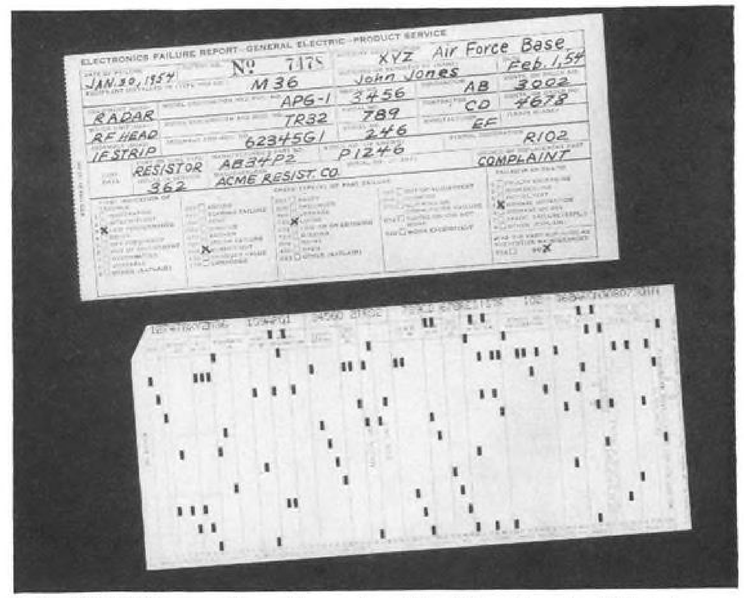
AC SPARK PLUG DIVISION . . . GENERAL MOTORS CORPORATION, FLINT, MICHIGAN

DEFENSE PRODUCTS of High Quality at Low Cost DELIVERED ON TIME

GE Cuts Down Field-to-Factory Gap

• Special report system gets data on equipment failures home fast for quick analysis, action.

By Philip Klass



FIELD REPORT form provides quick way for getting failure data onto IBM cards

An important tool for increasing the reliability of avionic equipment has been devised by General Electric's Electronics division at Syracuse and recently put into operation. It is a new system for speeding the all-important feedback of information to design engineers to let them know how their equipment is performing in the field, making it possible to spot potentially serious troubles before they become epidemic.

The GE system employs a special type of card for field engineers' reports. With it, their information can be quickly and easily converted for automatic data sorting and tabulation.

The system's operation was first described by GE's R. R. Landers before the Institute of Radio Engineers convention in New York, and more recently by P. G. Fritschel at the Conference on Airborne Electronics in Dayton.

After only three months of operation, the new method has proved so useful that GE's Electronics Division is expanding its use for commercial as well as the original military equipment, Landers told AVIATION WEEK. Other companies are also reported interested in adopting the system.

► **The Bottleneck**—Reports from a company's field engineers are a primary source of information on equipment shortcomings in service use. In most instances, these reports are filed but once a week, are usually written in narrative style, and intermix facts with opinions. Sometimes important details are omitted. And their value and completeness varies with the individual author, Landers points out.

Back at headquarters, skilled engineers must read these field reports to extract important data and to try to spot significant trends. This, plus the considerable clerical work involved, introduces serious delays between the field failure and the time that corrective action can be initiated in the factory.

► **GE's Approach**—The Government Marketing Dept. of GE's Electronics Division reasoned that the whole process could be speeded if field reports were put into IBM cards and machines were used to sort and tabulate it. But before this could be done, field reports would have to come in in such a form that the data could easily be transferred to IBM cards by semi-skilled personnel.

"Elecronics Failure Report" cards, approximately the size of an IBM card, are the keystone of the GE system. These are serially numbered, bound in checkbook fashion, small enough to slip into the pocket of a field engineer (see photo, above). They enable the field engineer to make an on-the-spot report when he goes out on a trouble call.

► **Speedy Reports**—Only one malfunction is reported on a single card, and the day's accumulation of cards is mailed back to headquarters every 24 hours. The card has spaces in which the tech rep fills in such information as the base location, date, type of equipment, assembly, and component involved, together with their model and serial numbers.

On the lower portion of the card there are squares which the tech rep checks to give more detailed information on the malfunction, including:

• **First indication of trouble.** The card lists such symptoms as inoperative, intermittent, low performance, noisy, off frequency, out of adjustment, overheating, unstable, other. If none of the items listed apply, the field engineer can write in all the details on back of card.

• **Type of part failure.** Approximately 1,000 different types of electrical and mechanical failures are given code numbers and listed in an accompanying instruction manual. Of these thousand, approximately 23 of the most common are listed on the card with small squares for checking. If the type of failure is not one of those listed on the card, the tech rep fills in the code number which applies. If the fault is not one of the thousand which are number-coded, it can be described on the back of the card.

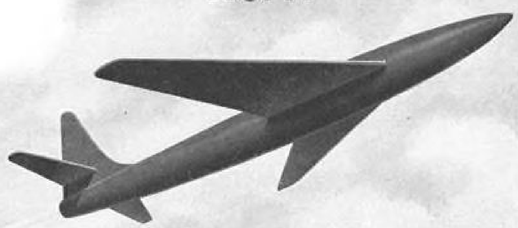
• **Cause of failure.** Card lists such things as faulty packaging, mishandling, initial test, normal operation, storage or age, associated failure, or other.

The use of cryptic codes to describe types of component failures requires that all parties have a common understanding of terms, Landers emphasized. The instruction manual which lists the 1,000 coded faults includes detailed definitions of each.

Carbon copies of each field report card are retained in the field engineer's book for his future reference.

► **Analyzing the Data**—When the cards are received at the factory, their data is promptly transferred to IBM cards. Once this is done, IBM machines can quickly sort out a variety of useful in-

Your future's on the rise when you're an aviation electronics engineer with RCA!



FIRE CONTROL
PRECISION NAVIGATION
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POSITIONS IN: ***SYSTEMS, ANALYSIS, DEVELOPMENT or DESIGN ENGINEERING***

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AUTOMATIC machine quickly sorts IBM cards based on field reports.

formation. For instance:

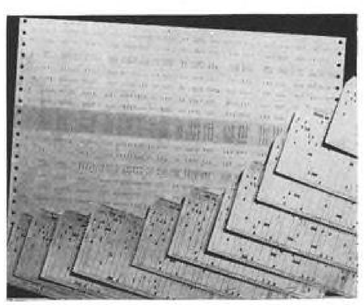
• **Number of equipment failures,** according to type of equipment, type of failure, environment (ground, air, or ship-based).

• **Number of component failures,** according to manufacturer, type of component, operating environment, type of equipment in which used, or other.

One such tabulation, shown below, lists component failures by type of component. This group of fire resistors which suffered the same type of failure (shaded area) flag attention as a component which bears investigation.

▶ **Spotting Trends**—Thanks to the new system, GE was able to prevent an epidemic of spring failures in a radar coupling by spotting a trend after only a couple of failure reports had been received, Landers reported. As a result, the factory could take corrective measures and field engineers were alerted.

The system also helps to pinpoint areas where effort will pay the biggest dividends. For example, in one month a total of 109 component failures were experienced in the field with a certain type of radar. Analysis showed that of these 109 components, only nine



TABULATIONS made from IBM cards group failure data in various ways.



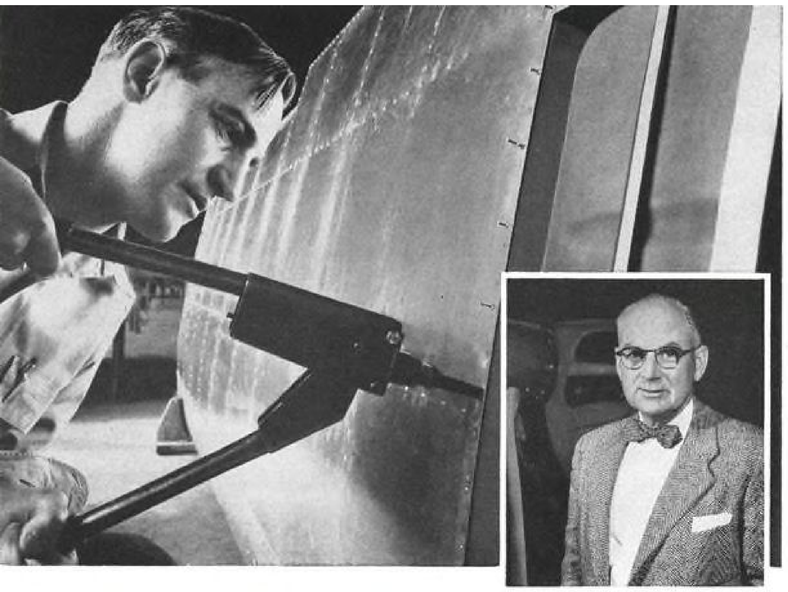
"Looks like another one of those hush-hush huddles with the man from Fafnir."



Fafnir KP-BS Self-Aligning Torque Tube Type Bearing

Teaming up with leading aircraft designers on advanced aircraft bearing design problems has been a specialty of Fafnir Bearing Engineers since the "baling-wire" days. Recent result of such teamwork is the Fafnir KP-BS Self-Aligning Torque Tube Type Bearing developed for hinge applications and push-pull controls on modern, high speed aircraft. The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR
AIRCRAFT BEARINGS
FIRST . . . at the turning points in aircraft design



Russell P. Hay

"We Speed Repairs—Cut Maintenance Costs With Cherry Blind Rivets," Says This Fixed-base Operator

Home base airports and service shops—the very backbone of operations and maintenance for private planes—must perform continued good service and reliable repair work at reasonable cost. They know from experience that they can do dependable work—quickly and economically—when Cherry Rivets are used for a myriad of fastening jobs.

That's why Russell P. Hay, Inc., well-known Cessna dealer at Pittsburgh's Allegheny County Airport, specifies Cherry Rivets for all service, maintenance and repair work in his CAA approved shop for metal airplanes.

Mr. Hay says, "We speed repairs and cut maintenance costs with Cherry Blind Rivets. Experience has shown us that they can replace any primary or standard rivet and give long, dependable service. We use them in a variety of ways from replacing entire wing surfaces to repairing small sections of controls and mounting accessories. With Cherry Rivets one man can do the job easily and quickly—they help complete repair jobs faster, which keeps our customers happy."

This is true in hundreds of home base airports and major airline service depots throughout the world where dependable, speedy Cherry Rivets help to reduce costs—provide a fast, safe, secure method of fastening in hard-to-reach places.

The use of Cherry Rivets speeds repairs by eliminating the necessity of removing entire sections to gain access for replacement of damaged sections and parts. They are installed by one man from one side of the work by a special gun which pulls the stem into the hollow shank—upsets the end of the blind side—firmly clinches the rivet in place—fills the hole—all in a split second. There is no bucking—no hammering—no exploding. With Cherry Rivets, ships get out of the shop faster, make room for other jobs—the owner is in the air again sooner and his repair bill held to a minimum.

Cherry Rivets are but one of a group of 10,000 types of fasteners and special cold-formed parts produced by Townsend in its several plants. As "The Fastening Authority," Townsend helps you speed repairs and original assembly—and helps you improve your operation with Cherry Blind Rivets.

For detailed application information, write for Bulletin TL-76.

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NEW BRIGHTON, PENNSYLVANIA
Sales Offices in Principal Cities
Cherry Rivet Division • Santa Ana, California

In Canada: *Parmenter & Bulloch Manufacturing Company, Ltd., Gananoque, Ontario*

types had suffered two or more failures. GE was thus able to concentrate its efforts on finding the cause of failure of these nine types.

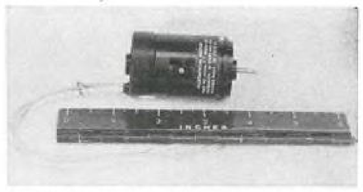
The new system has also provided data which suggests that preventive maintenance beyond a certain point may not pay off, Landers indicated. For that reason the card provides room for the field engineer to indicate whether component was replaced as a result of preventive maintenance program. With this data, GE hopes to determine the point of diminishing returns on preventive maintenance.

▶ **Future Possibilities**—One of the greatest potential uses for the GE system, Landers believes, is in determining the numbers of spare parts needed for both military and commercial electronic equipment. Military investment in spare parts sometimes costs as much as the basic equipment.

Landers pointed out that all of the necessary ordering information is on the failure card, including stock number, the person requesting the part, his address, and the contract to be charged.

Thus the supplying of replacement parts could be tied into the failure reporting system. The original punched card could be used to make the requisition automatically and could even make up the shipping label, Landers says.

Companies wishing more information on the new system may address their inquiries to Richard R. Landers, Government Marketing Dept., Electronics Div., General Electric Co., Syracuse, N. Y.



INCREMENTAL motor made by Stepper.

New Developments in Computer Components

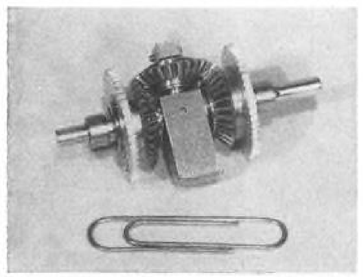
A new highspeed reversible stepping motor which converts digital pulses into shaft rotation at speeds up to 30 pulses/sec. will be manufactured and marketed by Stepper Motors Corp., Los Angeles, according to Northrop Aircraft which developed the device.

The incremental motors have been used in USAF equipment built by Northrop for the past two years. Stepper Motors has been granted an exclusive license.

Other new developments in the field of computer components include:

• **Read-recording head,** for use in magnetic drum memory devices, features a one-piece ferrite core which provides higher operating frequency and sensitivity, according to manufacturer, Librascope, Inc. Resonant frequency is 500 kc., crosstalk between adjacent heads is −60 db. Company's address: 1607 Flower St., Glendale, Calif.

• **Tiny mechanical differential** for analog computers is only slightly longer than a paper clip. It has a no-load breakaway torque of 0.001 oz. in. and 12 minutes-of-arc of lost motion, according to Ford Instrument Co., 31-10 Thomson Ave., Queens, N. Y.



MECHANICAL differential for computers.

New Meters Aid Lab Operations

Test and measurement operations in electronics laboratories may be aided by these recently announced devices:

• **Phase meter,** Type 405, for measuring phase difference between two signals over frequency range of 8 cps. to 150 kc., with error less than 3% or 2 deg., according to manufacturer. Meter has three selectable ranges, input impedance of one megohm. Manufacturer is Advance Electronics Co., Inc., 451 Highland Ave., Passaic, N. J.

• **Power meter,** for measuring rms. value over frequency range of d.c. through X-band, employs single power probe for entire range, with rugged power sensing element capable of withstanding 150% overload. Device has two scales: 0-20 mw. and 0-100 mw. Manufacturer is Polarad Electronics Corp., 100 Metropolitan Ave., Brooklyn 11, N. Y.

• **Frequency meters,** Models LA-5, LA-6, and LA-61, covering the frequency range of 10,100 mc., 100-500 mc., and 500-2,000 mc. respectively, and having reported accuracies of 0.001%, are available from Lavoie Laboratories, Inc., Morganville, N. J.

• **Peak voltage converter** designed for use with any sensitive rms. reading electrostatic voltmeter, permits measurement of peak voltages up to 30,000 v. over the frequency range of 60 cps. to 10 mc. Manufacturer is Sensitive Instrument Research Corp., 9-11 Elm Ave., Mt. Vernon, N. Y.



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Townsend tapping screws are available in the types shown here in a variety of head styles with slotted or Phillips recessed and hex heads. They are but one group of the Townsend family of 10,000 types of standard and special fasteners and small parts used by all industry to improve assembly and speed production.

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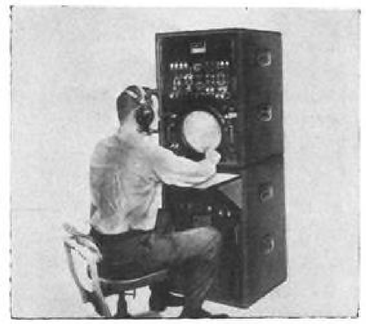
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QUADRADAR does four jobs: air surveillance, precision approach, height-finding, airport surveillance. Its two main parts: antenna pedestal (l.); console (r.).

Low-Cost Radar Combines 4 Jobs

Small but versatile is the best way to describe a new 4-in-1 low-cost airport radar developed by Gilfillan Bros., Inc. It can be used for surveillance, precision approach, height-finding, and as a runway taxiing radar. The new "Quadradar" is particularly suited for use at medium-size civil airports and at forward military airfields.

The Gilfillan "poor man's GCA" weighs 1,800 lb. and is priced at $37,500, putting it in competition with the recently announced Laboratory For Electronics SPAR (AVIATION WEEK May 3, p. 54). Both operate in X-band (3.2 cm.), but SPAR lacks the full hemispheric surveillance feature of the Quadradar.

Gilfillan says it expects to deliver production models of its new Quadradar within 10 months.

▶ **Operating Modes**—At the flip of a switch, the Quadradar operator can select any one of these operating modes:

• **Air surveillance.** Full 360-degree azimuth coverage for small aircraft at distances up to 20 miles (1,250 sq. mi.), or 40 miles for large planes (5,000 sq. mi.). In this mode, elevation antenna is automatically driven to a horizontal position where it will not obstruct vision of the azimuth antenna.

• **Precision approach.** Provides familiar azimuth, height, and distance information on approaching aircraft, covering a 30-deg. azimuth sector and a 7-deg. elevation sector (−1 to +6 deg.). Wide scan angle of azimuth antenna and double "cosecanting" of elevation antenna enables Quadradar to serve two parallel runways up to 3,000 feet apart from single antenna site. Motor-driven turntable enables operator to rotate antennas by remote control to serve several non-parallel runways.

• **Height finder.** Provides height-distance information on aircraft within a 20-mile radius at altitudes up to 50,000 feet, Gilfillan says. This is done by extending the normal vertical scan sector from 7 deg. to 31 deg. (−1 to +30). This feature is particularly useful for jets which make straight-in approach from high altitudes to conserve fuel, and for helicopters which make near-vertical approaches.

• **Airport surveillance.** When azimuth antenna is depressed to illuminate the airport runways, and range reduced to five miles, Quadradar gives tower operator a picture of aircraft and runway obstructions for taxiing instructions.

▶ **Quadradar Uses**—Gilfillan expects its Quadradar to find application at medium-size airports which cannot qualify for government-furnished instrument approach and surveillance facilities, as well as for tactical military aviation.

"At airports with 150 landings per day, Quadradar is capable of handling all traffic without the benefit of any other navigation aid," Gillfillan says. "By adding a single inexpensive homing beacon, capacity of the Quadradar is increased to handle air traffic at virtually all airports," company adds.

The set may also find use at civil airports as back-up equipment for standard ILS or GCA, to provide multiple runway coverage when wind shifts make existing single-runway equipment unusable. The set should also be useful in providing information to enable airport tower controllers to monitor stacked aircraft over holding points.

▶ **Packaged for Portability**—Gilfillan has packaged the Quadradar for inexpensive installation at civil airports, for easy portability in military applications.

The set can be transported by C-47 or helicopter, unloaded, assembled, aligned with runways and ready for operation in less than three hours, company says. If airstrip must be abandoned, set can be dismantled and loaded for transport in less than one hour.

The new radar consists of two units:

• **Antenna pedestal** on a four-legged stand, which also houses radar transmitter-receiver.

• **Operator's console,** which contains a 12-in. scope and associated video circuitry.

The antenna pedestal is weatherized to protect the avionic gear from the elements. The transmitter-receiver can be removed from pedestal and installed in the control tower, if desired, for easier access. The console can be located up to 500 feet from the antenna pedestal, or up to 10,000 feet if optional remoting equipment is use, Gilfillan points out.

▶ **Operational Features**—Interesting operational features of the Quadradar include:

• **Dual presentations.** When set is used for surveillance, a conventional PPI presentation with selectable ranges of 5, 10, 20, or 40 miles is provided. Center of presentation can be offset 10, 20, or 40 miles. When used for approach, a conventional Azel display is provided, i.e., the upper half of scope shows airplane height and distance out, lower half shows airplane azimuth and distance. In this mode (and in height-finder mode), a new type scope presentation, called Beta scan, is used to increase accuracy. As the plane approaches touchdown, its deviation from the desired flight path is shown on the scope with an expanded scale.

• **Choice of sweep.** In addition to Beta scan, Quadradar gives operator a choice of linear sweep or logarithmic sweep. The latter expands the distance scale toward the point of touchdown.

• **Clutter remover.** During rain or snowstorms, radar operator can switch from normal (linear) to circular polarization to reduce spurious echos (clutter) from the precipitation which might otherwise obscure aircraft blips.

FILTER CENTER

▶ **New Computer Magnetics**—Watch for increased use of magnetic amplifiers and mag amp-transistor combinations to replace vacuum tubes in digital computers. One manufacturer has reportedly developed a magnetic flip-flop which operates at frequencies of several megacycles, requires only a few microwatts of power.

▶ **IRE Convention Move?**—Exhibitors at the national IRE convention this year are being polled for their views on moving the annual affair from New York City to Atlantic City until a new convention auditorium, which could house the IRE show under one roof, is completed in 1957. Exhibitors are reportedly dissatisfied over this year's arrangements in which exhibits were located at the Kingsbridge Armory in



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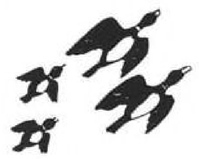
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the Bronx and many of the technical papers were given in Manhattan. Grand Central Palace in Manhattan, previous IRE convention site, has been taken over by the government for offices.

▶ **Airline Selcal Interest**—Domestic airlines are reportedly showing considerable interest in Selcal, the selective calling system originally developed for use by overseas carriers (AVIATION WEEK Nov. 16, 1953, p.71). United Airlines is said to be considering a fleetwide installation.

▶ **Chile Buys Bendix VHFs**—The Chilean Air Force has purchased Bendix Radio's latest VHF ground station equipment (TG-19 transmitters and RG-9A receivers) for use at 27 airports throughout the country.

▶ **New York PGANE Formed**—A New York chapter of the IRE's Professional Group on Aeronautical and Navigational Electronics has been formed, the sixth such local group in the country. Chapter includes Long Island, North Jersey and Ft. Monmouth Subsections. First meeting, June 10 at the General Electric auditorium, 570 Lexington Ave., will hear a paper by D. O. McCoy on Collins Radio's new TVOR.

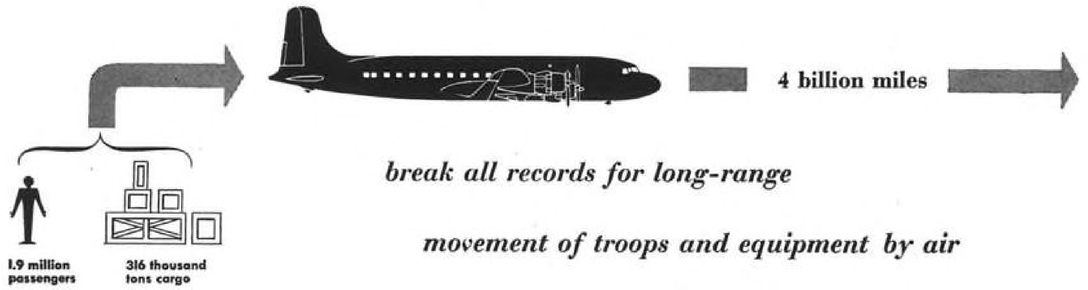
▶ **Avionics Conference Scheduled**—An East Coast Conference on Airborne and Navigational Electronics has been scheduled for Nov. 4-5 at the Sheraton-Belvedere Hotel in Baltimore. Conference is sponsored by the IRE's Professional Group on Aeronautical and Navigational Electronics and its Baltimore section. Persons wishing to present papers should submit 150-word abstracts before July 1 to Norman Caplan, Bendix Radio Div., Bendix Aviation Corp., Towson 4, Md. –PK

New Avionic Bulletins

Recently announced technical bulletins and catalogs describing components, devices and techniques of interest to the avionics field include:

- **Precision wirewound resistors,** Type "P," encapsulated, designed to MIL-R-93A; Bulletin L-30. Shallcross Manuf. Co., Collingdale, Pa.
- **Microwave components,** including waveguides, antennas, transmission lines, and accessories; catalog. Prodelin, Inc., 307 Bergen Ave., Kearny, N. J.
- **Measuring, indicating and recording devices,** including accelerometers, pressure transducers, and variable differential transformers; bulletin. Schaevitz Engineering, P. O. Box 505, Camden 1, N. J.
- **Oil-filled capacitors;** bulletin. Industrial Condenser Corp., Dept. AWN, 3243 N. California Ave., Chicago 18, Ill.
- **Recording oscillograph,** 18 or 26 channels, Type 5-114; Bulletin CEC-1500C. Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 15, Calif.
- **Thermostats,** semi-enclosed and hermetically sealed bimetal disc types; Bulletin L-9070. Bimetal, type W; Bulletin L-6395. Stevens Manuf. Co., Inc., Mansfield, Ohio.

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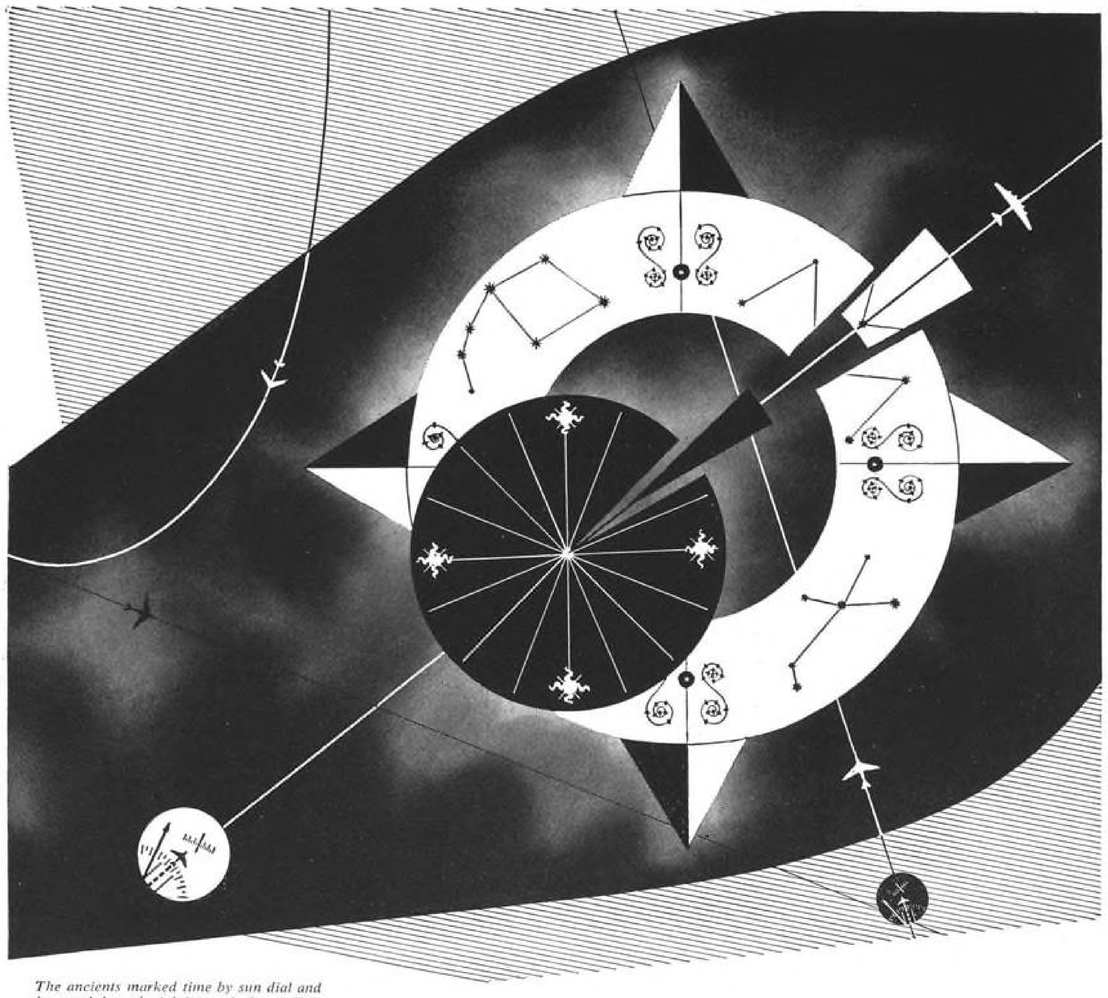
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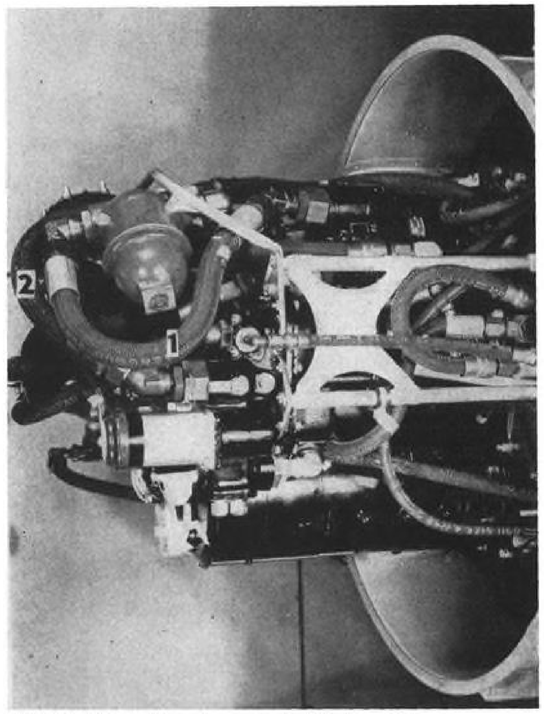
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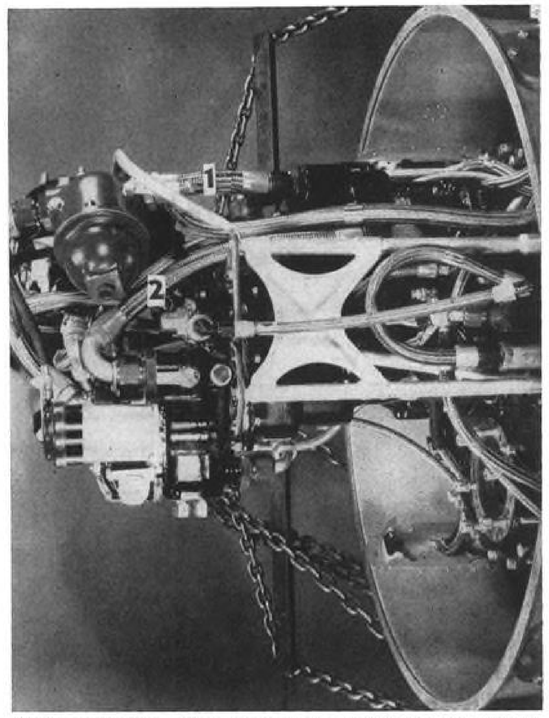
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BEFORE. Allison jet engine as received by Aeroquip.



AFTER replumbing. Compare hoses 1 and 2 in the two photos.

New Hoses Meet Needs of Jet Aircraft

Aeroquip developments exceed current military specifications while simplifying turbojet installations and saving weight.

By George L. Christian

Jackson, Mich.—Two new types of aircraft hose tailored specifically for the latest jet engines and airframes (jet and reciprocating) have recently been developed by Aeroquip Corp. here.

• **601 known as engine hose.** The 601 line, "Coverless Engine Hose," was created specifically for use on jet powerplants. Aeroquip says it is now being used by all U. S. jet engine manufacturers, either on a production or experimental basis, with the exception of one company.

The hose is smaller, lighter, has higher heat resistance and is more flexible than standard MIL-H-5511 hose now in wide use on military aircraft, according to Aeroquip. The line is suitable for use with any jet fuel or synthetic lubricant at temperatures up to 375F. This is 100 degrees higher than AN hose. Aeroquip is now testing hose which will go 25 degrees above the 601 line.

The 601 hose has been installed experimentally on the General Electric J73, Allison J71, Wright J65 and a small, Continental-built Turbomeca gas turbine. It is being used as production equipment on the Westinghouse J40 (for both fuel and oil) and the GE J79 for fuel only.

Development of the hose started in 1949.

• **617 airframe hose.** The 617 hose, designed primarily for airframe needs, is a lightweight, low-pressure hose meant particularly for such uses as inter-tank and tank-to-engine connections, and vent and drain lines. It is suitable for use with any type of fuel or oil in applications where pressures do not exceed 125 psi., according to Aeroquip. It is used on the Douglas A3D, F4D,

	MIL-H-5511			AEROQUIP 601			SAVINGS				
							WEIGHT		SIZE	FLEXIBILITY	
Size	Wt/Ft (Lbs)	O.D."	Min. Bend Radii*	Wt/Ft (Lbs)	O.D."	Min. Bend Radii*	Wt/Ft (Lbs)	% Lighter	% Smaller**	Improved Bend Radius	%
– 3	.124	.453	3"	.093	.375	1¾"	.031	25.0	31.5	1¼"	41.7
– 4	.132	.516	3"	.114	.438	2"	.018	13.6	28.0	1"	33.3
– 5	.156	.578	3⅜"	.145	.484	2¼"	.011	7.1	29.8	1⅛"	33.3
– 6	.228	.672	4"	.155	.547	2½"	.073	32.0	33.7	1½"	37.5
– 8	.264	.766	4⅜"	.170	.641	3½"	.094	35.6	30.0	1⅛"	24.3
–10	.372	.922	5½"	.207	.797	4"	.165	44.4	25.63	1½"	27.3
–12	.456	1.078	6½"	.285	.938	4½"	.171	37.5	24.4	2"	30.8
–16	.442	1.234	7⅜"	.380	1.141	5½"	.062	14.0	14.6	1⅞"	25.4
–20	.520	1.500	9"	.490	1.406	8"	.030	5.8	12.1	1"	11.1
–24	.673	1.750	11"	.675	1.672	9"	–.002	—	8.7	2"	18.2

*At maximum operating pressure.
**% Smaller Area of Hose ($A = \pi r^2$)

COMPARISON of specifications of Aeroquip 601 and standard MIL-H-5511 engine hose.



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and C-133; Lockheed 81P (VTO), R7V, C-121A,-B,-C; Grumman F9F-9; and Chance Vought A2U-1.

Aeroquip officials list these planes as including 617 hose in experimental installations: Boeing's 707 jet transport, the Convair F-102 and R5Y; Lockheed F-104; North American F-100; and Douglas B-66, RB-66 and DC-7.

Both the 607 and 617 series are in quantity production in all sizes.

Aeroquip also recently developed a third type of line—the 616. It is a silicone hose used with the company's "Little Gem" fittings. Primary application is to convey hot air (up to 500F) in jet engine anti-icing systems.

All three hoses are manufactured by the B. F. Goodrich Co. to Aeroquip design specifications.

▶**Halving the Weight**—Kent R. Manning, Aeroquip's chief development engineer, gave a convincing demonstration of what 601 hose can do, especially when used with Aeroquip-developed, lightweight, small-size fittings, such as the Little Gem and brazed aluminum fittings.

Aeroquip obtained an Allison J35 and a General Electric J47 engine from the respective makers. Both jets were delivered with regular MIL-H-5511 hose and standard fittings. Both engines were re-plumbed by Aeroquip using 601 hose, Little Gem and brazed aluminum fittings. Here are the results.

• **On the J35.** A total of 34.8 lb. of AN hose was taken off the J35 and replaced with 18.48 lb.—a saving of 16.32 lb. or 47%. Length of hose saved was reflected this way: 938 in. removed and replaced with 796 in. for saving of 142 in. or 15.10%.

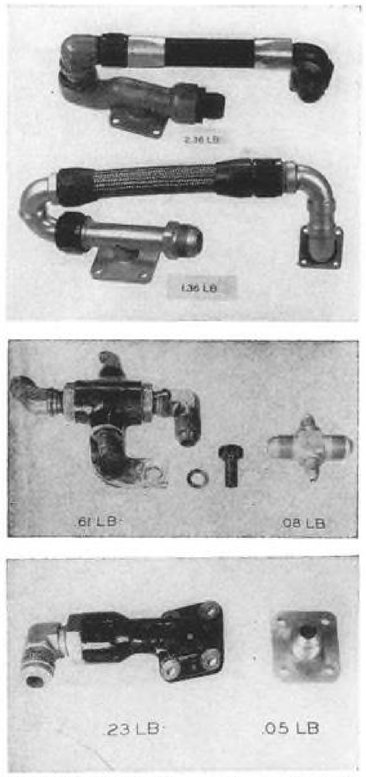
• **On the J47.** Weight saving of 15 lb. (29.2%) was achieved when 51½ lb. of AN hose and fittings were replaced by 36½ lb. of Aeroquip equipment. The number of items, such as hose assemblies and fittings, was reduced from 196 to 86. Leakage points, such as AN adapters screwed to AN swivel nuts, were reduced. High-temperature resistance was improved and engine plumbing was made compatible with synthetic lubricating oils conforming to MIL-L-7808.

▶**How It Saves**—Manning attributes the weight economy of the Aeroquip line to these factors:

• The 601 hose is lighter than equivalent MIL-H-5511 line.

• Less 601 hose is used on the engine. Being more flexible than the military hose, it is possible to make shorter, more direct runs between fittings, eliminating many cases of long, devious loops to reach certain accessories.

• Little Gem and Aeroquip elbow hose fittings are lighter than the many AN forged elbow fittings they replaced. And, because of better inside diameter design, flow characteristics are improved up to 30%, according to Aeroquip.



REPLUMBING J-47 meant simplification and weight saving. Top photo compares original governor connection (upper) and Aeroquip replacement; center compares old and new drain block; bottom, scavenger pump fitting.

Reduction in weight of the 601 hose is achieved by making a hose with a smaller o.d. for a given i.d. and by leaving off the cotton cover.

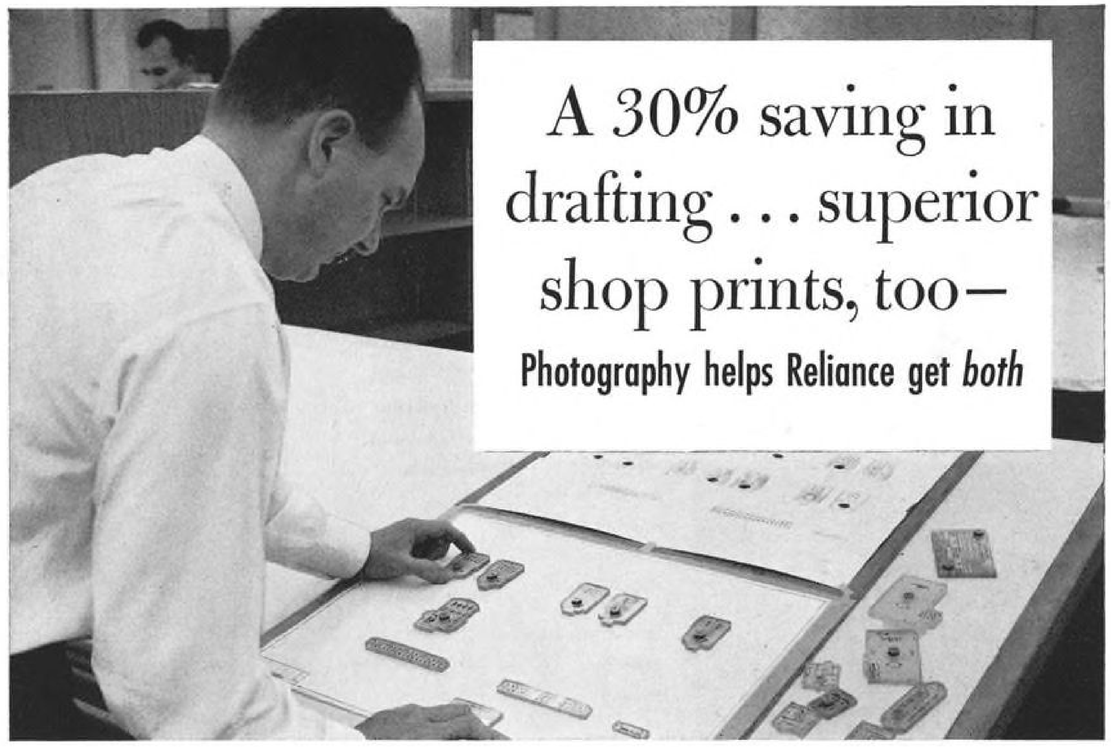
The o.d. reduction also results in an appreciable space saving.

▶**Improved Heat Resistance** — Inner liner of the 601 hose is specially compounded of Buna-N and Buna-S products to resist the new synthetic jet fuels and oils especially at high temperatures.

At the low end of the temperature scale, 601 meets MIL-H-5511 cold flexing requirements at —40F, says Manning. He adds that the hose can be operated down to —65F, where it will withstand normal engine vibration. It is not fully flexible at this temperature, nor is this required of fuel or oil lines.

On the top end of the scale, Manning asserts that 601 is a full 100F better than AN hose. Speaking in round figures, 601 performance at 350F is equivalent to MIL-H-5511 hose performance at 250F.

Manning cites this 24-hr. circulation



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The templates—on clear plastic—represent the designs of standard components that appear again and again in Reliance's many wiring diagrams. A draftsman uses them, first, to make a preliminary drawing — positioning the templates he needs on whiteprint paper, making a print, then roughing in the hook-up lines.

After this drawing has been approved, he prints the templates on Kodagraph Autopositive Paper, using a printing frame. Simple photographic processing—under normal roomlight—produces a positive print of the layout directly. All he has to do now is add the hook-up lines, and another drawing is ready for Reliance's file of photo-lasting Autopositive "originals." *Another saving can be chalked up!*

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BECAUSE Shelby Seamless comes to you with the basic shape and hole already made you can eliminate or greatly reduce many time and labor-consuming operations connected with boring and machining. You also save the wear and tear on expensive tools, as well as the needless waste of steel.

Another important advantage in using Shelby Seamless Tubing is that its excellent machining characteristics and uniformity speed up production and improve the quality of your output. *You can turn out parts by the millions and the last part will be as metallurgically and dimensionally accurate as the first part produced.*

Shelby Seamless Steel Tubing is available in a complete range of sizes; in different wall thicknesses; various finishes and steel analyses. Our engineers will be glad to submit recommendations based on a study of your particular requirements.



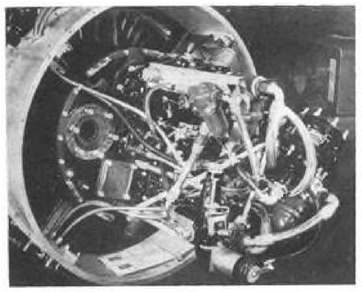
All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.

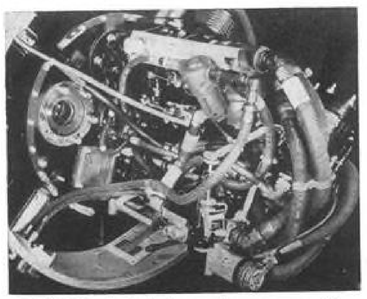
NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S SHELBY SEAMLESS MECHANICAL TUBING

USS

UNITED STATES STEEL





CLEANER installation, less congestion, easier accessibility result when Allison J35 plumbing is changed from MIL-H-5511 to Aeroquip 601.

test which all 10 sizes of 601 have passed with a good margin of safety (sizes are: 3, 4, 5, 6, 8, 10, 12, 16, 20, and 24). Tests were run with Esso Aviation Turbo Oil 15 (MIL-L-7808B), and 35, for which there is as yet no military spec.

Hoses are run at −40F for one hour, then proof tested at 600 psi. for 30 sec. Units are then transferred to a synthetic hot oil circulation stand.

Here the synthetic oils are pumped through the hose at 300F for 20 hr. The stand vibrates the hose at ¼ in. amplitude, and at a frequency of 1,750 cps. Pressure is 70 psi. After 20 hr., temperature is peaked to 375 ±10F. It takes 15-20 min. to reach this temperature, which is held for 15 min. Hose is then proof-pressure tested at 400 psi. for 30 sec. Full cycle takes about 24 hr.

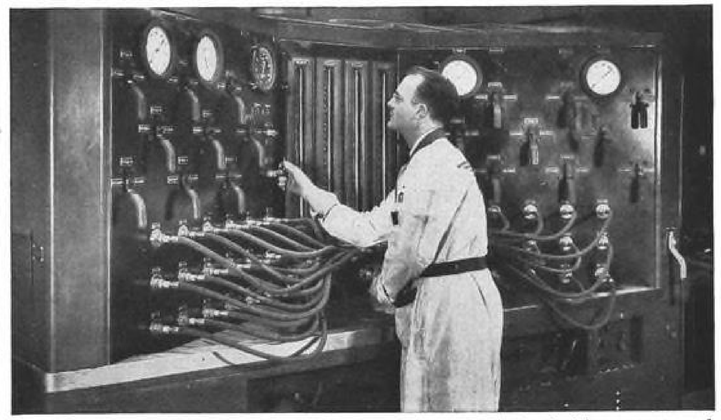
All 10 sizes passed 10 consecutive 24-hr. tests (called the 200-hr. circulation test) without the slightest trouble, according to Aeroquip.

▶ **Shelf Life**—Shelf life of assembly is considerably improved over standard assembly because of the use of the Aeroquip-developed Little Gem fitting, the company claims. The fitting does not rely on compression of the rubber for sealing, whereas standard AN fittings do rely on rubber compression to seal, and cause cold flow and relatively rapid deterioration of the hose ends, according to Manning.

The Little Gem fitting uses a positive, metal-to-metal contact (wire braid

GREER TOPICS

Important News of Aviation & Industrial Test Equipment



A fuel flow distributor for the Westinghouse J-40 jet engine is checked for accurate and dependable performance by an expert inspector. Greer precision-engineered and built the test machine above to meet the precise test requirements of Westinghouse.

Westinghouse Jet Engines Under Rigid Quality Control



Greer Hydraulic Control Pump Test Stand meets the high quality control standards required at Westinghouse. Components are inspected under simulated flight conditions.



Westinghouse lube pump for J-40 jet engine gets thorough inspection with Greer built test stand. Accurate readings from meters and gauges decide components dependability.

Greer Test Equipment subjects jet components to rigorous inspection

A thorough quality control system is maintained at Westinghouse to make sure each J-34 and J-40 jet engine component will stand up in use. These complex parts are put through gruelling tests under simulated flight conditions to ferret out weaknesses and determine air worthiness. The test equipment *must* give a true picture of performance.

That is why Westinghouse chooses Greer. Because Greer test machines are precision-engineered to give the same accurate, dependable results regardless of place, conditions or operator. Greer equipment is in use the world over by leading aircraft manufacturers and airlines.

Greer designs and builds to meet your out-of-ordinary test requirements, and in addition, has a complete standard line of machines to check all systems of all aircraft—so standardized they can be ordered directly from our catalog.

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Greer Hydraulics Inc. 454 Eighteenth Street, Brooklyn 15, New York

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2832 East Grand Boulevard, Detroit, Michigan • and sales representatives in all principal cities

in hose is firmly gripped between interior metal sleeve and outer metal shell of the fitting). Hose-fitting combination is too new, however, to give actual shelf life figures, according to Aeroquip officials.

Pressure limit ranges of the hose are (going from the small to the large size): Max. operating pressure: 2,250-600 psi.; proof pressure; 4,500-1,200 psi.; minimum burst pressure; 9,000-2,000 psi.

▶ **Other Advantages**—Manning cites these other advantages for the 601 hose:

• **Increased flexibility.** Improvement in bend radius, because of thinner wall construction, use of smaller size wire in braid, etc., ranges from a maximum of 41.7% for Size 3 to a minimum of 11.1% for Size 20. Average betterment for all 10 sizes is 28.9%.

• **Simplified installation.** Because of the hose's smaller diameter, accessibility to engine components is increased, resulting in easier, faster installation, and a saving in manhours.

• **Better fire resistance.** Fire resistance of 601 hose is better than standard MIL-H-5511 line by factor of from 1 to 3, depending on the hose diameter; the larger the diameter, the better the fire resistance. The Little Gem fitting shows up well under high-flame conditions; it is virtually impossible to blow the fitting off, Aeroquip says.

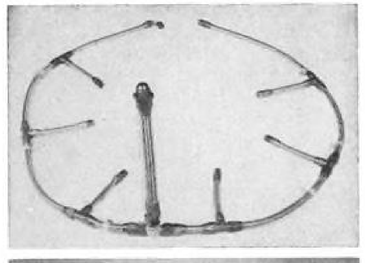
Current price of the hose, including fittings, is approximately 1½—2 times that of standard hose. This increase may be more than offset, however, when total cost of plumbing is taken into consideration, since by using Aeroquip hose and couplings, substantial savings result from using less line; substituting less expensive, standard-type fittings for special castings and shapes; reduction in number of fittings; quicker installation, saving manhours; and the weight saving for the entire installation.

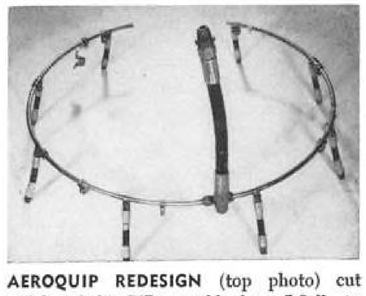
▶ **601 Construction**—The inner and outer cotton braids used in MIL-H-5511 hose have been eliminated, and stainless steel braid has been substituted for the carbon steel braid. The wire diameters in MIL-H-5511 hose were a constant .012 in. all hose sizes. In the Aeroquip 601 hose, the wire diameters range from .008 in. in the small sizes to .010 in. for the larger sizes, which saves some weight and gives improved flexibility.

On all 601 sizes, the inner tube is followed by a partial coverage of wire braid, then an outer full coverage of stainless steel wire braid. The inner tube material is a synthetic rubber, designed for use with fuels and oils, coupled with high heat resistance.

▶ **Airframe Hose**—The 617 lightweight development was started as a result of a Navy suggestion that they needed a lighter, less cumbersome hose for airframe application.

Manning points out that the 617 hose construction is similar to that of MIL-H-5511, except that "a little less of everything goes into its makeup, the wire braid is open, using less wire . . .

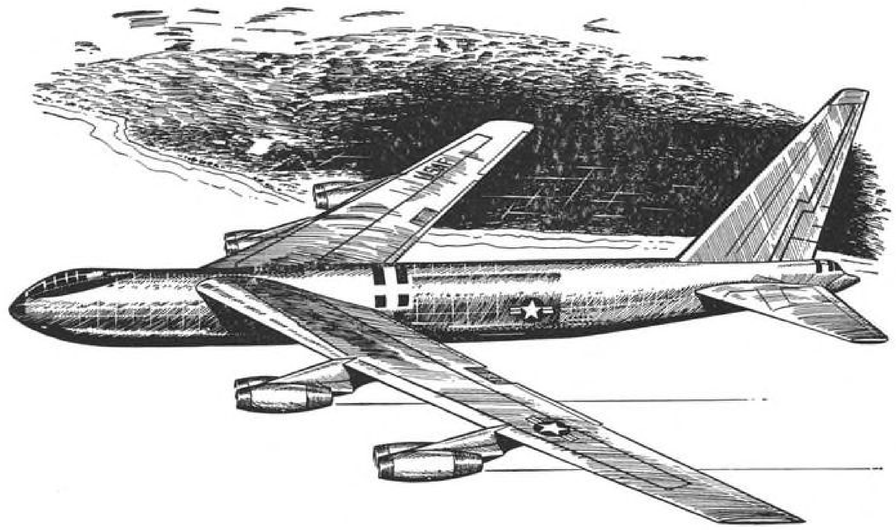


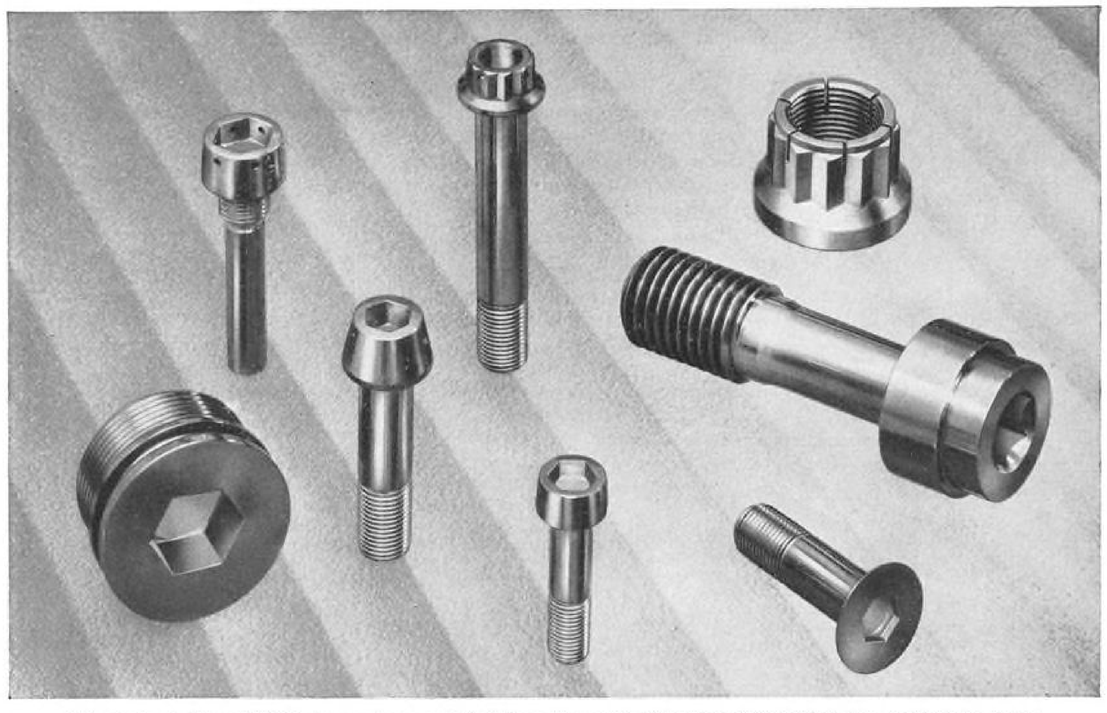


AEROQUIP REDESIGN (top photo) cut weight of this J47 assembly from 5.9 lb. to 3.5 lb. Installation time and number of fittings also was reduced.



Boeing B-52 Stratofortress uses SPS Precision Fasteners





A typical selection of SPS fasteners. For complete information, write STANDARD PRESSED STEEL CO., Jenkintown 3, Pa.

AIRCRAFT PRODUCTS DIVISION SPS JENKINTOWN PENNSYLVANIA

Why Alloy Steels?



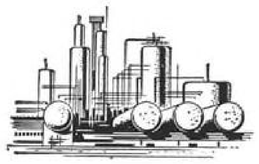
Carbon steels are better today than ever before. A major producer of both carbon and alloy steels, Republic is aware of this fact. Even so, there are limits to the application of carbon steels. Machine design may restrict the size of a part. High strength may be an essential combination with light weight. Sometimes surface hardness and ductility must be held within the limits. Such are the applications in which *only* alloy steels can perform definite tasks with certainty of results at lower ultimate cost.



Take large sections—where hardness must be carried deep into the steel. Heavy crankshafts, connecting rods, piston rods, large gear and axles are examples. Here alloy steels *are necessary,* and the cost low in proportion to results. With carbon held constant, depth-hardening quality increases as the alloy content is increased.



Sometimes weight and space limitations demand that smaller sections carry heavier loads safely. For safety's sake, the answer *must be* alloy steels. Under repeated stress, high tensile strength and hardness do not necessarily indicate high fatigue properties. The load-carrying ability of a steel depends upon its alloy constituents and the form of the structure at the time it is bearing the load.



A problem of high pressures at elevated temperatures may present a problem. But alloy steels *have proved* their high resistance to creep. Some stainless alloys maintain high strength up to 1800° F. They resist oxidation—therefore do not lose their strength appreciably through reduction of section.



High elastic properties and strength may be the primary requirement, especially for welded structures. Weight reduction may be most important. In these applications, low carbon complex alloy steels *offer distinct advantages.* Such alloy steels at equal or higher yield points show low weld-hardening tendencies. Resistance to corrosion is improved. So is ductility of the weld. And retention of toughness at sub-zero temperatures, as well as creep resistance at high temperatures, is better.



To help you get the most from alloy steels, Republic offers you its unique 3-D Metallurgical Service. You benefit from the combined experience and coordinated efforts of three groups of highly-trained men—(1) the Republic Field Metallurgists; (2) the Republic Laboratory Metallurgists; (3) the Republic Mill Metallurgists. All work hand-in-hand to help you do the job you want done with alloy steels at the lowest possible cost. Ask us about this service.

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617 HOSE has shorter, lighter fitting than standard MIL-H-5511 hose.

and the wall of the hose is thinner."

The hose uses a compression-type, all-aluminum fitting, since it is not designed to support high pressures. But the fittings are considerably smaller than standard fittings, being almost one half as long and slightly smaller in diameter, contributing to weight and bulk reduction.

Inner tube of the hose is the same as that of the 601 hose, making it equally usable with all types of aircraft fuels and lubricants.

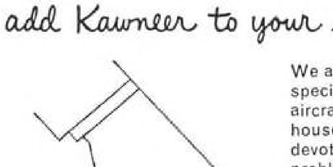
Aeroquip lists these ratings for the 617 hose: temperature limits: −40 to + 300F; normal operating pressure; up to 125 psi.; actual burst pressure: about 1,700 psi.; fire resistance: equivalent to MIL–H-5511 hose.

► **Kel-F Hose**—Another Aeroquip hose product which is giving the Air Force quite good results is the Kel-F nitric acid loading hose, the company says.

In a trial at one Air Force base, the hose was tested for 90 days during which it handled 12,000 gal. of nitric acid. Hose performed very satisfactorily according to the Air Force. During the first 45 days of the test residual white fuming nitric acid was deliberately left in hose to determine its resistance to the highly corrosive acid. It stood up well. Hose previously used for this application did not have nearly the corrosion-resistance of the Aeroquip product, according to company officials.

► **Company Background**—The company was started in 1940 when 10 business men in Jackson ventured a total of $10,000 to help a young engineer, Peter F. Hurst, form a company to produce and sell a then-new type of hose which featured detachable, reusable fittings. Hurst is now Aeroquip's president.

Prime advantage from the military point of view was in logistics. No longer did hose assemblies have to be made up in given lengths in factories, involving the maintenance of bulky hose inventories all over the world. Now lengths of Aeroquip hose and separate fittings could be stocked in supply depots. When an assembly needed replac-



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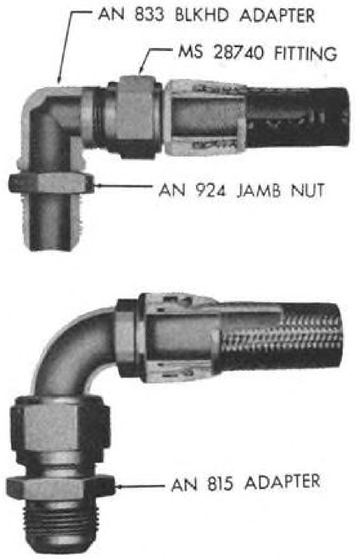


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SMOOTHER FLOW in Aeroquip elbow (bottom means lower pressure drop.

ing, all that had to be done was to cut off the required length of hose, quickly attach a pair of fittings and a replacement was ready. Moreover, damaged hoses no longer meant junking permanently attached fittings or vice versa.

By the summer of 1943, the Army Air Corps and the Navy had adopted the Aeroquip as standard design, according to company officials. At the war's end, Aeroquip's sales had soared to $6,000,000. By 1953, its industrial sales had risen to more than 2½ times its combined industrial and military sales volume in 1947. Total 1953 dollar sales, industrial and military combined, had risen nearly 600% since 1947, although unit prices of the company's products were reduced during this period.

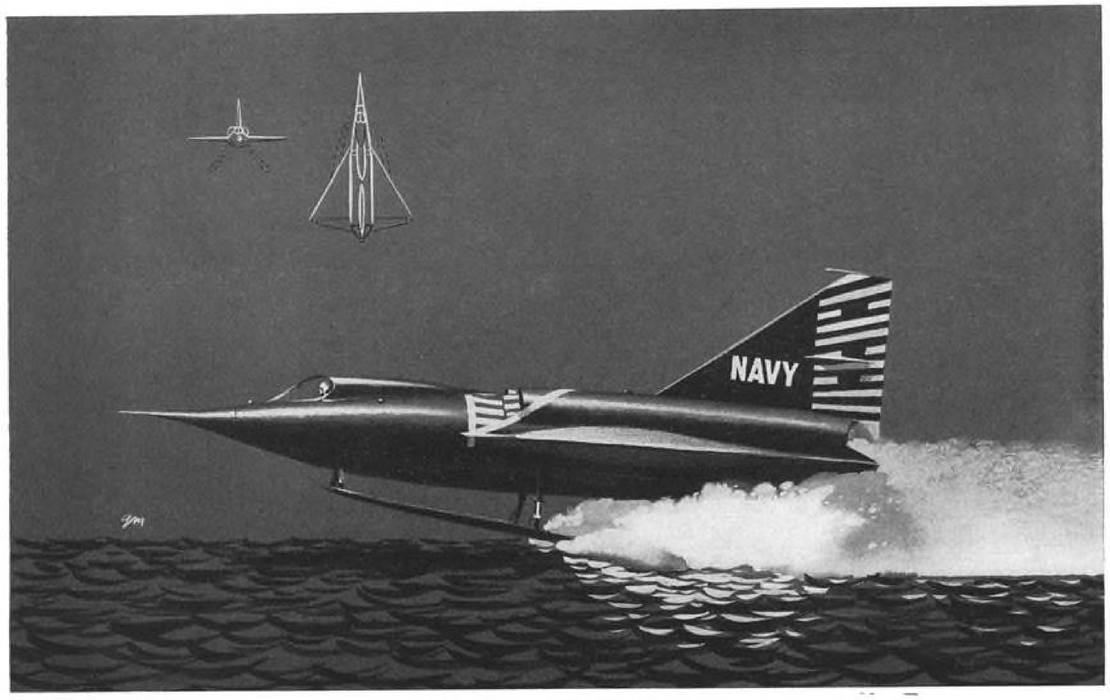
Current annual sales exceed $20,000,000 and company assets are more than $10,000,000.

Company currently occupies floor space of 215,800 sq. ft., of which 135,000 are at Jackson. The remainder is in two plants at Burbank, Calif., and Van Wert, O.

Company now employs 808 persons in all its plants.

Fifth Anniversary

NWA's Stratocruisers mark the end of five years of operation this month. In this period the fleet of 10 double-deckers has carried more than 1.4 million passengers more than 31 million miles. The planes, which have logged more than 122,000 flying hours, average about 10 hours a day in the air.



U.S. Navy XF2Y-1 Sea Dart

World's First Delta-Wing Seaplane

The "Sea Dart" rides low in the water until power is applied to the two Westinghouse J-34 turbo jet engines. Then her hydro-skis break water and the "bird" climbs at a sharp angle, pushed on by a thrust of 3,400 lbs. from each engine.

This revolutionary water-based plane, the Convair-built XF2Y-1, represents a successful blending of the high-speed land airplane's performance with the versatility and mobility of water-based aircraft. She's the world's first delta-wing seaplane, and the first known combat-type aircraft to utilize retractable hydro-skis for improved rough water take-off and landing performance.

But her designers were not the first (nor will they be the last — as long as planes keep going higher, faster, farther) to depend on Inco Nickel and Inco Nickel Alloys. Especially for parts where unusual combinations of corrosion resistance, heat resistance, strength and ductility are demanded.

THE INTERNATIONAL NICKEL COMPANY, INC.
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Inco's Technical Service Section has a vast amount of research and service data available on the Inco Nickel Alloys and their applications in the aviation industry. They may help you specify the right alloy for your requirements — write them.

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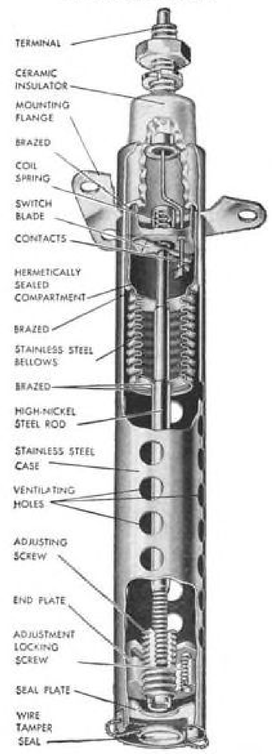
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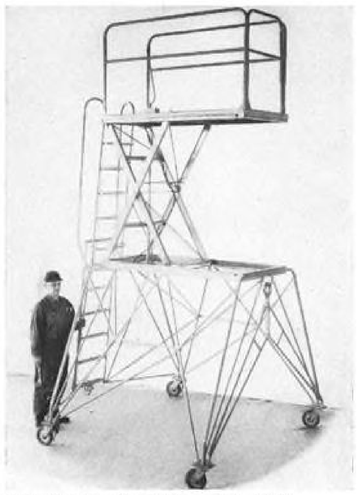


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NEW AVIATION PRODUCTS



MODEL D5 extends from 7 to 12 ft.

Adjustable Stands for Aircraft Maintenance

Adjustable aircraft maintenance stands that were formerly available only for military use are now being produced for commercial customers.

Made by United Steel & Wire Co., the stands are operated by one man. The operator wheels one to the work, mounts the platform and raises it to the required height by means of hydraulic lift. The platform is 3x6.4 ft. Steps and decks are made of non-skid steel mesh. The manufacturer suggests that used in pairs the workstands provide excellent support for scaffolds.

Two models are available: D4 adjusts from 3 to 7 ft.; D5 from 7 to 12 ft.

United Steel & Wire Co., Battle Creek, Mich.

Portable Tachometer Is Accurate to 1%

A portable hand tachometer for speeds from 2 to 100,000 rpm. has been introduced by General Electric. The tachometer includes a scale-changing device to reduce misreading of its various ranges.

The unit comes in three different models, each having three ranges. Accuracy is reported to be plus or minus 1% of full scale under all conditions. The device can also be used to measure linear speeds—range is from 2 to 100,000 fpm.

Equipment consists of two basic units: a head which is placed against the moving object, and an indicator which is attached by a 2-ft. flexible electric cable.

The unit, with accessories, comes in a single case. Total weight is 3¾ lb.

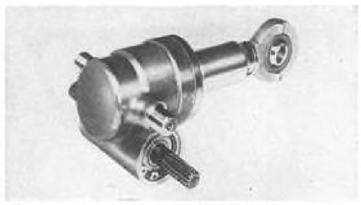
General Electric Co., Meter & Instrument Dept., Schenectady 5, N. Y.

Non-Abrasive Cleaner Protects Aluminum

An aluminum cleaner, polish and preservative called Corky, has been put on the market.

After tests in exhaust contamination areas of transport and military and light aircraft using fuel with octane ratings varying from 80 to 130, initial clean-up required about the same efforts as is usually expended with non-abrasive, non-chemical cleaners. After initial clean-up, an application of Corky, lightly buffed with shop towels, prevented exhaust contamination from baking on to the surface, according to the maker. Subsequent clean-ups were done easily on accumulations left on up to 150 hours.

Corky also gives effective protection against oxidation. The cleaner is non-abrasive, non-chemical, is harmless to the skin and can be used over a wide temperature range, according to the manufacturer, McAlpine Co., Creve Coeur, Mo.



STURDY jack weighs only 1.1 lb.

Aircraft Screwjack Fits Where Space Is Tight

Lear, Inc.'s new aircraft screwjack is capable of high load actuation and will act as a heavy-duty structural member, although it is compact and weighs only 1.1 lb.

Known as Model 586, the Lear screwjack is designed for maximum operating loads of 3,500 lb. in compression and 1,200 lb. in tension. Reportedly it will withstand static loads of 7,000 lb. in tension and 8,000 lb. in compression without deformation.

Suggested applications are leading-edge flaps, trailing-edge flaps, dive brakes, and other space-limited locations. The Acme screw of the unit is precision-ground from a high-grade forged alloy steel selected for long life and high impact resistance under temperature extremes, Lear says. Op-

"BOMBS AWAY"—the story of an R.A.F. Bomber

NO. 4 IN A SERIES ON THE AVRO VULCAN

"Last Night, over Peenemunde..."

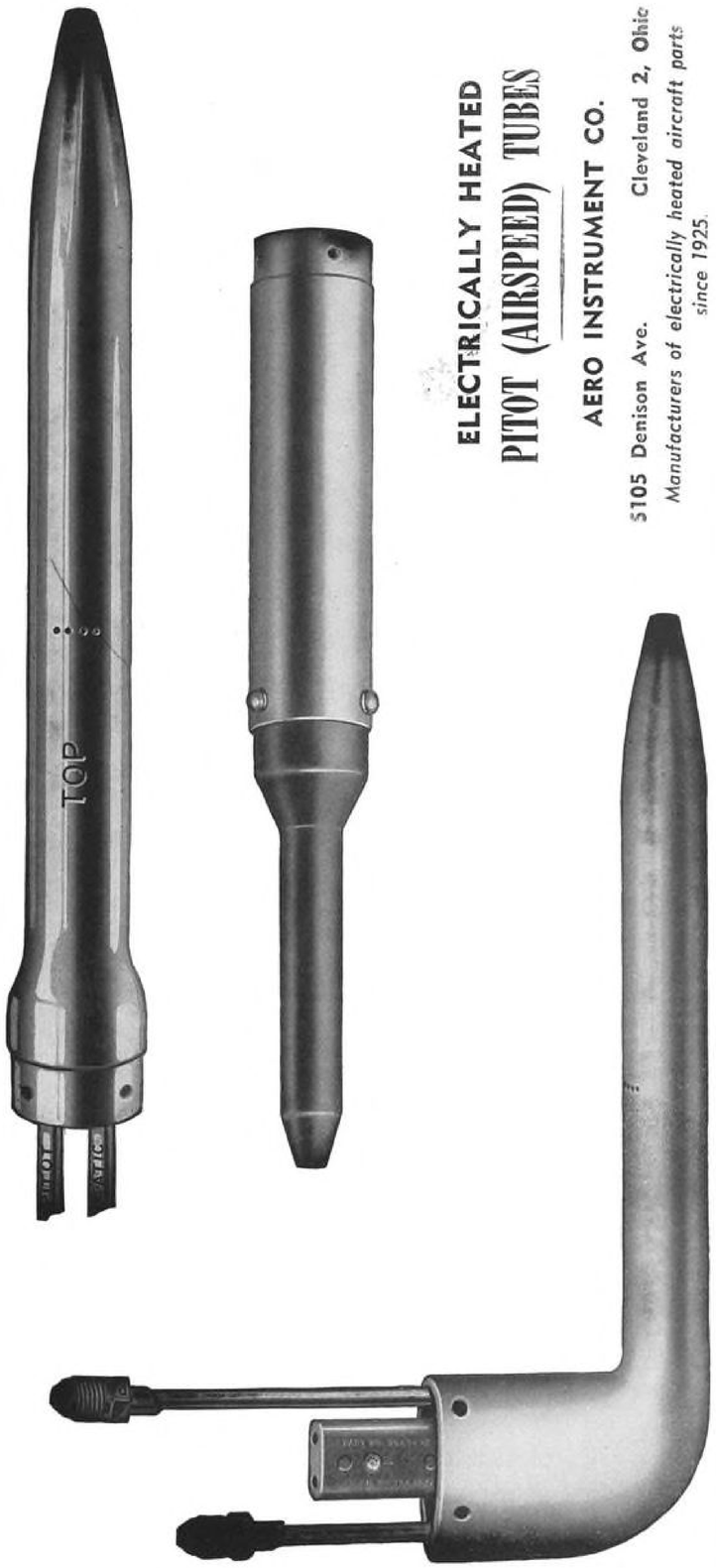


Who will ever forget hearing the B.B.C. announcer so impersonally reporting that epic of the last war, the great raid on the German rocket establishment at Peenemunde? Avro Lancasters were there, and there in great force; as indeed they were in so many important operations—19 Lancasters took part in the epic of the Ruhr Dams and Wing Commander Guy Gibson won his Victoria Cross flying one of them in the destruction of the great Mohne Dam. The Lancaster was the R.A.F.'s most vital heavy bomber through the major part of the war. But this is not remarkable, for ever since the start of the Royal Flying Corps there has never been a year when an Avro 'plane was not in service, and the R.A.F. has long been accustomed to rely on Avro for many of its best machines. Today Avro is preparing to meet that trust yet once again. After many years of intensive design and prototype research, production is under way on the mighty Avro Vulcan. This is the first delta bomber in the world embodying an entirely revolutionary planform. Not only is the delta the best design to satisfy all the new problems presented by near-sonic flight at high altitudes and long range, but it provides the long-sought advantage of aerodynamic simplicity which will greatly hasten and economise on production and ultimate service maintenance. Vulcans are now in super-priority production for the Royal Air Force.

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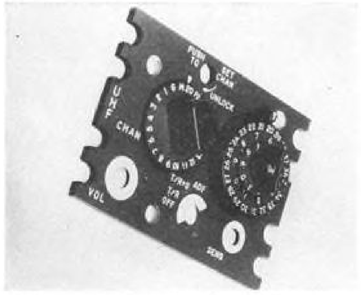
5105 Denison Ave. Cleveland 2, Ohio

Manufacturers of electrically heated aircraft parts since 1925.

erating temperature range of the unit is —65F to 250F.

The screwjack can be driven from either side. It also can be driven from one side while transmitting power through worm to a mating shaft for synchronization of one or more additional screwjacks. Gear ratios of 9:1, 18:1 or 36:1 are available.

Lear, Inc., 110 Ionia Ave., N. W., Grand Rapids 2, Mich.



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Edge-Lighted Plastic Panel Resists Scratches, Nicks

A new line of edge-lighted plastic panels for aircraft and communications installations is being introduced by Kerrco Products.

The panels are durable, Kerrco says, as a result of special molded laminate process which insures stability over long use. They are hard to scratch or nick.

Kerrco notes that the panels are accurately sized, and that the molded edges are an integral part of the front and back. The units meet requirements of MIL-P-7788.

Kerrco Products, Hastings, Neb.



DIAPHRAGM is one-piece stainless.

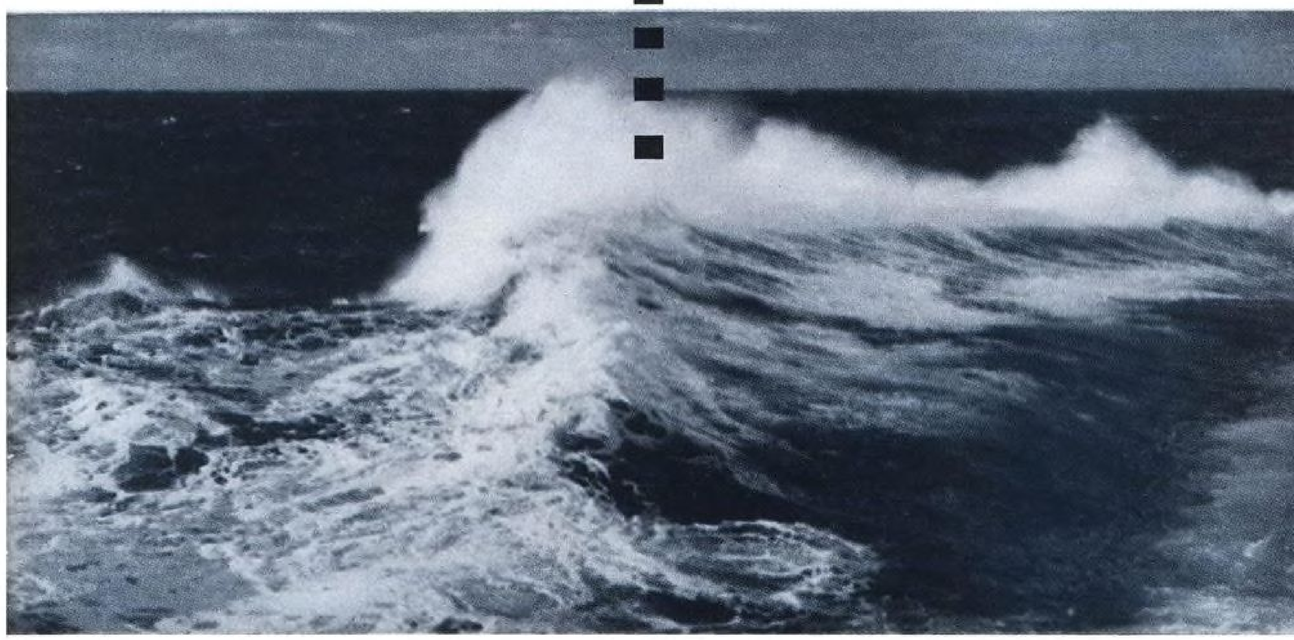
Pressure Fueling Cap Seals Over Wide Range

A new fuel-servicing cap for aircraft incorporates a one-piece stainless steel diaphragm that is said to give effective sealing against a wide range of pressures.

Designated Model PF-5200 by its maker, Gabb Special Products, the unit is said to conform to MS-29526 covering non-flush type caps and its design reportedly meets all requirements of military specification MIL-C-8605 for servicing connections with a bayonet flange.

Gabb reports that it is currently pro-

TOP SECRET



You see here the next great area in the rocketing progress of flight . . . a study in deep blue of three-fourths of our world.

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Today at Martin, one of the most important developments in the world of aviation is under way—and under wraps. When the champagne is swung, it may well launch a new era. For the next Martin flying boat will be a giant step forward of unprecedented dimensions, both in its importance to naval airpower and in its implications to commercial aviation.

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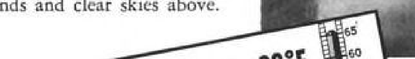
MARTIN
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FLY WEATHER-WISE

These weather items prepared in consultation with the United States Weather Bureau



Encountering thin, patchy stratus about 900 feet in late afternoon, be on guard for rapid increase in cloud cover and lowering of base, especially with steady southerly winds and clear skies above.



← **Learn the significance** of "Spread"! The less the difference between Air Temperature and Dew Point Temperature—the greater the risk of fog. Don't trust spreads less than 5° F. at night.



When destined to a coastal airport, pick an inland alternate, especially in spring when the water is still cold and may cool an onshore wind to the dew point.

Air Temperature....60° F.	NO FOG		Air Temperature....60° F.	FOG
Dew Point .....55° F.			Dew Point .....55° F.	
Water Temperature 58° F.			Water Temperature 50° F.	

In general, in estimating fog conditions, expect no ceilings with winds less than 5 m.p.h. Expect a ceiling when winds are 10-30 m.p.h. An important exception may occur when sea fog blows inland over a cold land mass with strong winds and near zero ceiling.



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ducing the cap for several leading manufacturers of Air Force and Navy jet fighters. The military specifications require operation from −3 psi. to 60 psi., with 180-psi. burst pressure. The unit weighs 0.79 lb.

Feature of the cap which permits this wide range of pressures is reported to be the one-piece stainless steel diaphragm which utilizes a pressure differential method to obtain positive sealing under all conditions.

Unit weighs only 0.79 lb.

Gabb Special Products, Windsor Locks, Conn.

ALSO ON THE MARKET

Temperature detector that operates on variations of electrical resistance has been especially designed for cylinder head temperature measurement on the Wright 3350 and Pratt & Whitney 4360 and 2800 engines. The 45-deg. elbow and screwdriver slots in the head of the locking cap reportedly reduce much of the installation and removal difficulty caused by obstruction from the cooling baffles. Flexible armored cable protects leads from abrasion.—Thomas A. Edison, Inc., Instrument Div., West Orange, N. J.

Lubricating pump for gas turbine engine is used to provide lubrication prior to engine coming up to speed. When up to speed, the engine-driven Model RG-9570 pump reportedly is capable of lubricating and scavenging the engine. It is non-pulsating, positive-displacement, rotary-vane type. Materials are suitable for operation at temperatures down to −65F. Operating speed is 2,000 rpm. and capacity is 2½ gpm. at 20 psi.—Lear, Inc., Lear-Romec Div., Elyria, Ohio.

Specialty fastener for use in fastening objects to sandwich structures is manufactured in variety of sizes and materials to meet specific requirements. Known as Kwiko self-locking insert, unit is threaded, with a self-contained locking feature. Body of insert is placed in the hole of the sandwich structure, and the grommet ring is snapped into position on the outer sheet of the structure to lock insert in position.—Shur Lok Corp., 9010 Bellanca Ave., Los Angeles 45.

Actionflex aircraft hose, is made from laminated sheets of silicone-impregnated fiber-glass cloth and bonded under a long-cycle, high-temperature, high-pressure cure. Hose is claimed to be pressure-resistant, capable of carrying liquids and gases under extremely high- or low-temperature conditions with no loss of flexibility or deterioration.—Orchard Industries, Hastings, Mich.

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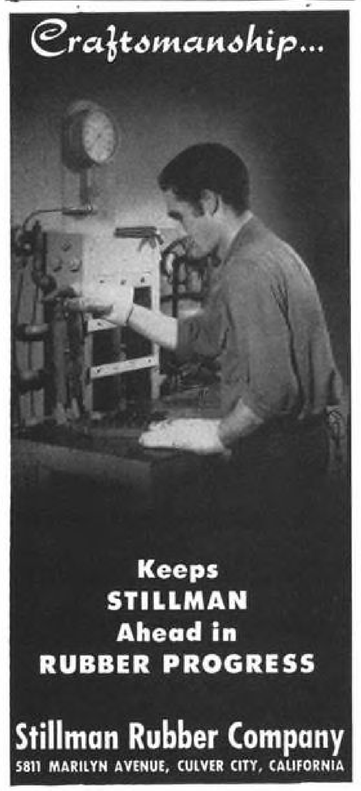
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AVIATION SAFETY

CAB Accident Investigation Report

How AA Convair Hit Albany Tower

THE ACCIDENT

An American Airlines' Convair 240, N 94255, struck two of three radio towers located 3.1 miles southwest of the Albany Municipal Airport, Albany, N. Y., and crashed at approximately 0834,[1] Sept. 16, 1953. The aircraft was executing an approach to the airport when the accident occurred. All three crew members and 25 passengers on board were killed; the aircraft was destroyed by impact and fire.

HISTORY OF THE FLIGHT

American Airlines' Flight 723 of Sept. 16, 1953, was a scheduled operation between Boston, Mass., and Chicago, Ill., with intermediate stops, among which were Hartford, Conn., and Albany, N. Y.

The crew consisted of Capt. J. W. Stentz, First Officer W. J. Schanken, and Stewardess J. G. Thornquist. Prior to departing Boston the crew filed a company VFR (visual flight rules) flight plan to Chicago following which the company issued a flight clearance to proceed to Albany INSTOP (instrument or on top of clouds authorized)[2] with an intermediate landing at Bradley Field, the airport serving Hartford, Conn., and Springfield, Mass. The alternate airport was Syracuse, N. Y.

At the time this flight clearance was issued, the weather en route to Albany was good and the conditions at Albany were above minimums. The portion of the flight to Bradley Field was without incident and the aircraft arrived there at 0657.

At Bradley Field Capt. Stentz reviewed the latest weather reports in the company's operations office and was advised that Bradley Field had been added to his flight clearance as a second alternate in addition to Syracuse because the weather at Albany at this time was below the company's landing minimums[3] but was forecast to improve to within limits by the time the flight arrived there. The special Albany 0642 weather report available to the captain at this time was: ceiling indefinite zero, sky obscured, visibility zero, fog. The en route weather was clear.

According to the company's records, the gross takeoff weight of the aircraft at Hartford was 37,889 lb., which was within the allowable gross takeoff weight of 40,503 lb.; the load was properly distributed with respect to the center of gravity limits of the aircraft.

Departure from Bradley Field was made at 0714 with 25 passengers. Immediately before departing, the flight advised the tower it was proceeding to Albany VFR. At 0737, a message from the company's dispatcher at New York was relayed to Capt. Stentz through the company radio at Albany as follows:

"If Albany still below limits on your arrival, if OK with you, suggest hold vicinity until at least 0830 EST. Expect Albany to have limits 0730-0800 EST. Advise fuel on board when over Albany." Flight 723 acknowledged and advised, "We will hold."

At 0740, the flight reported to Albany Approach Control that it was over Montgomery Ward, an in-range visual check point, VFR, and requested a clearance of at least 500 feet on top of clouds to the Albany Range Station. This request was approved and the flight was cleared to maintain at least 500 feet on top and to hold north of the Range Station. The 0739 Albany special weather report was given the flight: "Ceiling indefinite, 100 feet, sky obscured, visibility ¼ mile, fog, wind west-southwest one mile per hour." Flight 723 reported over the Range Station at 0742. During the holding period the number of aircraft in this pattern varied from six to nine.

The special Albany weather report issued at 0750 indicated thin obscurement, ceiling estimated 4,000, overcast, fog, visibility ¾ miles. At 0753, the first of the aircraft in the holding pattern, American Airlines' Flight 750, was cleared for an instrument approach to Runway 19. At 0800, this aircraft missed its approach and was immedeately cleared to climb toward the south and to again remain at least 500 feet on top of clouds. A second aircraft which was holding was then cleared to make a similar approach and it too was forced to execute a missed approach procedure. At 0816, an instrument approach and a landing on Runway 19 were successfully completed by one of the holding aircraft.

Immediately following this landing, Flight 723 was cleared to make an instrument approach to Runway 19. Three minutes later the flight advised the tower that its approach was being abandoned because the aircraft's flaps could not be lowered. It was then still at least 500 feet on top of clouds and was advised by the tower to remain there until further advised. At approximately 0830, the following message was transmitted from the Ablany Tower: "All aircraft holding Albany. It now appears to be pretty good for a contact approach from the west. It looks much better than to the north."

Immediately following this message, Flight 723 was asked by the tower if it would accept a contact approach from the west for a landing on Runway 10. After requesting and receiving current weather

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[1] All times referred to herein are based on the 24-hour clock and are Eastern Standard Time.

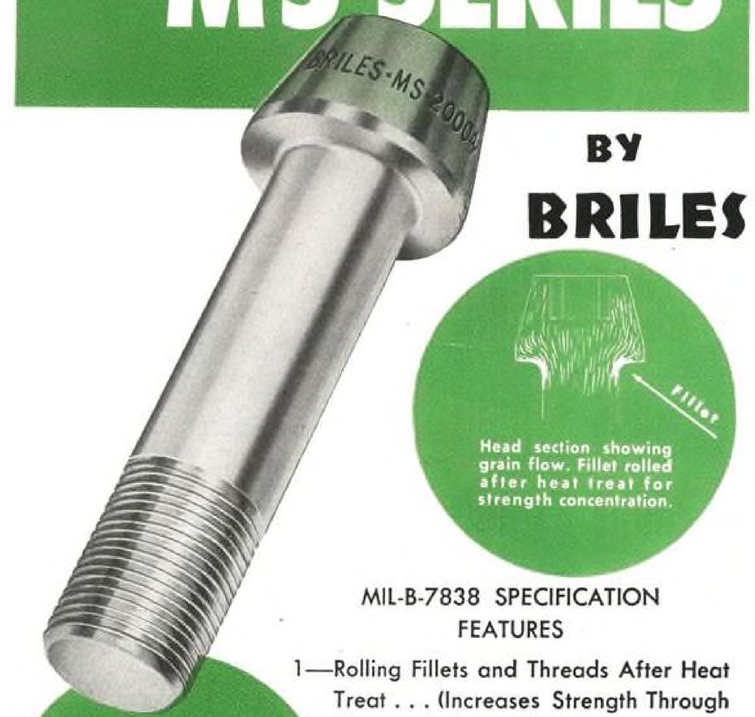
[2] With this type of clearance and since the flight was to be made by means of visual flight rules (VFR), it was not necessary to file a flight plan with Air Route Traffic Control.

[3] The company's ceiling and visibility instrument landing minimums at Albany, N. Y., for Convair aircraft are: Regular straight-in landing Runway 19—ceiling 400 feet, visibility one mile, day or night. Other approaches to Runway 19 or all other runways—ceiling 600 feet, visibility one mile day and night.



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including altimeter setting (29.74) and the length of Runway 10 (4,500 feet), the flight stated it would accept a contact approach. Clearance was then issued the flight to make a contact approach to Runway 10. Acknowledgment of this clearance was the last radio contact with the flight. At approximately 0834, Flight 723 struck the radio towers and crashed.

The weather reported at the time of the accident was thin scattered clouds at 500 feet, ceiling estimated 4,500 feet, broken clouds, visibility 1½ miles, fog.

INVESTIGATION

Investigation revealed that the right wing of the aircraft struck the center tower of three radio towers of Station WPTR at a point 308 feet above ground followed immediately by the left wing striking the end (easterly) tower 293 feet above ground. These towers, located 3.1 miles southwest of the airport, are spaced in a line 266 feet apart on a true bearing of 234 degrees with their tops 370 feet above the ground and about 690 feet above sea level.

Seven feet of the outer panel of the right wing including the right aileron and control mechanism from the center hinge outboard together with 15 feet of the left outer wing panel and aileron separated from the aircraft at this time. Following the collision with the towers, ground impact occurred a distance of 1,590 feet beyond and on a true bearing of 52 degrees from the tower last struck. First ground contact was made simultaneously by the nose and the left wing with the aircraft partially inverted. Impact forces and the ensuing fire destroyed the major portion of the aircraft.

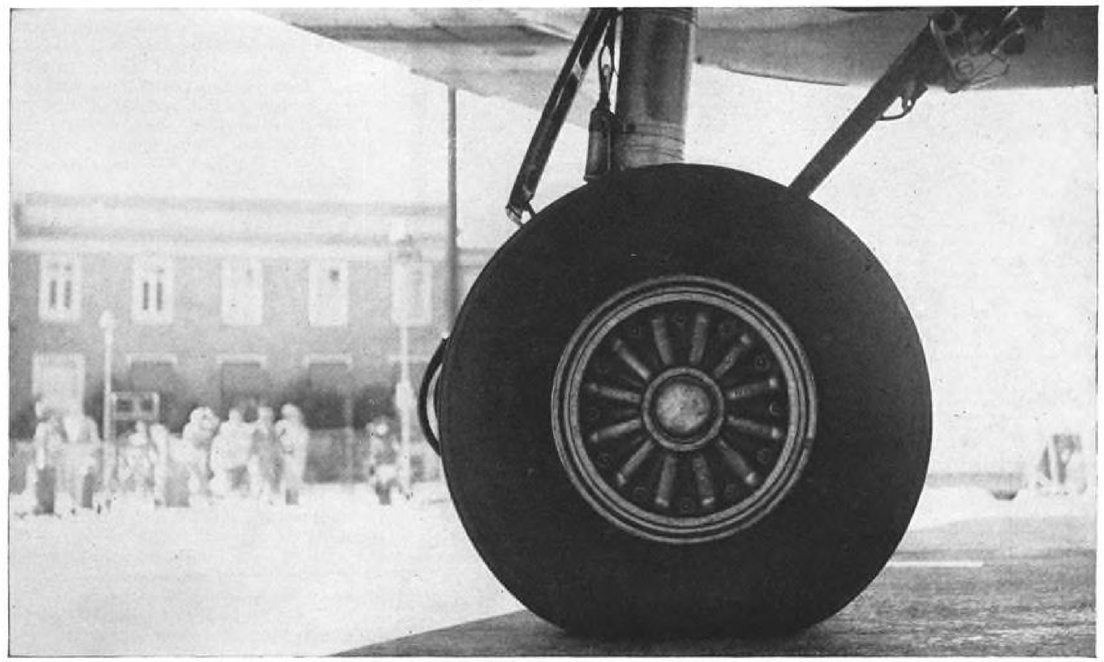
Both engines separated from the aircraft at impact and were found adjacent to the main wreckage. The exterior of the left engine showed heavy impact damage to cylinders 8 through 15. The lower halves of the intermediate and rear accessory sections of this engine were missing. Other



Balloon Radome

Supported by internal air pressure, this plastic balloon houses the whirling antenna of an Air Defense Command radar. This particular unit is located at the 675th Aircraft Control and Warning Sqdn., Antigo, Wis. Approximately 150-250 men make up a typical AC&W squadron.

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Range: 0-14.7 psi, absolute
Resistance: 7500 ohms
Maximum voltage: 75 volts
Accuracy: 2% of full scale
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components of the engine suffered impact and fire damage.

The right engine was more extensively damaged than the left engine with approximately two-thirds of its rear accessory section destroyed by fire. Both engines were visually inspected at the scene of the accident and then shipped to the American Airlines' Maintenance Base at Tulsa, Oklahoma, for a complete tear-down inspection under the supervision of a Board investigator. Although these engines were severely damaged, no evidence was found from the parts examined to indicate that a mechanical failure occurred prior to ground impact.

All propeller blades were badly damaged. With one exception, all blades were broken free; however, their shank ends remained in the barrels. Upon removal of each propeller dome an examination indicated that the dome settings were approximately plus 29 degrees at impact; this setting is the full low pitch position.

The landing gear control handle attached to the locking quadrant was found in the "down locked" position. Inspection of the landing gear revealed that it was down and locked at impact.

There was no indication of fire having occurred in flight. All four CO_2 cylinders were recovered. The valve of one was broken at impact and the cylinder discharged; the others were fully charged.

It was determined that the flaps were in the "full up" position at impact. The wing flap selector valve and electrical solenoid showed a minimum of external damage. Examination of the solenoid assembly disclosed that the plunger shaft between the selector valve and solenoid had failed due to fatigue at approximately the last thread at the attach end to the solenoid. This type of failure would not permit the pilot to lower the flaps and the flap selector valve could not be positioned manually from the cockpit.

Examination of the airframe and associated systems not destroyed by impact or fire disclosed no evidence of structural failure having occurred prior to impact other than failure of the flap mechanism.

All instruments were severely damaged. The barometric setting knobs of both the captain's and first officer's altimeters were broken off and the instruments damaged. The barometric scale of the former read 29.45 in. and that of the latter 29.76.

It was determined that at the time of the accident there was sufficient fuel on board for the aircraft to have flown to either of its alternates with the required reserve.

The radio control panels were so damaged that a determination of precise frequency settings was impossible. However, by comparing the indicated settings with the positioning of the component parts, estimated settings were determined as follows:

- ADF Receivers. One ADF receiver was set at 209 kc.; the other at 220 kc. The frequencies of the Albany ILS compass locators for the middle and outer markers are 201 and 219 kc. respectively.
- Low-Frequency Range Receiver. By approximating the position of the tuning condenser, it was determined that this receiver was positioned at approximately 260 kc. The volume control was in the "off" position. The frequency of the Albany Range Station is 263 kc.

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• HF Communications Unit. This unit was set to 5476.5 kc. This is the company "Day" frequency for the route.
• VHF Communications Unit. This unit was set to approximately 118.5 mc. The Albany Tower transmits on and guards 118.7 mc.
• VHF Navigation Receiver. This unit was turned to 116.9 mc. The frequency of the Albany VOR is 116.9 mc.
• Omni Bearing Selector. This selector was set to 99 degrees. The bearing of the desired runway was 100 degrees and the VOR Station was located near the intersection of this runway and the north/south runway.

No evidence was found to indicate a failure or malfunction of any of the aircraft's radio-communication or radio-navigation equipment prior to impact.

All CAA navigation and landing facilities for Albany were immediately checked and found to have been functioning properly when the accident occurred.

The subject radio towers were erected in 1948 with the approval of the CAA and the Federal Communications Commission. All three towers were hazard-painted and lighted in accordance with accepted standards. The lighting system included a light-sensitive device to assure automatic operation during periods of restricted visibility. These lights were on at the time of the accident.

Company personnel stated that Capt. Stentz was a well-qualified Convair pilot, had made many landings on the Albany Airport, was thoroughly familiar with the surrounding terrain, and knew the height of the WPTR radio towers and their location with relation to the airport.

Runway 19 is 5,000 feet long and is used when a straight-in approach is to be made using the low-frequency range. The straight-in approach to this runway or its reciprocal, Runway 1, is over relatively flat terrain. Runway 19 is also aligned with the instrument landing system. Although ILS was in operation this date, it had only been approved by the CAA a short time prior to Sept. 16 and Capt. Stentz had not received his company's authorization to use it.

Runway 10 is 500 feet shorter than Runway 19 and its approach is over irregular terrain. The elevation of the airport is 288 feet above sea level.

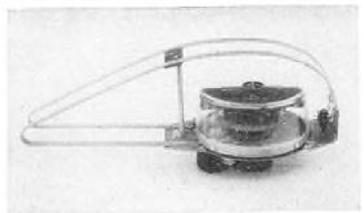
According to qualified witnesses the Convair 240 can be landed on Runway 10, without flaps and under similar conditions of load, surface wind, density altitude, and runway slope. Also, these aircraft can be stopped within 3,500 feet of runway distance provided both brake pressure and reverse propeller thrust are applied.

On the morning of Sept. 16, a low pressure area dominated the New England states and a stationary front extended along the coast from New Jersey to Rhode Island. A small pressure wave was developing in this front and was causing a variable cloud cover over the New England states accompanied by some shower activity. Areas of clear sky over moist surface air produced sufficient cooling during the night that local conditions of ground fog and low stratus clouds developed.

At the time Flight 723 was making its approach, Albany Airport and the immediate surrounding terrain were partially covered by patches of fog and low stratus clouds. The base of these clouds was reported to be 500 feet above the ground and the tops at 1,000 to 1,200 feet.

Above this condition at an altitude of approximately 4,500 feet, there was another layer of broken clouds. Between these two cloud layers, the weather was clear and the visibility was good. Due to the effect of warming by the sun's rays, surface conditions were improving, causing varying conditions of obscurement with a general improvement occurring in the entire western sector. The surface visibility at the airport was reported to be one and one-half miles.

In an effort to determine as accurately as possible the flight path of the aircraft during its approach, many persons were in-



ADF Loop Corrector

Rigid corrector for automatic direction finder loop antennas, reportedly makes it possible to limit quadrantal error to a maximum of 2½ degrees, giving better weak-signal performance. It is now in production at Learcal Division of Lear, Inc. New corrector is interchangeable with previous design used on Lear ferro-dynamic loop.

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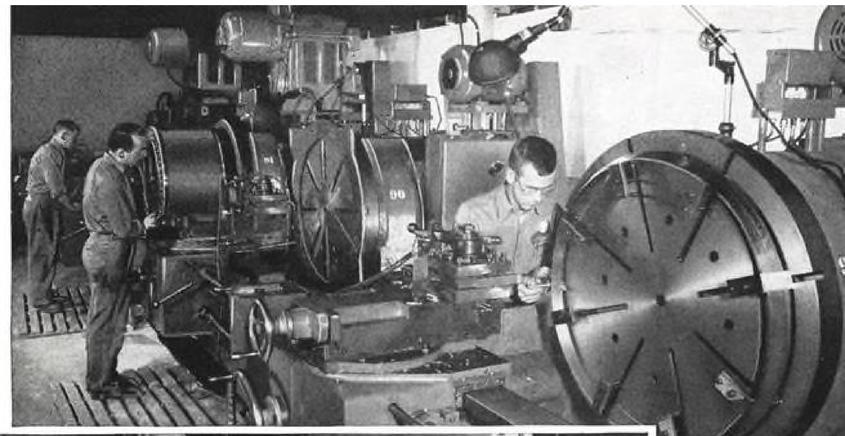
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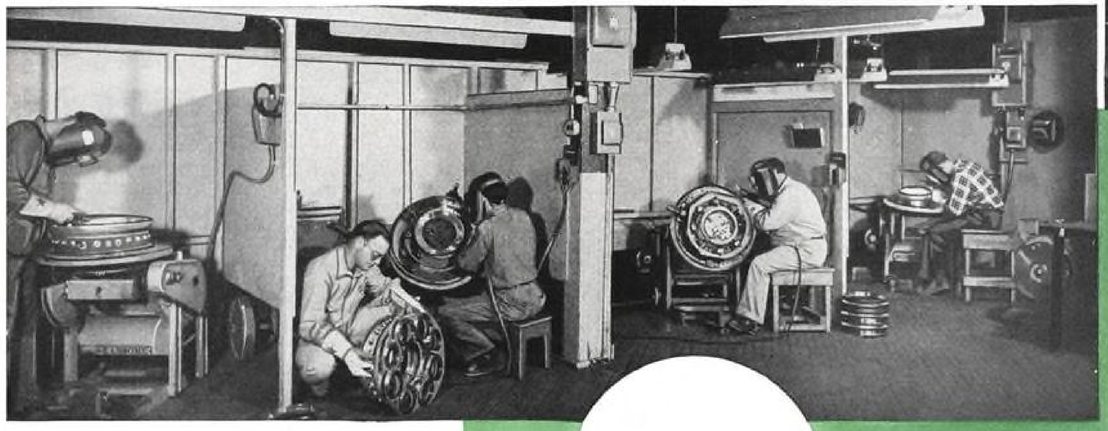
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DEPT. A-12, BRAZIL, INDIANA

terviewed. From statements of those persons who were considered to have actually seen or heard the aircraft, it was determined that the approximate following pattern was flown: The aircraft was first observed approximately one-half mile west of the airport on a southerly heading flying at about 2,000 feet. Near the south boundary of the airport it turned right toward the west and disappeared into or above a fog bank. It is believed that after flying this direction a short time, the aircraft again flew toward the south. This direction was held for a few miles, after which a wide circular right turn was begun and terminated on a heading slightly south of east. This latter heading was continued until the aircraft collided with the radio masts.

While in the circular right turn, the aircraft flew over the eastern side of the Voorheesville Army Depot located approximately 11 miles southwest of the airport. At this point the aircraft was observed by witnesses on the ground to be flying at a low altitude and one witness saw its landing gear extend. These witnesses stated that they could distinctly hear the noise made by the aircraft's engines and that they appeared to be functioning normally. Ground visibility in this area was approximately three miles, limited by haze and fog, and there appeared to be a dense fog to the northeast in the direction of the airport.

Witnesses who were closer to the radio towers said that when they saw it, the aircraft was flying very close to the tree tops and only appeared between patches of fog. Several witnesses in this area said that the aircraft appeared to be "rocking" from side to side and that the engines sounded as though they were "sputtering." The fog in this area (near the towers) was quite dense and ground visibility was poor. A witness who did not see the aircraft hit the towers but did see it fall to the ground said that the upper one-third of the towers was completely obscured by fog. A sound believed to be a surge of engine power was heard immediately prior to the crash.

ANALYSIS

Several factors had to be considered by Capt. Stentz at the time he decided to execute a contact approach to Runway 10. The result of these considerations could have been the basis for his decision, and also could have had a decided bearing on the manner in which the approach was executed. It is advisable to review some of these factors.

When Flight 723 arrived at Albany, it was necessary because of a low ceiling and restricted visibility to hold, together with a number of other aircraft, at least 500 feet on top of clouds north of the Albany Range Station. Weather conditions were changing rapidly and were expected to improve sufficiently in a short time to permit landings. A few minutes after the flight entered the holding pattern, two of the aircraft were cleared, in turn, to make standard instrument approaches to Runway 19. Both of these aircraft, however, executed missed approaches because they were unable to establish visual reference with the ground within their authorized minimums. A third flight, however, made a landing, whereupon Flight 723 was cleared to make the same type of approach. This was abandoned because the wing flaps could not be extended and since the flight was still 500 feet on top, it continued in the No. 1 position in the holding pattern.

Approximately 10 minutes after abandoning the instrument approach, Flight 723 was informed by the tower that the weather was clearing to the west and was asked if it would accept a contact approach to Runway 10 from that direction. After requesting and receiving current weather, altimeter setting, and length of Runway 10 Capt. Stentz replied in the affirmative. His specific request for the length of this runway was undoubtedly made to ascertain if it was of sufficient length for the flaps-up landing, with its attendant higher approach speed and additional landing roll. His acceptance of this runway indicated that he was fully satisfied that a safe landing could be made.

At the time Capt. Stentz accepted this contact approach, it appears to have been a reasonable decision; the weather was clearing to the west of the airport and the bases of the scattered clouds were reported at 500 feet. Why the captain decided, in executing the approach, to fly in a general southerly direction and then make a wide right hand turn to align with the runway is not known. It is entirely possible that from his position in the holding pattern, the weather in that area appeared to be better.

The course which the pilot chose carried the flight into intermittent areas of fog and haze. Confronted with these conditions the captain should have pulled up



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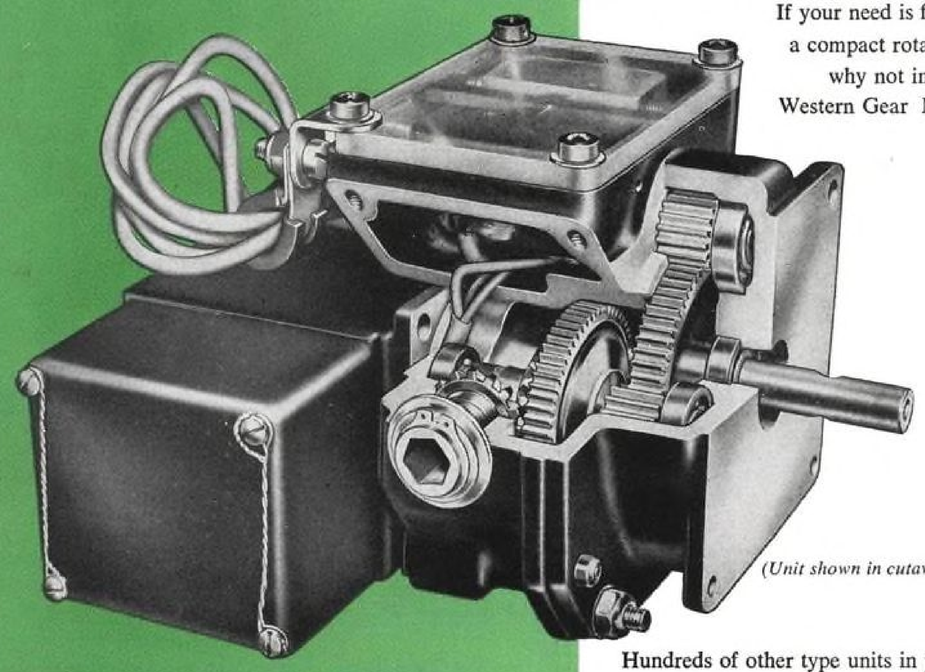
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and discontinued the approach. However, he flew the aircraft at an extremely low altitude, probably in an effort to maintain or regain visual flight and be able to touch down as near the approach end of the runway as possible.

Rolling turns were made along the flight path in an apparent effort to enhance forward visibility. Undoubtedly it was the execution of these turns which caused ground witnesses to say the aircraft was rocking from side to side.

The fact that the aircraft's omni bearing selector was set to 99° indicates that this instrument might have been used during portions of the approach as a check for runway ailgnment. However, it is apparent that during the latter portion of the approach the aircraft was flying so low that the crew could not have devoted much of their attention within the cockpit.

Because of these conditions it is probable that the aircraft continued the wide right turn past the desired heading to the runway and onto a heading which resulted in collision with the towers. The engine sound which witnesses described as a surge of power immediately prior to the collision may have been a sudden application of throttle by the pilot in an effort to avoid the towers. It is also possible that witnesses misinterpreted this sound because none were familiar with aircraft, engine, and propeller noises at low altitudes.

The Board views with concern the practice of some aircraft operators of making contact approaches to airports during very poor weather. It is intended that this matter be investigated further to determine whether some limitations upon contact approaches should be made in Part 60 of the Civil Air Regulations. A contact approach is made as an alternative to the instrument approach specified by the Administrator in order to expedite the flow of traffic. The need for some such alternative approach procedures, particularly in areas of high traffic density, is recognized.

However, the Board is considering whether such alternative approach procedures should be explicitly specified by the Administrator and adhered to by all pilots under weather conditions less than



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New British digital computer, recently purchased by A. V. Roe Ltd., is the first such machine to be used in British aircraft industry. Built by Ferranti, Ltd., the new $280,000 computer will greatly speed aircraft stability and performance analyses. Machine can store 15,000 twelve-digit numbers, multiply two numbers in 2.2 milliseconds, add in 1.2 milliseconds.

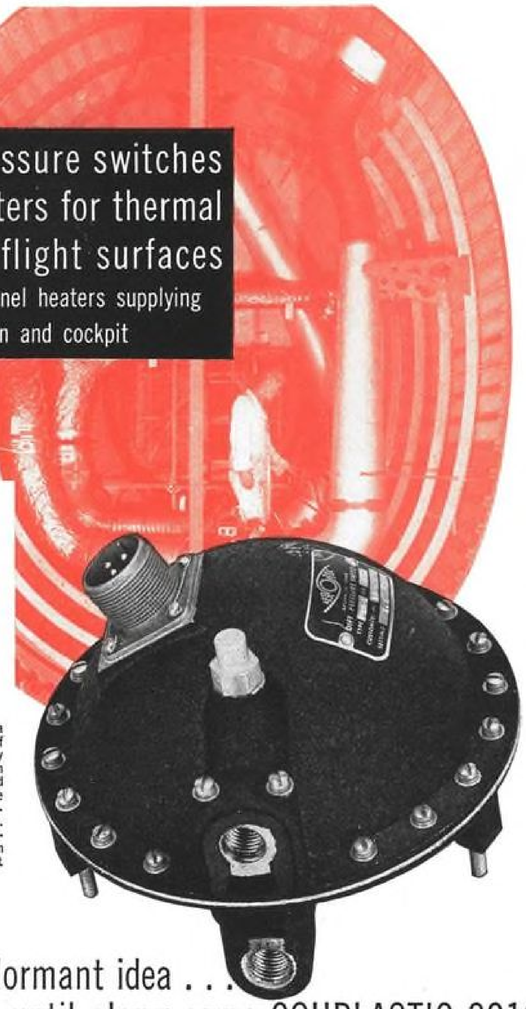
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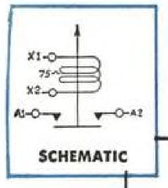


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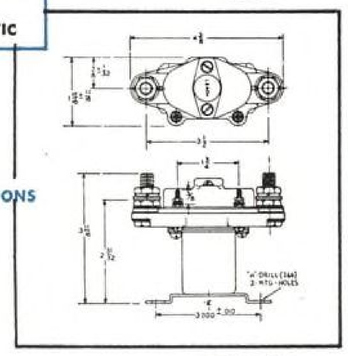
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the minimums specified for VFR approach and landing.

FINDINGS

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

1. The carrier, the aircraft and the crew were currently certificated
2. The aircraft was loaded to a weight less than its maximum allowable and its center of gravity was located within prescribed limits.
3. Upon arrival of the flight, Albany weather was below authorized landing minimums and the aircraft was required to hold.
4. A standard instrument approach was started and later abandoned because of mechanical failure of the wing flap mechanism.
5. A contact approach to Runway 10 was later accepted because improved weather, especially to the west of the airports, made this runway most feasible.
6. The aircraft made a wide right turn southwest of the airport to align with Runway 10.
7. The latter part of the approach was at low altitude through weather conditions which prevented adequate visual reference.
8. Under existing conditions the pilot should have abandoned the approach.
9. The aircraft struck radio towers, the upper portions of which were obscured by fog.
10. These towers were hazard-painted and lighted in accordance with accepted standards.
11. All CAA navigational and landing facilities were functioning properly.
12. No evidence was found in the residual wreckage not destroyed by impact or fire to indicate that structural or mechanical failure occurred prior to impact other than to the wing flap mechanism.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was that during the execution of a contact approach, and while maneuvering for alignment with the runway to be used, descent was made to an altitude below obstructions partially obscured by fog in a local area of restricted visibility.

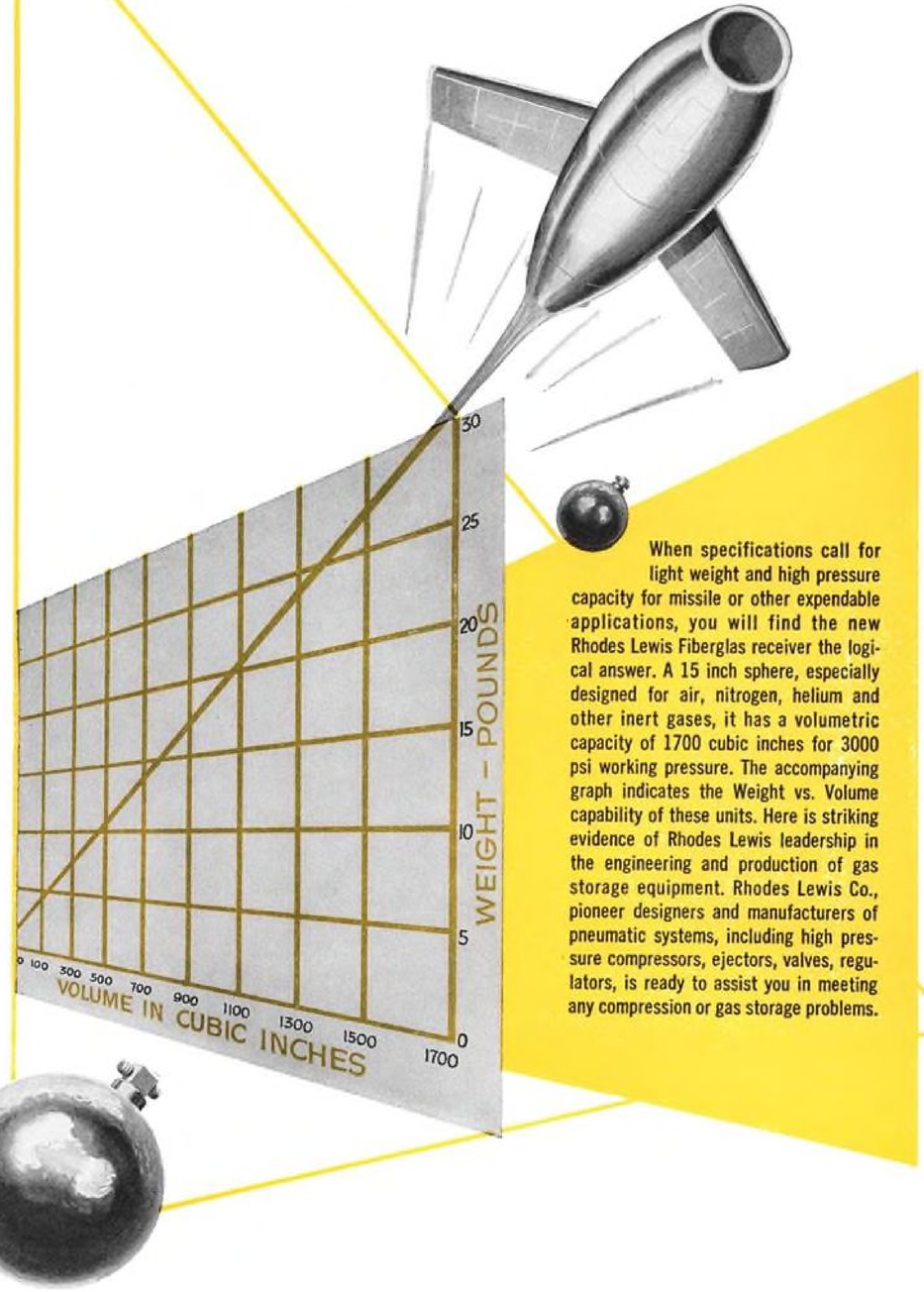
By the Civil Aeronautics Board:

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

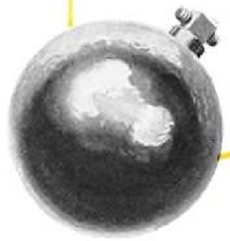


AVIATION WEEK, JUNE 7

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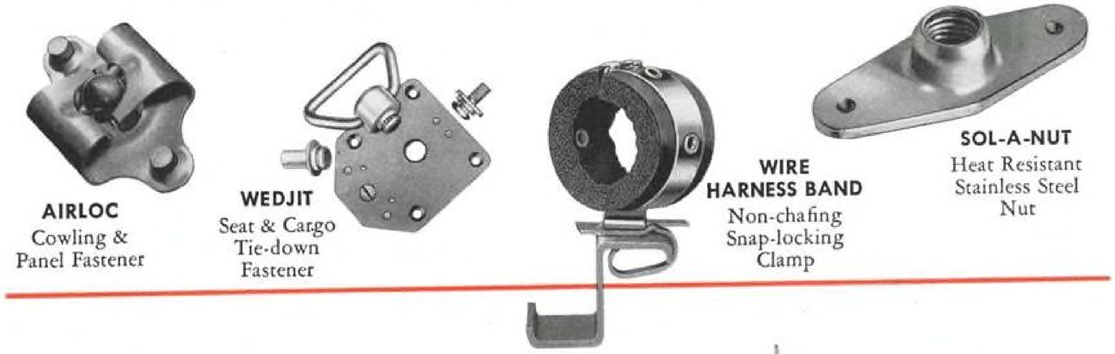
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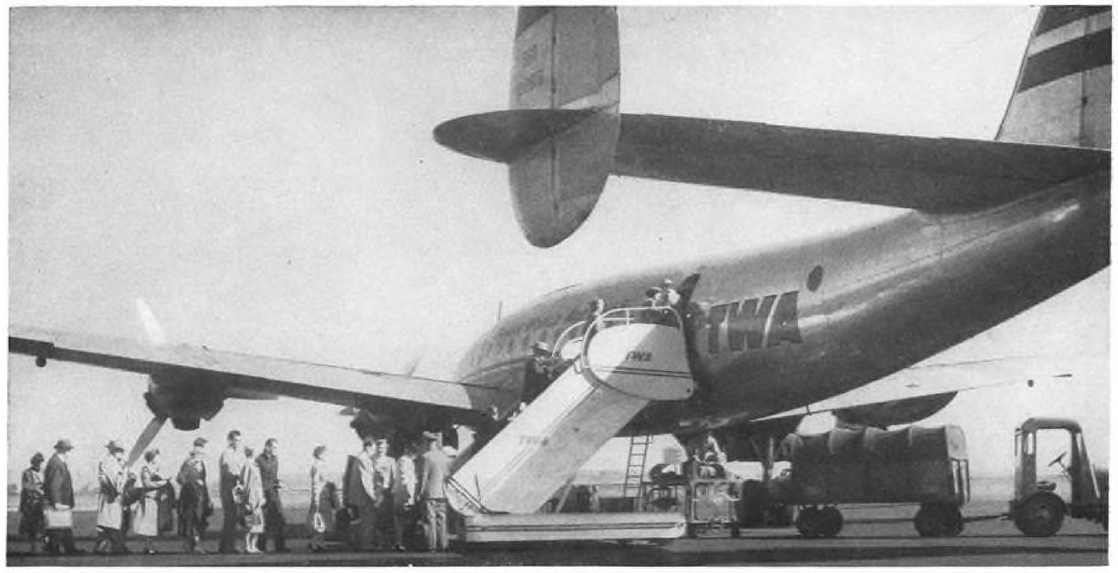
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AIRCOACH PASSENGERS board Trans World's transcontinental "Sky Tourist" Constellation at New York's LaGuardia Airport.

TWA Aircoach Revenues Top First-Class

- **Low-fare service brings in greater portion of record $187 million, with new gains forecast for this year.**
- **Damon bets on future of mass market development, predicts tourist will be the air transport 'breadwinner.'**

By Frank Shea, Jr.

Stressing mass appeal over class appeal, Trans World Airlines is on the way to another big year via aircoach.

One of the pace setters in what has become a major industry trend (AVIATION WEEK, May 24, p. 88), TWA has developed low-fare tourist service to the point where it is accounting for the greater portion of the airline's total revenue and traffic.

▶ **Budget-Minded Traffic**—Last year, aircoach played a big part in Trans World's all-time sales high of $187.2 million in gross revenues, and officials predict that this year the tourist flights will account for about 54% of total passenger revenues and more than 60% of total passenger mileage.

"Future airline profits lie in development of the mass market," says TWA president Ralph Damon, "and this is where we are placing the most emphasis. First-class traffic is bound to reach a saturation point in the not too distant future, and new traffic must be generated from among the budget-minded consumers who presently do not travel by air."

▶ **Sagging Profits**—Damon is one airline chief who does not hold rapid aircoach expansion partially responsible for the recent sag in profits. Big factor last year was an increase in depreciation charges on nearly $6.5 million in new aircraft, he says.

In addition, TWA's International Division, since the outset of service in 1946 through the first quarter of this year, has received only temporary mail compensation at a level intended to exclude any return on investment, Damon notes.

"These two factors, not aircoach expansion, have been the cause of our dipping profits," the TWA chief emphasizes. Last year, despite the all-time high sales total, the carrier's net income declined from $7.6 million, or $2.30 a share, in 1952 to slightly more than $5 million, or $1.52 a share.

▶ **Increasing Strength**—Overall, however, TWA's position continued to strengthen financially in 1953. Stockholder equity increased to $56.8 million, or $17.04 per share, compared with $15.53 per share at the end of 1952.

In debt reduction, the company made payments of $18.6 million and reduced the total to $41.8 million as of Dec. 31.

Of TWA's remaining debt, $14.6 million is scheduled for payment this year, while a total of $6.3 million has been segregated into a special fund representing advance payments, cash and government securities to defray the cost of aircraft scheduled for delivery in 1955.

▶ **Record Growth**—Freight and express had the greatest volume growth last year of any single year since 1948, jumping to 34.7 million ton-miles from 1952's figure of 29.7 million ton-miles.

Traffic-wise, over its combined domestic and international routes, TWA carried a record 3,140,000 revenue passengers a total of nearly 3 billion passenger-miles.

This represents a 22% jump in number of passengers, an increase directly attributed to expansion of aircoach services, Damon says.

▶ **Breadwinner**—TWA management on the whole is firm in the belief that, over the long run, low-cost tourist service will emerge as the principal "breadwinner" for the airline industry. Unit profits will be lower, but the greatly expanded markets will more



HIGH-DENSITY SEATING in domestic TWA Connie accommodates 81 passengers.

than compensate for this, they say.

"Dollar for dollar, our highest rate of return per plane-mile is derived from aircoach service," says Henry Fellows, TWA's director of sales research. The coach traffic is not diverted first-class traffic but, for the most part, is new business, he notes.

▶ **Shorthaul Gains**—This is considered particularly significant in view of the fact that several other airline executives are on record as insisting that coach gains are made at the expense of first-class losses.

"This just is not so," insists Fellows, "nor is it true that aircoach is only profitable over longhaul routes. Shorthaul aircoach over heavily traveled route segments can be equally as profitable as longhaul service, he says.

Fellows cites the New York-Washington run as particularly suited to shorthaul coach operations. In addition, he points to TWA's highly lucrative tourist service between San Francisco and Las Vegas.

"We have stimulated new business with our San Francisco-Las Vegas aircoach," he continues. "Before, people never thought of running to Las Vegas just for the weekend. Time and cost were prohibitive factors. But now, by making low-cost service available, we've stimulated their desire for short weekend vacations.

"San Francisco-Los Angeles is typical of what can be done in many other parts of the country via shorthaul aircoach."

▶ **Growing Trend**—TWA also refutes claims by several other airlines that aircoach traffic is seasonal at best. "Over the long run, this should not be the case," says Fellows. "The national economy will exert tremendous influence.

"What some people fail to realize," he adds, "is that there is a growing tendency in the U. S. toward more and more leisure time. It is not inconceivable that the normal work week will be shortened even further, with labor unions leading the way. The trend is there.

"Today, the average working man has more money to spend than ever before. With a shortened work week he will also have more time in which to spend it. It will be up to the airlines, in successfully competing with other consumer items and services, to stimulate his interest in air travel."

▶ **Big Attraction**—Low-cost service is the answer, says Fellows. He points to a number of possibilities where aircoach will be a big attraction. In addition to off-season weekend vacations, there are visits to relatives, trips in search of new job opportunities and visits to more healthful climates to relieve chronic ailments—all previously considered beyond the reach of the average working man because of time and cost factors.

Fellows also cites the case of the small independent businessman who does not have an expense account but must draw from his own funds for company trips. With aircoach service, such men find they can make more trips, widening their contacts and expanding their business on a limited budget.

▶ **Obvious Solution**—And there are the large corporations, too, notes Fellows. He points out that presently most of these firms have an established policy of always having their personnel use first-class service. Many believe this adds to the prestige of the company.

"But the slightest slump in their business, and these same firms look for ways to cut down on expenses and bring budgets into line," he adds. "Aircoach would be the obvious solution to consistently heavy travel expenditures."

TWA president Damon emphasizes that first-class traffic, supported largely by "expense account-type" business travel, rapidly is approaching the saturation point. He estimates that this point will be reached about the time the present traffic rate is doubled.

But aircoach knows no saturation point, he says. "This is where we will generate our new traffic—offering air travel to the masses at prices they can afford to pay."

Contrary to opinions expressed by several other airline chiefs, Damon is strongly opposed to any tariffs that would narrow the fare differential between coach and first-class. "Any increase in fares," he says, "should keep first-class and coach in the same proportion as they are at present."

▶ **Coach Pays Off**—A look at recent TWA traffic figures gives ample evidence as to how the carrier's "coach emphasis" program has been paying off. For the first four months of this year, aircoach passenger miles totaled 440,303,000, with domestic up 33% and international tourist traffic showing a 47% gain.

In April, aircoach traffic topped first-class for the first time, accounting for 55.3% of total system passenger miles during the month.

Equipment-wise, TWA now has 26 Constellations, each with 81-seat capacity, and five 70-passenger DC-4s in domestic tourist service, with 19 Connies in international service. Aircoach planes on the international routes carry 59 passengers.

▶ **Aircoach Outlook**—As far as TWA is concerned, aircoach is definitely here to stay, and in a big way.

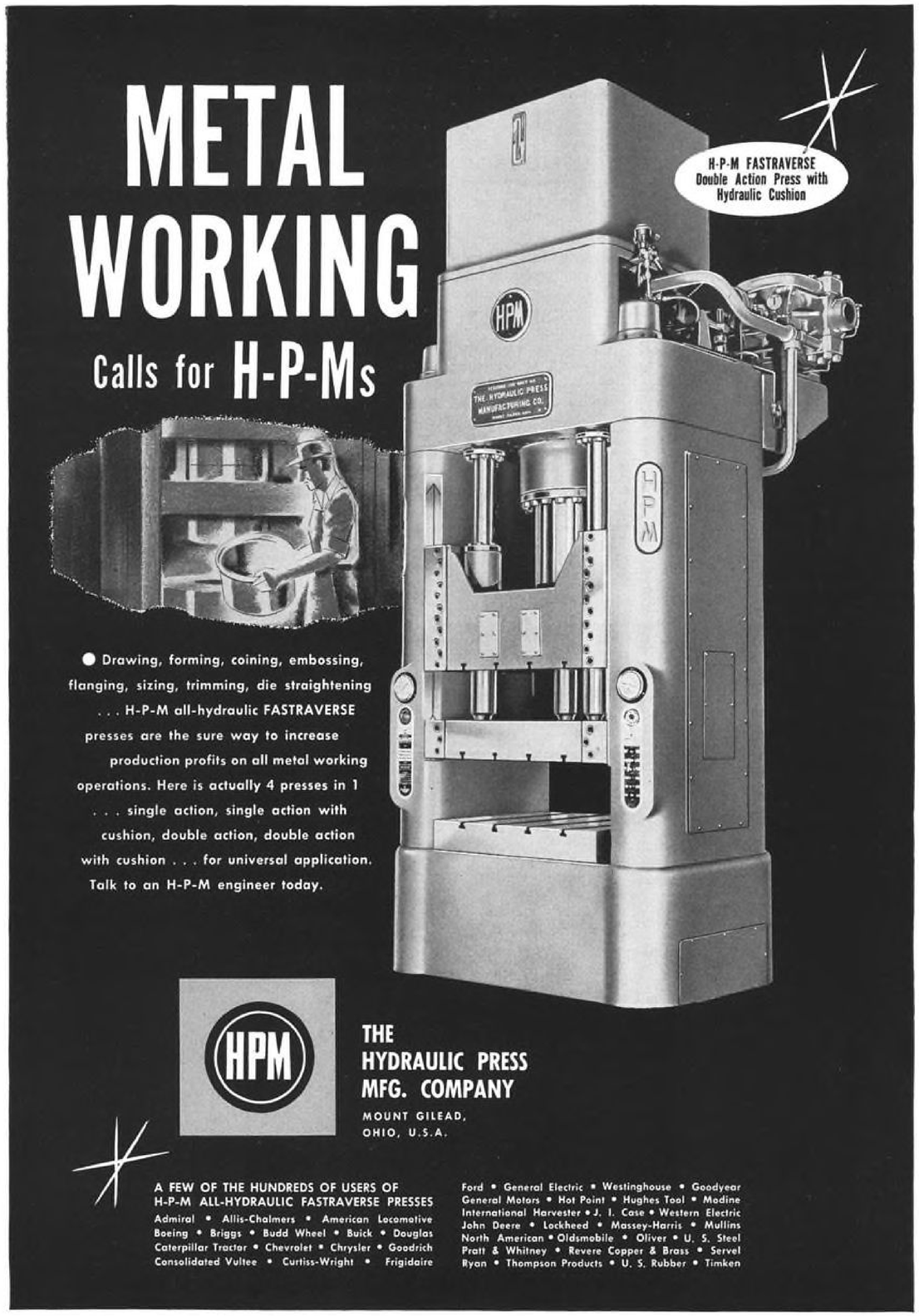
Here's the overall industry outlook from Damon's point of view: "I fully expect that within three to five years the industry will show 80% of its passenger revenues as derived from mass, as contrasted with class service—and, by the end of this decade, the total dollar revenues will be more than doubled.

"Before that time, what we now call air tourist service will even change its name and become standard class, with the present first-class category labeled luxury service."

Hawaiian Salaries

Hawaiian Airlines paid its president, S. C. Kennedy, $28,700 in 1953, the airline reports to Securities & Exchange Commission. Other top executive salaries paid included:

Ford Studebaker, vice president, $17,500; David Watson, vice president-treasurer, $15,375; John S. Pugh, secretary, $10,395, and Brian Cooke, assistant treasurer, $9,500.



Court Backs State Tax on Braniff

U. S. Supreme Court last week upheld constitutionality of ad valorem taxes imposed by states on airline planes which land and take off on interstate flights.

The 7-to-2 decision was handed down in the case of Braniff Airways vs. the State of Nebraska. Braniff argued that its flight equipment is immune from taxation because its headquarters is not in Nebraska, the federal government controls interstate air commerce, and the tax is a burden on interstate commerce.

▶ **Sufficient Contact**—The court pointed out in its ruling that Braniff's right to fly over the state of Nebraska goes back to the same constitutional basis on which navigable waters can be used regardless of the ownership of adjacent land. In the case of water carriers, the court said, the state has the power to tax their property used in interstate commerce.

The court emphasized that past decisions held that interstate commerce may be required to pay a non-discriminatory share of the tax burden. It said the issue devolves into the question of "whether 18 stops per day by the appellant's aircraft is sufficient contact with the state of Nebraska to sustain that state's power to levy an apportioned ad valorem tax on such aircraft.

"We think such regular contact is sufficient to establish Nebraska's power to tax."

▶ **Protection Cited**—The court then declared that Braniff is in the same position as railroads, truck and water carriers in that it has an opportunity to "exploit the commerce, traffic and trade that originates in or reaches Nebraska. . . . Nebraska certainly affords protection during such stops and these regular landings are clearly a benefit . . ."

Braniff, which was merged with Mid-Continent Airlines while the case was in litigation, makes 14 stops a day at Omaha and four at Lincoln, Neb. The original court action was filed by MCA.

The court pointed out in its decision than when the case was filed by Mid-Continent a report for 1950 showed that 9% of its revenue and 11¼% of its total tonnage originated in Nebraska. About 9% of its total stops were made in that state. The tax imposed was $4,280.44.

Mid-Continent fought the levy in the Supreme Court of Nebraska, which dismissed the airline's argument. Appeal then was made to the U. S. Supreme Court.

▶ **Frankfurter Dissents**—The court decision was delivered by Justice Stanley Reed. Justice William O. Douglas handed down a concurring decision and Justice Felix Frankfurter a dissenting opinion. Justice Robert H. Jackson also dissented, but did not write an opinion.

In his opinion, Frankfurter cited the court's decision in the case of Northwest Airlines vs. Minnesota, in which the state was permitted to tax the entire airline fleet although NWA operated in eight states.

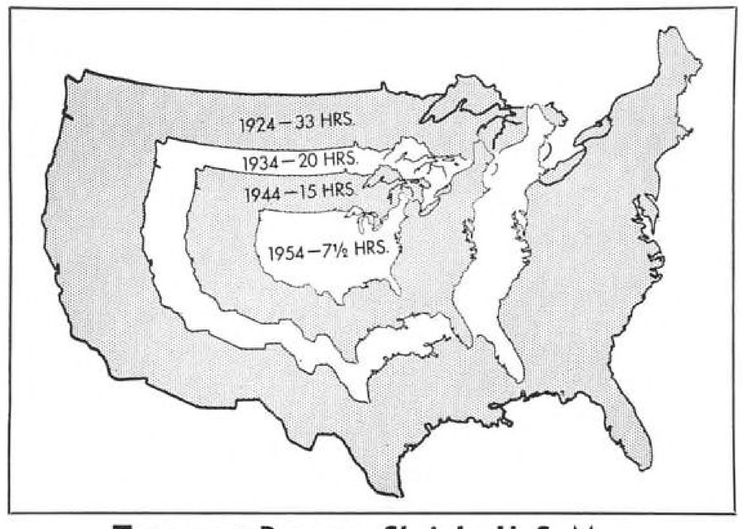
Frankfurter maintained that the court majority demonstrated the "inherent complexities of the law's adjustment to such novel problems as the excercise of the taxing power over commercial aviation in a federal system."

▶ **Dissent Reasoning**—He held that the parallel of boats, trucks and railroad cars with airlines does not hold, saying that transportation on the ground has a "closeness of duration of relationship to that state obviously not true of planes which make brief stopovers for a few minutes."

Air Transport Assn. said the decision was not a surprise, but was more or less a reaffirmation of what most operators accept as the law. In addition to Nebraska, six other states levy similar taxes, ATA said. They are Arizona, Florida, Minnesota, North Dakota, Washington and Wisconsin.

The Nebraska tax is calculated on the basis of a formula designed to fix the proportion of Braniff's equipment allocated to the state. This formula considers arrivals and departures, revenue tons handled, and the revenue originated in the state.

In addition to state taxes, many airlines pay levies to local governments, based on planes and other property.



Transport Progress Shrinks U. S. Map

Size of the U. S. steadily shrinks in terms of travel times as shown by the above superimposed maps keyed to scheduled aircraft speeds. In 1924, mail planes crossed the country in 33 hr. Boeing 247s cut this time to 20 hr. in 1934. A decade later the Douglas DC-3 sliced another five hours off. Today the Douglas DC-7 spans the U. S. from the West to East Coast in 7½ hr. Military jets have made it in less than 4 hr.

CAB May Act Soon In Balboa Route Case

Action by Civil Aeronautics Board on the reopened three-year-old New York-Balboa through service case is expected this week, following a scheduled final meeting of the airlines involved.

There were these developments:

- Sixty-day period set by CAB Mar. 26 for settlement passed the deadline without agreement between Pan American World Airways, Panagra and Braniff.
- Panagra and PAA vetoed Braniff's proposal to transfer its South American routes, franchises and properties to Panagra, for which Braniff would receive Panagra capital stock.
- Braniff expected a counter-proposal from Panagra.

CAB deferred decision on the case in March for 60 days (Aviation Week Apr. 5, p. 88) to enable the airlines to establish an independent airline in the west coast of South America to serve the combined international routes of Braniff and Panagra.

The Board figured such an agreement would set up two competitive routes:

- Panagra and Braniff's combined routes, operating primarily along the west coast of South America.
- Pan American's east coast routes.

At a meeting in New York May 12, PAA advised Braniff that if that com-

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pany would withdraw from South American operation, PAA and Panagra would be willing to pay a fair and reasonable price for its equipment and facilities in South America.

Braniff prepared a resolution in reply, stating that it wanted to explore ways and means of integrating its international routes and properties with those of Panagra so as to build a "stronger and more profitable property." Braniff said it was not prepared to abandon its South American operation.

It offered instead to transfer its routes and properties in South America to Panagra in exchange for capital stock in Panagra.

This proposal promptly was rejected by PAA and Panagra.

Observers believe Pan American and Panagra will have a counter-proposal to Braniff's earlier measure. Andrew B. Shea, Panagra president, is in Europe and unavailable for comment.

CAB Proposes 12-Hr. Nonstop Crew Limit

Civil Aeronautics Board last week proposed to extend the present 8-hr. domestic flight time limitation to 12 hr. for nonstop transcontinental flights having three crew members. The aircraft, however, must be pressurized and the flight must be scheduled "for not more than one takeoff and landing," CAB said.

The action came while the Board still had pending a decision on a requested waiver of the 8-hr. regulation to permit American, United and Trans World Airlines to operate single-crew nonstop transcontinental flights (AVIATION WEEK May 31, p 16).

▶ **CAA Petition**—CAB gave the industry until July 1 to comment on the proposed amendment to Part 40 of the Civil Air Regulations.

Meanwhile Civil Aeronautics Administration petitioned the Board to force American to "cease and desist" operating its east-west DC-7 transcontinental flights nonstop. CAA took the action when it determined that American had reached a point by May 31 where it could not, mathematically, complete 50% of its east-west trips under the 8-hr. regulation by July 1.

American had no comment last week on CAA's move.

▶ **UAL Service**—United Air Lines began operating DC-7 service between New York and San Francisco June 1. Only eastbound trips, scheduled at 7½ hr. are being operated nonstop. Westbound flights make a stop in Denver. United begins New York-Los Angeles service nonstop both directions on June 18.

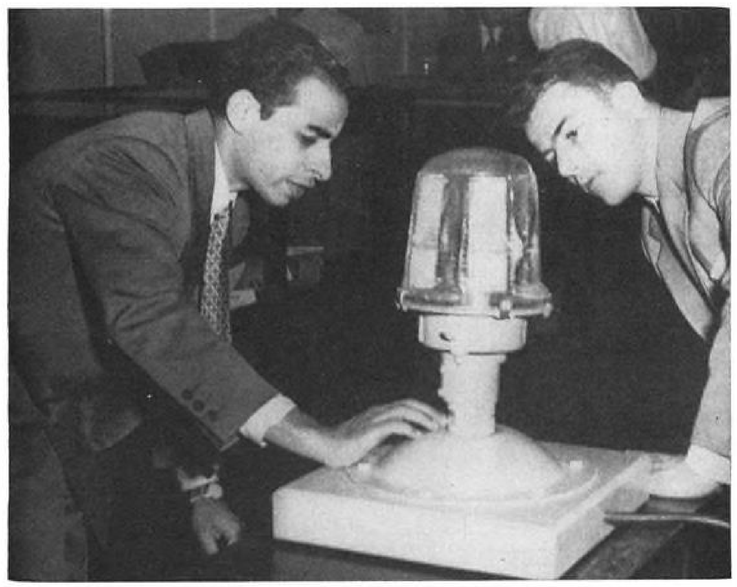
In proposing an amendment to the CARs CAB makes clear it does so "without deciding the merits of the request for waivers." The Board says it "believes that rule-making proceedings should be immediately instituted."

Following the oral argument held by the Board earlier, American filed a letter with CAB, pointing out:

- Nonstop flights involve less stress on the crew today than they did at the time of adoption of the 8-hr. rule.
- Nonstop flights reduce a crewman's working days per month 33⅓%, since a crew can obtain a month's flying time in only 10 working days.
- American's actual experience with the DC-7 nonstop operation since November demonstrates the flight's safety.

In reply to American's letter, Air Line Pilots Assn. charged that "the 85-hour monthly limitation and maximum 8-hr. day have existed side by side since 1934. The 8-hr. limitation was adopted as a maximum, a figure above which accident exposure was increased. One has only to compare the DC-7 aircraft to the Boeing 240 or DC-2 and to visualize a flight from New York to Chicago as compared to spanning the entire continent to put to death American's ridiculous contention concerning the decrease of the stress on the air crew over the years."

The Board was expected last week to act on the waiver request although two members are absent from Washington. Josh Lee is vacationing and vice chairman Harmar Denny is in Italy.



Refugee Pilot Studies Automatic Light

Lt. Franciszek Jarecki (right), Polish pilot who escaped from Soviet-dominated Poland in a Russian MiG-15 Mar. 5, 1953, inspects with Adel Francis of Egypt's Civil Aviation Department, a new airport light that can be turned on by a pilot flying over the field merely by saying the word "light" into his radio microphone. Using the CAA-developed light, pilots can fly into unattended airports. The lights can be switched off after takeoff by voice transmission, completing the cycle.

New Beirut Airport Returns Big Revenues

Beirut, Lebanon—Dedication of a luxurious terminal building at the new $16.5-million Beirut International Airport points up the Lebanese airfield's buildup from an insignificant landing strip to a top commercial air center in a brief four years.

The field has become Lebanon's biggest single enterprise, bringing in a direct annual revenue of about $500,000.

Last year an average of 21,795 passengers moved through the field monthly, compared with only 2,064 in 1950. In 1953, there were 62 daily flight movements as against only eight daily in 1950.

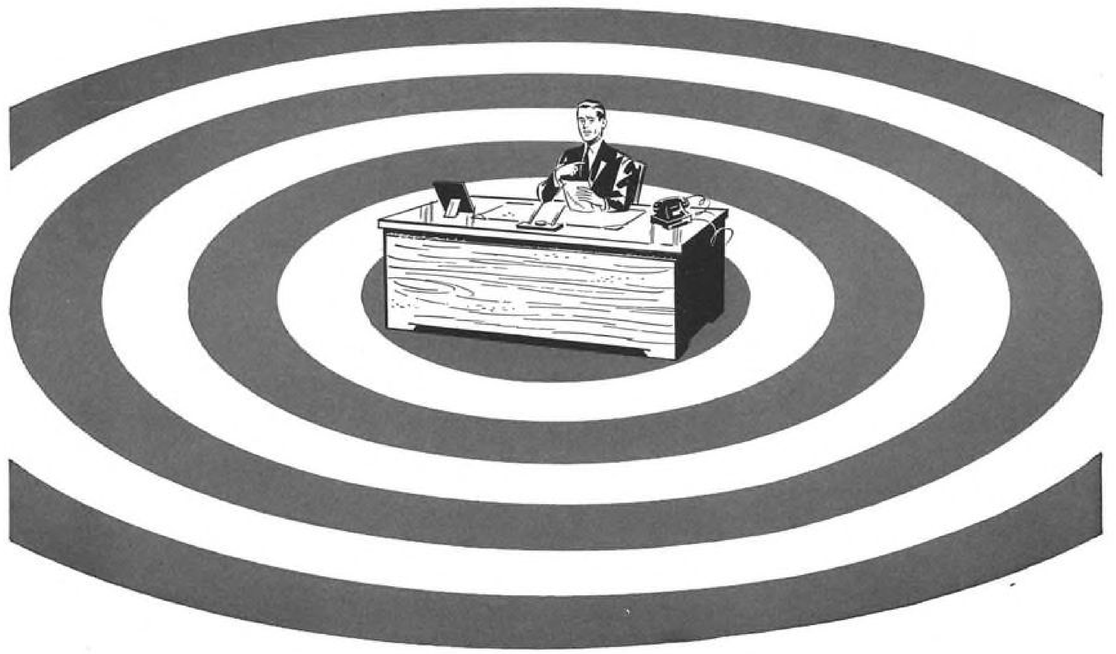
A total of 29 airlines, many of them top-ranking international carriers, are operating through the field that originally was used only by local services.

The new terminal building features an international bazaar where travelers may buy and carry out goods duty-free.

The building also has storage space for import, export and transit goods including refrigerated rooms for perishables and vaults for gold or other valuables.

A $114,000 storeroom for aircraft maintenance and overhaul parts is being constructed.

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☐ **Check contents** and locations of first-aid kits. Be sure they're adequate and up to date. Here, again, your CD Director can help. He'll advise you on supplies needed for injuries due to blast, radiation, etc.

☐ **Encourage personnel** to attend Red Cross First-Aid Training Courses. They may save your life.

☐ **Encourage your staff** and your community to have their homes prepared. Run ads in your plant paper, in local newspapers, over TV and radio, on bulletin boards. Your CD Director can show you ads that you can sponsor locally. Set the standard of preparedness in your plant city. There's no better way of building prestige and good community relations—and no greater way of helping America.

Act now . . . check off these four simple points . . . lives are at stake . . . have you a right to delay?

CAB ORDERS

(April 26-May 5)

DENIED:

Seaboard & Western Airlines application for exemption to fly two roundtrip flights carrying U. S. military personnel from Luxembourg to New York on a contract with Furlough Tours Inc.

United States Overseas Airlines application to operate one flight between Newark, N. J., and Frankfort, Germany.

Braniff Airways motion to dismiss the reopened proceeding in the Fargo, N. D., service case.

DISMISSED:

Pacific Northern Airlines complaint against reduced charter rates and charges proposed by Pan American World Airways in States-Alaska service.

United Air Lines proposal to provide person-to-person signature service for $1 on cargo shipments when required by order, regulation or contract of a U. S. government agency.

Proceeding into reduced rates for U. S.-Alaska, Hawaiian and Puerto Rican service filed by S. S. W. Inc.

Pan American World Airways proposed 10-cents-a-pound rate for cargo between San Juan, P. R., and New York.

Northwest Airlines proposed reduced rates between Anchorage, Alaska, and Seattle for carriage of passengers on freighter-type aircraft.

Alaska Airlines proposal of reduced rates for hauling mercury from McGrath to Anchorage.

GRANTED:

Central Airlines permission to use Fort Smith, Ark., Airport.

City and Chamber of Commerce of Reno, Nev., leave to intervene in proposal by United Air Lines to amend its routes so as to add Ely, Nev., as an intermediate point alternate to Elko, Nev., between Salt Lake City and Reno.

ORDERED:

Extension of investigation period into day coach fares between Washington and Jacksonville, St. Petersburg and Tampa, Fla., filed by National Airlines.

Investigation into tourist fares between Anchorage, Alaska, and various U. S. points as filed by Northwest Airlines, United Air Lines and Western Air Lines.

Consolidation of various applications involved in Slick Airways application for issuance of a permanent certificate.

APPROVED:

Intercompany arrangements between American Airlines and Mohawk Airlines and various other air carriers.

AUTHORIZED:

Temporary suspension of service asked by Resort Airlines in Puerto Rico, the Virgin Islands and Dominican Republic.

FIXED:

Central Airlines temporary mail rates.

Ozark Air Lines mail rates.

EXTENDED:

Trans-Canada Air Lines authorization to fly between Tampa, Fla., and Mexico City for six months. Also TCA authorization to use Kinross Airport, Mich.

SUSPENDED:

Letters of registration issued to Air Services Inc., Continental Charters Inc. and Economy Airways Inc.

Champagne Flight

Los Angeles—Champagne and orchids for passengers highlight the new DC-6B luxury service Western Air Lines has inaugurated from Los Angeles to San Francisco, Portland and Seattle-Tacoma.

On the flight, named "The Californian," patrons enjoy vintage champagne and filet mignon dinners. Women passengers receive orchid corsages as they leave the plane.

Seat reservations at no extra fare are planned so passengers may select the place of their choice when checking in at the airport for their flight.

Service schedule is arranged so that the northbound flight leaves Los Angeles daily at 6 p.m. (PDT), while its southbound counterpart takes off from Seattle-Tacoma at 4:20 p.m. (PST).

Board Reports Cause Of NAL DC-6 Crash

Cause of National Airlines DC-6 crash off Mobile Bay, Ala., Feb. 14, 1953 (AVIATION WEEK Feb. 23, 1953, p. 15), Civil Aeronautics Board reports, was due to the following factors:

- Loss of control followed by inflight failure and separation of portions of the airframe structure while flying through a violent storm.
- Failure of the airline to inform the plane's pilot of the storm's location.

The crash occurred on National's regular Miami-New Orleans flight during a storm of tornado proportions. All 46 persons aboard were killed. Main wreckage was located in the Gulf of Mexico 3.8 mi. offshore and about 52 mi. right of the regular course. About 75% of the DC-6B was recovered.

▶ **Beyond Pilot Control**—The Board found there was no indication of malfunctioning control, fatigue failure, fire, explosion or lightning strike. Investigators figure the plane's structure failed at a moment "when gust loads combined with violent maneuvering loads were being imposed to maintain or regain control."

Although a special severe weather bulletin issued at Washington, D. C., was received by National Airlines and the weather bureau at Miami and New Orleans, no U. S. Weather Bureau advisory weather reports were issued to air route traffic control to report the unexpected development and movement of the storm to en route flights; "nor did National Airlines attempt to relay this information to Flight 470," the accident investigation report reveals.

The Board concludes that the pilots "were beset by a most unusual complex of conditions beyond their control."

CAB sees airborne radar as a possible answer to similar future problems.

PAA, Pioneer List Executive Salaries

Pan American World Airways paid its vice president and assistant to the president, Samuel F. Pryor, $43,700 in salary during 1953, the airline reports to the Securities & Exchange Commission.

PAA president Juan Trippe's salary was not reported because only those of more than $25,000 are filed with the commission.

Other salaries of more than $30,000: Henry J. Friendly, vice president and general counsel, $42,300; Franklin Gledhill, vice president, $41,700; and John C. Leslie, vice president, $40,900.

Pioneer Air Lines paid its president, Robert J. Smith, $15,050. Others reported to SEC: Harold B. Seifert, vice president, $13,650; Harding L. Lawrence, vice president, $13,250; Eugene W. Bailey, secretary-treasurer, $13,650; and Wayne O. Richardson, who resigned as assistant secretary-treasurer Dec. 31, $5,685.

SHORTLINES

▶ **KLM Royal Dutch Airlines** does not plan implementation of any vacation credit plan ideas as being promoted by other carriers, according to M.E.A.L. de Jong, the airline's U. S. director of traffic and sales.

▶ **Japan Air Lines** may increase its trans-Pacific flights from two to three per week next fall. Westbound reservations have been extremely heavy, the airline reports.

▶ **Pan American World Airways** has stepped up its direct services from Chicago and Detroit to Europe to three flights weekly.

▶ **Saudi Arabia Airlines** has purchased four Convair 340s, with delivery scheduled to begin this month, according to J. V. Naish, executive vice president of the Convair Division of General Dynamics Corp.

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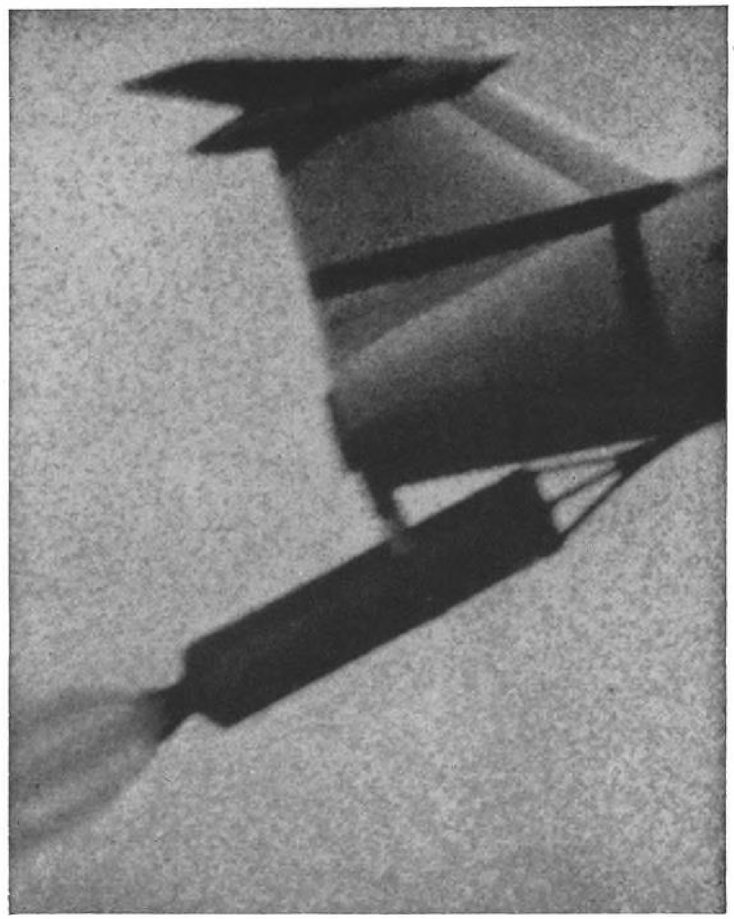
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Description	Mfg.	Part No.	Quan.
Pump	Pesco	1H-260K	195
Pump	Thompson	TFD8600	75
Cylinder Hyd.	Grumman	5359404	417
Heater	Surface Combustion Co.	83A9	6
Heater	Stewart Warner (200,000 BTU)	921B	230
Blower	Dynamic Air Engine	4582-AA-6C	18
Blower	Joy Manufacturing Co.	U-702-15	24
Tank Unit	Minn. Honeywell	G-1098D	11
Trim Tab Controller	Pioneer	15701-1A	15
Oil Cooler Assembly	U.A.P.	U8416-MM	12
Oil Cooler Assembly	U.A.P.	U8013-MM	14
Hydraulic Pump	Vickers	PF12-713-25BCE	124
Hydraulic Pump	Vickers	PF-713-20BCE	327
Hydraulic Pump/ 3000 P.S.I.	Vickers	MF45-3911-20Z	43
Hydraulic Cylinder	Air Associates	HC2109	29
Hydraulic Cylinder	Air Associates	HC2110	8
Fire Detector	Edison	117-47	46
Fire Detector	CO_2 Mfg. Co.	ASDC2	65
CO_2 Cylinders	Kidde	981280	185
CO_2 Cylinders	Kidde	M870036B	47
Anti-Icer Pump	Adel	D7818	125
Auxiliary Power Unit	Eclipse	NEP-2	29
Auxiliary Power Unit	Lawrence	LER-30D	16
Pump	Pesco	1E-621	8
Pump	Pesco	2E258SA	21
Separator	Pesco	3V-217-HC	32
Accumulator	Vickers	AA14002A	35
Actuator	Air Associates	M-2031	22
Wobble Pump (D-3)	Erie Meter	AN4014	17
Oxygen Cyl.	Kidde	923748	74

ENGINE ACCESSORIES

Starter	Eclipse	1416-12E	75
Generator	Eclipse (NEA-3A)	716-3A	100
Starter Motor	Jack & Heinz	JH950-R	90
Generator	G.E.	2CM46A2	4
Generator	Eclipse	1003-4	71
Carburetor	Stromberg	PD12K10	550
Carburetor	Stromberg	PR48-A1	236
Carburetor	Holley	1685-HAR	90
Carburetor	Holley	1375-F	19
Magneto	Scintilla	SF9-LN-2	407
Fuel Pump	Pesco	2P248EB	6
Fuel Strainer	U.A.P.	U635A	76
Governor	Woodward	5x18	10
Prop. Reversing Control	Ham. Standard	72400	20
Oil Separator	Eclipse	564-2A	384
Oil Filter	Purolator	27314	100
Pressure Relief Valve	Aerotec	V301B7	20
Tachometer	Eclipse	227-11-D3A	11
Vacuum Pump	Eclipse	610-2C	6
Spark Plugs	Aero	LS4-AD1	185,000

AIRCRAFT ENGINES & PARTS

Engine	Wright	R-1820-52	1
Engine	Wright	R-1820-54	16
Engine	Wright	R-1820-60	4
Engine	P & W	R-1830-43	1
Bearing	P & W	1045	166
Flange	P & W	3506	500
Follower Assy.	P & W	8288	130
Blower Assy.	P & W	3M814	814
Shaft	P & W	48362	53
Shaft	P & W	48363	75
Gear	P & W	48461	390
Gear	P & W	76236	78
Bearing	P & W	84289	1178
Housing	P & W	84487	113
Nose Housing	P & W	84591C	77
Crankcase Assy.	P & W	84350-D	200
Pump Assy.	Wright Aero	420313	33
Drive Assy.	Wright Aero	416421	46
Q.E.C. Unit		FM1	36
Q.E.C. Unit		PY4M(B24)	17

AIRCRAFT ENGINES & PARTS (Contd.)

Description	Mfg.	Part No.	Quan.
Bearing	Torrington	NR6L12	25790
Bearing	Fafnir	AN200-K3L2	18273

GAUGES

Compass	Eclipse	36001-0	20
Gyro Indicator	Eclipse	14601-1F-B1	11
Gyro Indicator	Eclipse	10078-1AG	62
Position Indicator, Wheel & Flap	Weston	AN5780-2	400
Position Indicator, Wheel & Flap	G.E.	AN5780-2	1000
Position Indicator, Wheel & Flap	Eclipse	20100-11C-4-A1	23
Pitch Trim Gauge	Eclipse	15100-1B-A1	19
Cowl Flap Indicator	G.E.	8DJ29AAY	21
Oil Temp. Indicator	Lewis	77C3	23
Oil Temp. Indicator	Lewis	77C4	13
Oil Temp. Indicator	Weston	828TY13Z2	71
Manifold Pressure Gauge	Manning, Maxwell & Moore	AN5770-2	28
Fuel Quantity Gauge	Eclipse	3801-3B	128
Dual Carb. Temp. Gauge	Weston	828TY12Z2	40
Carb. Air Temp.	Lewis	77C3	22
Carb. Air Temp.	Weston	119862	40
Air Temp. Gauge	Weston	727TY70Z2	11
Air Temp. Gauge	Weston	727TY72Z2	85
Air Temp. Gauge	Weston	727TY73Z2	88
Air Temp. Gauge	Weston	727TY74Z2	83
Air Temp. Gauge	Weston	728-40Z2	10
Air Temp. Gauge	Weston	727-TY37P	298
Air Temp. Gauge	Lewis	47B22	33
Air Temp. Gauge	Lewis	47B23	28
Air Temp. Gauge	Lewis	47B24	54
Air Temp. Gauge	Lewis	47B21	30
Cylinder Head Temp.	Lewis	76B19	8
Tachometer Indicator	G.E.	8DJ13ABK	6
Tachometer Indicator	Eclipse	2222-1F-2A	200
Magnesyn Indicator	Eclipse	23000-2A	67
Pressure Transmitter	Giannini	47114-D2.0-20	8
Differential Pressure Gauge	Kollsman	906-6-011	22
Differential Pressure Gauge	Kollsman	254BK-6-052	48

AIRCRAFT (RADIO)

Transmitter	Bendix Radio	TA-12B	20
Receiver	Bendix Radio	RA10-DB	35
Amplifier(PB10) W/ED3Mount	Eclipse	15401-1	10
Radio Noise Filter	G.E.	1C-200	740
Radio Noise Filter	G.E.	NF10084	959
Tube		JAN6AL5	327
Standing Wave Ind.	Hewlett Packard	415A	3
Antenna Switch	Bendix Radio	MS49A	26
Control	Bendix Radio	3616	81
Station Box	Bendix Radio	3620	23
Insulator	Bendix Radio	MT48C	518

ELECTRICAL PARTS

Thermo Switch	Fenwall	17322-1	3
Thermo Switch	Fenwall	18423	4
Thermostat	Fenwall	18422-0	20
Ignition Unit	Southwind	925C-1A	5
Plug	CAKZ	UG-21/U	1979
Transformer	Eclipse	DW33	11
Transformer	Eclipse	DW28	80
Transformer	Eclipse	DW47	33
Transformer	G.E.	70G3	26
Servo Motor	Transicoil	#1300-20	57
Motor	G.E.	5BA40NJ1A	425
Motor	G.E.	5DP65-MB1	189
Motor	G.E.	5BA25D-J4B	44
Motor	Airesearch	26675	25
Motor	Diehl	FD65-5	21
Circuit Breaker	Spencer	PM-5	2094
Valve	Parker	AN5831-1	60
Valve	Eclipse	612-4A	130
Valve	Kohler	K1593-6D	1888
Valve (0-500PSI)	Bendix	146102	46
Circuit Breaker	Spencer	C6363-1-5A	115
Circuit Breaker	Spencer	C6363-1-2A	115
Circuit Breaker	Heinemann	AM1614-80	1700
Circuit Breaker	Cutler Hammer	6141-H69A	237
Amplidyne	G.E.	5AM31JJ9A	31

ELECTRICAL PARTS (Contd.)

Description	Mfg.	Part No.	Quan.
Amplidyne	G.E.	5AM31NJ10	111
Switch	Kidde	A-4614	151
Ignition Switch	Scintilla	AN3213-1	70
Ignition Switch	Nesco	A-9(94-3226)	250
Master Switch	Jos Pollack	M862A	66
Thermo Switch	Fenwall	17322-2	126
Heater Control Switch	White-Rodgers	1033-4E1	287
Air Ram Switch	Minn. Honeywell	PG208AS1	148
Air Ram Switch	Minn. Honeywell	PG208AS7	40
Pressure Switch	Aerotec	M-101-B	20
Impact Switch	Kidde	SA/3A	18
Switch	C.H.	8909-K99	2000
Dome Light	Grimes	AN3096-4	2585
Dome Light	Grimes	AN3096-5	775
Dome Light	Grimes	AN3096-6	1365
Plug	Cannon	NAF310310-4B	2747
Plug	Cannon	NAF310310-5B	402
Relay	Leach	7264-404	47
Relay	Leach	7210	24
Relay	Allied	BOBX-2	31
Relay	Square D	82A	718
Relay	G.E.	CR2791-G100-K4	281
Relay	G.E.	CR2792F101-A3	626
Relay	Guardian	G34464	41
Relay	Guardian	G31502-A	350
Relay	C. P. Clare	D2060	45
Control Box	Vapor Car Heating Co.	9804B	34
Compensator	Vapor Ca Heating Co.	46B311	25
Solenoid	Interstate Aircraft & Eng. Co.	A812	202
Flex. Cable	Airesearch	25432	66
Temp. Control	Fulton Syphon	715E	52
Noise Filter	Mallory	NF3-5	500
Regulator	G.E.	3GBD1A18A	13

VALVES

Check Valve		AN6018-1	32
Check Valve		AN6207-12	400
Bleeder Valve		AN6204-2	500
Hyd. Solenoid Control Valve	Whittaker	25352-2	13
Valve	Kidde	982585	326
Valve	Oh. Chem.	AN-60009-1B	395
Valve (3000 PSI)	Parker	2-1046-76	47
Restrictor Valve	Parker	SP4-2746-77	68
Restrictor Valve	Parker	SP4-2746-78	105
Restrictor Valve	Parker	SP4-2746-79	40
Restrictor Valve	Parker	SP4-2746-80	48
Restrictor Valve	Parker	SP4-2746-81	60
Restrictor Valve	Parker	SP4-2746-76	142
Restrictor Valve	Adel	18784	33
Cone Check Valve	Parker	PL2-2546-75	127
Cone Check Valve	Parker	PL2-2546-76	123
Cone Check Valve	Parker	PL2-2546-77	620
Cone Check Valve	Parker	PL2-2546-78	540
Check Valve	Parker	PLY-843-54	112
Check Valve	Parker	PL2-1846-77	23
Check Valve	Kenyon	19100-2-101B	67
Check Valve	Eclipse	557-5	9
Check Valve	U. S. Gauge	AW-CV-1-1	180
Valve	Parker	6-746-10	68
Valve	Vickers	AA31400	28
Restrictor Valve	Adel	18784	33
Lock Valve	Adel	12924-2	85
Brake Valve	Vickers	146102	22
Selector Valve	Parker	SP-1-445-8	7
Selector Valve	Adel	D9530	478
Selector Valve	Adel	D9530-2	668
Selector Valve	Adel	D9560-2	428
Selector Valve	Adel	D9632	179
Selector Valve	Adel	D9696	237
Selector Valve	Adel	D10044	744
Selector Valve	Adel	D10051	244
Solenoid Valve	United	37D6210 (AN4078-1)	2200
Magnetic Valve	General Control	AV1B1174	114
Throttling Valve		73-A-01	1865
Relief Valve	Airex	1265-900	240
Pressure Relief Valve	Aerotec	V301B7	20
Valve	Aero Supply	74247 (TyPH3)	814
Valve	Whittaker	AN5830-1	335
Valve	Whittaker	AN5830-6	74
Underwing Fueling Valve	Parker	7-2646-12	5
Disconnect Valve	Allen	5QD1800N	148
Drop Tank Valve	Allen	8QD1800B	53
Disconnect Coupling	Allen	38QD1800B	60

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FEATURE PAGE

News Sidelights

Aerocar, Inc., is negotiating with a Canadian aircraft firm to have the two-place flying automobile produced north of the border and in the British Commonwealth. The Longview, Wash., company notes that the Aerocar is in the final flight phases of CAA certification. Auto component of the prototype has logged well over 25,000 miles on ground travel. National Assn. of Manufacturers is stated to have made a movie of the Aerocar for showing on NAM's television show, Industry on Parade.

New full name of the government-backed German airlines is Deutsche Lufthansa Aktiengesellschaft (Luftahansa for short). Former name: Aktiengesellschaft fur Luftverkenhrsbedarf (Luftag for cable purposes).

Canadian Pacific Airlines claims to be the only air carrier operating a paddle-wheel steamer in connection with its service. CPA operates a 1,600-ton sternwheeler in the Yukon Territory from Whitehorse to Dawson City. It's a tourist deal for this summer, with flights from Vancouver to Whitehorse, paddle-wheel steamer to Dawson City.

U. S. colleges and universities now own a fleet of 111 planes logging nearly 14,000 hours annually in aviation education programs, Aircraft Industries Assn. reports.

Russians conceived the theory of liquid-fuel rockets at the close of the 19th Century, a member of the Hungarian "Flying Lectures Bureau" claims. K. E. Ciolkovszky is named as the responsible scientist. The Hungarian press also claims Oszkar Asboth, a Hungarian mechanical engineer, was the first to fly a helicopter. This event is said to have occurred 25 years ago.

Dr. E. Paul Torrance told the Western Psychological Assn. at Los Angeles recently that psychological tests he conducted on 31 of the 38 American Korean jet aces showed without exception the airmen were individuals who have been driven by an extremely strong, aggressive spirit since boyhood.

First Air Force squadron to fly more than 1,000 hr. in one month in North American F-86D all-weather jet fighters has been presented a special plaque by NAA to commemorate the event. The unit, 60th Fighter-Interceptor Squadron of the Eastern Air Defense Force, also has maintained an accident-free operation for the past six months. More than half the squadron's pilots are Korean veterans.

Seeking to put the maximum cargo airlift to work on flights with the highest airfreight potential, American Airlines has designated 14 flights to be operated exclusively with DC-6Bs. AA points out that the DC-6B operating on combination cargo-passenger flights can carry 4,000 lb. more cargo than similarly operated DC-6s.



FIERCE-LOOKING DH MOSQUITO that Dianna Bixby selected for an attempt on the round-the-world speed record is an extensively modified version of the British-designed World War II fighter-bomber. New all-metal nose that includes cockpit was fitted to all-wood structure to permit installation of pressurization. Plane is designed to do more than 400 mph. at 40,000 ft.

AVIATION CALENDAR

June 13-18—American Society for Testing Materials, annual meeting, Hotels Sherman and Morrison, Chicago.

June 16-20—International Tourist Plane Flight, held in conjunction with Fourth Centennial of Sao Paulo, Brazil.

June 17-21—American Institute of Electrical Engineers, summer and Pacific general meeting, Hotel Biltmore, Los Angeles.

June 18-19—Britain's National Air Races, sponsored by Royal Aero Club, Bagington Aerodrome, Coventry, England: International Trophy Race, June 18; King's Cup Air Race, June 19.

June 20-23—Aviation Distributors & Manufacturers Assn., mid-year meeting, Stanley Hotel, Estes Park, Colo.

June 21-24—Institute of the Aeronautical Sciences, annual summer meeting, IAS Building, Los Angeles.

June 23-25—Symposium on Global Communications, sponsored by Institute of Radio Engineers, Statler Hotel, Washington, D. C.

June 24-26—American Helicopter Society, 10th annual forum, Washington, D. C.

July 3-6—Eighth annual All Women Transcontinental Air Race, sponsored by Ninety-Nines, Inc., Long Beach, Calif., to Knoxville, Tenn.

July 3-11—Philadelphia Glider Council, annual Open House Week; Glider Training Camp, June 11-17; both at Hilltown, (Pa.) Gliderport.

July 4—Western National Air Show & Races, including closed-course midget racer events, sanctioned by National Aeronautic Assn., Dansville, N. Y.

July 13-15—Western Plant Maintenance Show, to be managed by Clapp & Poliak, at the Pan-Pacific Auditorium in Los Angeles.

July 22—Third National Aviation Education Workshop, sponsored by CAP and the University of Colorado, Boulder, Colo.

Aug. 7-8—Second annual fly-in and convention, sponsored by Experimental Aircraft Assn., featuring "home-built" aircraft, sportplanes, racers, antiques, Milwaukee, Wis., held in conjunction with the fourth annual national air pageant.

Aug. 9-10—American Society for Quality Control, first annual Western Regional Conference, to be held in conjunction with the National Conference of the Aircraft Technical Committee, U. S. Grant Hotel, San Diego.

Aug. 9-11—Turbine-powered air transportation meeting, Seattle, sponsored by the Institute of the Aeronautical Sciences.

Aug. 25-27—Western Electronic Show & Convention, sponsored jointly by West Coast Electronics Mfg. Assn. and Institute of Radio Engineers, Ambassador Hotel, Los Angeles.

Sept. 4-6—National Aircraft Show, Dayton, Ohio.

Sept. 13-24—Instrument Society of America, first International Instrument Congress and Exposition and third annual Analytical Instrument Clinic, Philadelphia.

Oct. 17-22—International Union of Aviation Insurers, annual general meeting, New York.

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AUSTENAL LABORATORIES, INC. 24
Agency—Frank C. Nahser, Inc.
B G CORPORATION, THE 44
Agency—Gaynor & Co., Inc.
B. H. AIRCRAFT CO., INC. 100
Agency—Harold Marshall Adv. Co.
BARBER COLMAN CO. 36
Agency—Howard H. Monk & Assoc.
BRILES MFG. CO. 94
Agency—McKee-Burns Advertising
BRISTOL COMPANY, THE 38
Agency—James Thomas Chirurg Co.
CAMLOC FASTENER CORP. 47
Agency—Lewis Advertising Agency
COLLINS RADIO CO. 97
Agency—W. D. Lyon Co., Inc.
CONNECTICUT HARD RUBBER CO. 103
Agency—Peck Brothers Adv.
CONSOLIDATED VULTEE AIRCRAFT CORP. ..... Front Cover
Agency—Buchanan & Co., Inc.
COOPER PRECISION PRODUCTS, INC. 91
Agency—Sudler Company, Advertising
deHAVILLAND AIRCRAFT OF CANADA 84
Agency—Paul-Taylor-Phelan, Ltd.
DOUGLAS AIRCRAFT CO. 73
Agency—J. Walter Thompson Co.
DOW CORNING CORP. 41
Agency—Don Wagnitz Adv.
EASTERN INDUSTRIES, INC. 28
Agency—Bernsen Advertising Agency, Inc.
EASTMAN KODAK CO. 77
Agency—J. Walter Thompson Co.
EDO CORPORATION 30
Agency—Davis-Parsons-Stromeier, Inc.
ELASTIC STOP NUT CORP. ..... Fourth Cover
Agency—G. M. Basford Co.
FAFNIR BEARING CO. 67
Agency—Horton-Noyes Co
FAIRCHILD ENGINE & AIRPLANE CORP. 39
Agency—Gaynor & Co., Inc.
GILFILLAN BROS., INC. 42, 43
Agency—Erwin, Wasey & Co.
GLADDEN PRODUCTS CORP. 98
Agency—Walter C. Davison Co.
GLOBE INDUSTRIES, INC. 58
Agency—Weber, Geizer & Kalat, Inc.
GOODYEAR AIRCRAFT CORP. 23
Agency—Kudner Agency, Inc.
GREER HYDRAULICS, INC. 79
Agency—Dunwoodie Adv. Service
GRUMMAN AIRCRAFT ENGINEERING CORP. 121
Agency—Fuller & Smith & Ross, Inc.
HARDMAN TOOL & ENGINEERING CO. 76
Agency—The Essig Company
HARRISON RADIATOR DIV. G. M. CORP. 35
Agency—D. P. Brother & Co.
HETHERINGTON, INC. 53
Agency—The Harry P. Bridge Co.
HOLLEY CARBURETOR CO. ..... Second Cover
Agency—Holden-Clifford-Flint, Inc.
HYDRAULIC PRESS MFG. CO., THE 109
Agency—The Jay H. Maish Co.
INDIANA GEAR WORKS 46
Agency—Bozell & Jacobs, Inc.
INTERNATIONAL NICKEL CO. 85
Agency—Marschalk & Pratt Co.
IRON FIREMAN MFG. CO. 86
Agency—Joseph R. Gerber Co.
KAWNEER COMPANY, THE 83
Agency—Fuller & Smith & Ross, Inc.
KEN COOK COMPANY 96
KIDDE & CO., INC., WALTER 5
Agency—Cunningham & Walsh, Inc.
KOLLSMAN INSTRUMENT CORP. 74
Agency—Schaefer & Favre Adv.
LEACH RELAY CO. 104
Agency—The McCarty Co.
LEAR, INC. 27
Agency—Buchanan & Co., Inc.
LEWIS ENGINEERING CO. 22
LIBRASCOPE, INCORPORATED 72
Agency—Western Adv. Agency
LOCKHEED AIRCRAFT CORP. 50, 51
Agency—Foote, Cone & Belding Adv.
LOCKHEED AIRCRAFT CORP. 111
Agency—Hal Stebbins Agency
LORD MFG. CO. 70
Agency—Davies & McKinney Adv
MANNING, MAXWELL & MOORE, INC. 31
Agency—Fuller & Smith & Ross, Inc.
MARMAN PRODUCTS CO. 10
Agency—West Marquis, Inc.
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McCULLOCH MOTORS CORPORATION 105
Agency—Stromberger, LaVene, McKenzie Adv.
MICRODOT DIVISION FELTS CORP. 92
Agency—Hicks & Greist, Inc.
MONADNOCK MILLS, UNITED CARR FASTENER CORP. 106
Agency—H. B. Humphrey, Alley & Richards, Inc.
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MONSANTO CHEMICAL CO. 95
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OLIVER CORPORATION 84
Agency—Richard R. Pitt Adv.
PACIFIC DIVISION BENDIX PACIFIC CORP. 29
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PASTUSHIN AVIATION CORP. 52
Agency—Lynn-Western, Inc.
PHILLIPS PETROLEUM CO. 5
Agency—Lambert & Feasley, Inc.
PSP ENGINEERING CO. 84
Agency—L. J. Swain Advertising
RADIO CORP. OF AMERICA 66
Agency—Al Paul Lefton Co., Inc.
REMINGTON RAND, INC. 59
Agency—Leeford Adv. Agency, Inc.
REPUBLIC STEEL CORP. 82
Agency—Meldrum & Fewsmith, Inc.
RESIN INDUSTRIES, INC. 4
Agency—Taggart & Young Adv.
RHEEM MFG. CO. 19
Agency—Campbell-Ewald Co.
ROBINSON CO., RALPH C. 83
Agency—Chapin-Damm Advertising
ROE & COMPANY LIMITED, A. V. 87
Agency—Dolan, Davis, Whitcombe & Stewart, Ltd.
SAWYER & SON CO., H. M. 80
Agency—McMillan & Marsden
SEARCHLIGHT SECTION 115, 116, 117, 118, 119
SOCONY VACUUM OIL CO. 90
Agency—Compton Advertising, Inc.
SPERRY GYROSCOPE CO. ..... Third Cover
Agency—Beach, Yates & Mattoon, Inc.
STANDARD PRESSED STEEL CO. 81
Agency—Gray & Rogers Adv.
STILLMAN RUBBER CO. 92
Agency—Lynn-Western, Inc.
SURFACE COMBUSTION CORP. 62, 63
Agency—Odiorne Industrial Adv.
THOMPSON FIBER GLASS CO., H. I. 61
Agency—Abbott Kimball Co. of Calif.
TOWNSEND COMPANY 68, 69
Agency—Bond & Starr, Inc.
TRANS-SONIC, INC. 96
Agency—Hare Advertising
TWIGG INDUSTRIES, INC. 99
Agency—La Grange & Garrison, Inc.
U. S. STEEL CORP. (U. S. STEEL SUPPLY) 101
Agency—Batten, Barton, Durstine & Osborn, Inc.
U. S. STEEL CORP. 78
Agency—Batten, Barton, Durstine & Osborn, Inc.
VOI-SHAN MFG. CO., INC. 57
Agency—Anderson-McConnell Adv. Agency
WESTERN GEAR WORKS 102
Agency—Ruthrauff & Ryan, Inc.
WHITTAKER CO., LTD., WM. R. 37
Agency—Mogge-Privett, Inc.
WILCOX ELECTRIC CO. 93
Agency—Carter Adv. Agency, Inc.

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 115-117
Selling Opportunities Offered 116
Positions Wanted 116
Selling Opportunities Wanted 116
SPECIAL SERVICES
To the Industry 118
PLANES—EQUIPMENT
(Used or Surplus New)
For Sale 117-119

Where to Buy
PRODUCTS - SERVICES
ACCESSORIES

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Grumman, nearing its 25th Anniversary, needs engineers to work on its new experimental light-weight Naval fighter, plus other jet fighters, anti-sub planes, and amphibians. Grumman has openings for experienced aircraft engineers, and recent engineering graduates.

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Send resumés to Engineering Personnel Dept.
Interviews at Employment office.



GRUMMAN AIRCRAFT ENGINEERING CORPORATION
BETHPAGE • LONG ISLAND • NEW YORK

EDITORIAL

United's DC-7 Record

Breakfast time in New York and dinner in Honolulu, without jets!

United Air Lines airlifted a group of authors, press, radio and television people on the one-stop flight of 5,000 mi. on May 24—thanks to the new Wright-powered Douglas DC-7s. Four piston engines!

The time was 16 hours and 51 minutes, including a stop of almost an hour in San Francisco. This was a new commercial record between New York and Hawaii.

The five-hour difference in time between terminals helped, but even so, we left Idlewild well after dawn on this "dawn to dusk" hop, and we were on Honolulu Airport before dusk.

United devised this dramatic record-breaking flight to illustrate the speed and comfort of the Sevens, which it has put into transcontinental service this month. Sevens will operate to Hawaii beginning early next year, United's president, W. A. Patterson, said.

Aviation people who think a 17-hour flight is necessarily uncomfortable should bring themselves up to date and realize how rapidly this airliner development is moving.

Engine synchronization, vibration and insulation problems are being solved in steady fashion, although there was never a new plane yet without its teething difficulties, and we suspect there never will be. But if a 10,000-mi. trip with United Air Lines is any criterion, progress is marked. Those in charge of cabin comfort deserve praise. Pressurization appears to have reached a new peak in efficiency, removing much of the fatigue from the passenger's high-altitude flying.

This may be the jet era, but it is doubtful if any jet transport yet available could have equaled the Seven's record flight over this 5,000-mi. stretch—whether you consider elapsed time, economics or comfort. After a trip like this, you know very well why the jets aren't on U. S. airlines yet.

Hawaii Is Air Minded

Hawaii is something of a dream world even for aviation enthusiasts. It takes a visit to these islands to realize how the airplane has taken over from all other transportation media.

The two competing airlines, Hawaii and Trans-Pacific, have knocked out scheduled passenger boat service between the islands. A slow barge service remains for heavy freight.

When a native, or anyone else, goes from one island to another he flies. When he moves, his furniture is piled into a DC-3 freighter with little or no crating or packing. Airline spokesmen say the transportation of the furniture by air dosen't cost any more than the crating charges would be in this country. The truck delivery at each end of the journey is short, because of the small size of the islands.

Inter-island airlines in Hawaii have no competition from steamers, railroads, buses, nor motor cars!

And when one of the active volcances spouts it seems the islands' entire population wants to go on aerial sightseeing cruises around the spectacle. Every plane the airlines can spare is pressed into service, almost around the clock, for 30-minute circle tours. Plane utilization at those times is out of this world.

In these respects the islands meet their reputation as a paradise. But the airline operators have their problems. They feel the luxury tax on travel is unfair to the residents and the airlines, because air travel is vital; the car is useless. Competition between the two air transport lines is bitter, and there is strong opinion that adding a second company has cost the government money in subsidies. Because of their remote location, the lines have problems not encountered on the mainland. Some of the simplest problems of mainland airlines become tough nuts to crack on agricultural islands over 2,000 miles west of California, and many CAA and CAB regulations that are enforced don't make much sense out in Hawaiian operations.

Nevertheless, the airplane is king in Hawaii transport and we hope a bright young transportation student makes a study of this phenomenon for his advanced degree some day. The facts would add to air history.

Easier to Fly Than Kites!

We thought the era of the glib promoters of rosy-hued helicopter projects had run its course but the mails bring in new material.

Helicopters have a tremendous future. No other aviation publication has presented so much information on the development of the art, or has expressed so much confidence in their potentialities.

Perhaps because of this deep interest in the most versatile vehicle ever designed by man, we are struck by the dangers of the wrong kind of publicity. To misinform the public with inferences and promises that are beyond today's or even tomorrow's possibilities is unfair, to say the least. It is no service to aviation.

We have before us a press release with the headlines, "U. S. to Rise Above Traffic Problems; Family Helicopter Is Easier to Fly Than a Kite."

We read: "If your budget will stand the strain of a higher-priced car, you're in the—-market. If your coordination is good enough to drive a car, you can learn to handle the new two-seater skycraft in a few hours—or a couple of days, if you miss the stimulation of traffic. . . ."

This new model, we are told, will "make its bid to become the American family's second car before the last office-to-seashore hop is made this summer."

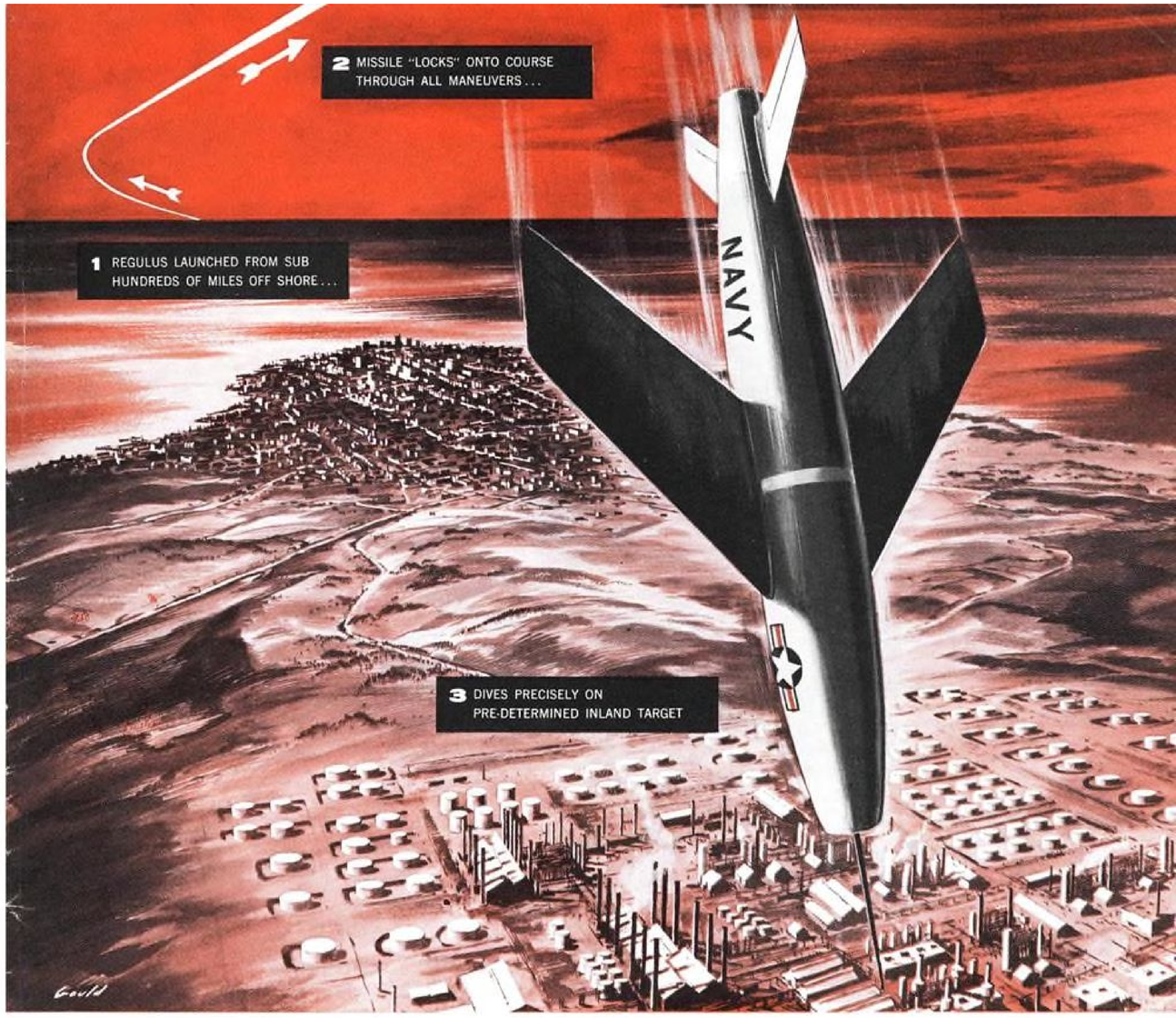
Furthermore, we are informed that the company is offering not only its product, but its profits to the public!

"So, anyone with a few dollars—which might be scheduled to chase the ponies or nest in a savings account—may get on the ground floor of this aviation production business . . . right now."

It is also interesting to note that the company is closely withholding any technical information about its proposed product.

Probably with good reason!

—Robert H. Wood



Sub-Launched Missile Gives Navy New Striking Power

CONTROL OF REGULUS HELD "UNCANNY"..."BIRDS" CAN BE RETRIEVED DURING TESTS

THE STORY BEHIND THE STORY:

■ When a guided missile launched from a submarine hundreds of miles off shore can be held to an accurate course at speeds approaching Mach 1, and precisely aimed at a specific inland target—that's news, *bad* news for a possible enemy. And, when costly models of the missile can be recovered and re-used time after time for evaluation and training, that's news, too—*good* news for American taxpayers.

■ On both counts, the Navy's Regulus, developed by Chance Vought Aircraft, Inc., is constantly in the headlines.

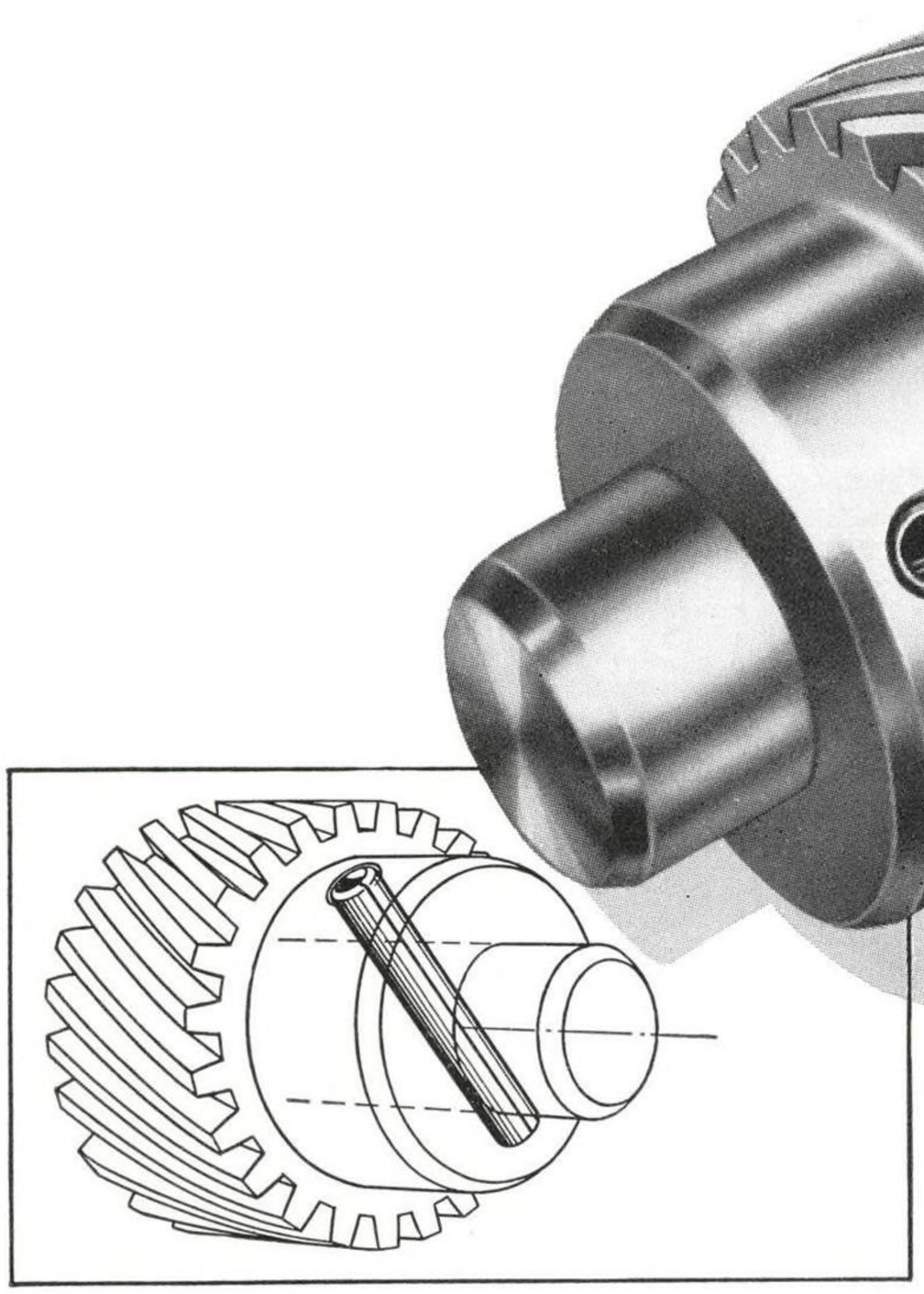
■ Providing the stability that holds Regulus on its course with a vise-like grip—and assuring recovery during tests—is a specially-designed Automatic Pilot, created by Sperry. Like its relative, the famous Sperry Gyropilot® Flight Control favored by the military and leading airlines, this electronic "brain" is sensitive to the slightest signal change in the flight path. Under its command, powerful servos or "muscles" of the control system make instant corrections—fly Regulus unfailingly through intricate maneuvers at all speeds and at all altitudes.

■ There's a mighty difference between the automatic controls created by Sperry for this newest guided missile of the Navy, and those provided by Sperry for the Navy's first guided missile back in World War I days. But they're alike in this respect: Both resulted from an unmatched combination of skillful engineering *plus* specialized experience in electronics and gyroscopics, and precision in production.

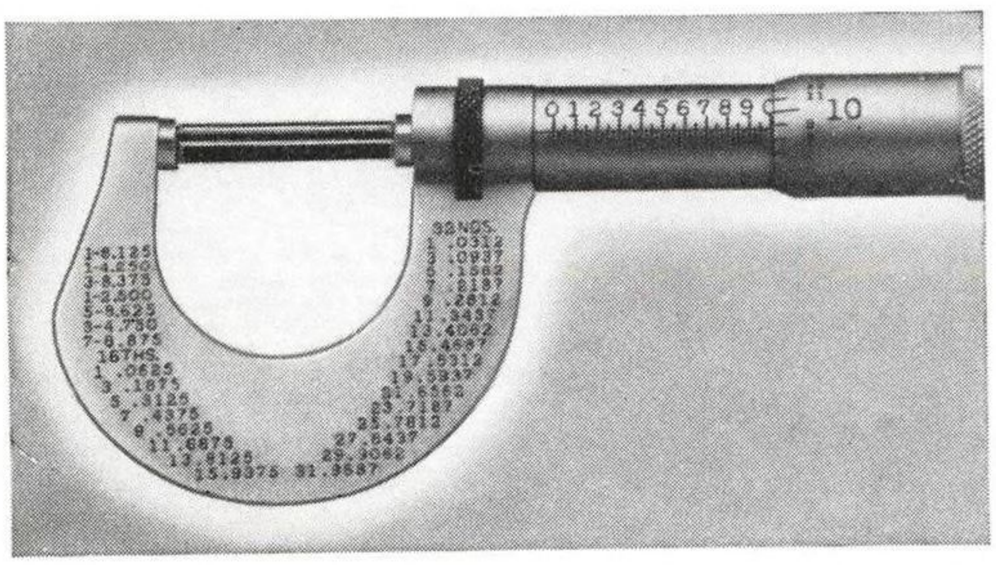
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SPERRY GYROSCOPE COMPANY

DIVISION OF THE SPERRY CORPORATION • GREAT NECK, N.Y.



To function effectively, a spring pin must drive easily into holes drilled to normal production tolerances, compressing as driven. To drive easily, hold firmly and fit flush, the pin —*every* pin—must meet the strict requirements of specifications such as those prepared by the SAE and the Military Services.



Since failure of a pin can be as costly as a failure of any other precision part, it is important to check the pins *you* buy for uniformity . . . uniformity of diameter and length, shear strength, hardness, insertion and removal forces, and recovery of diameter.



* consistent quality

is as important in the pin as in the gear

Rollpin has been tested many times—by many manufacturers—with a consistently high performance record. It has been widely recognized as the "quality" fastener of its type. In this case, quality can be—and should be—measured. We strongly urge that you test for quality when buying spring pins.

ELASTIC STOP NUT CORPORATION OF AMERICA

Dept. R28-625, Elastic Stop Nut Corporation of America
2330 Vauxhall Road, Union, New Jersey

Please send the following free fastening information:

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

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