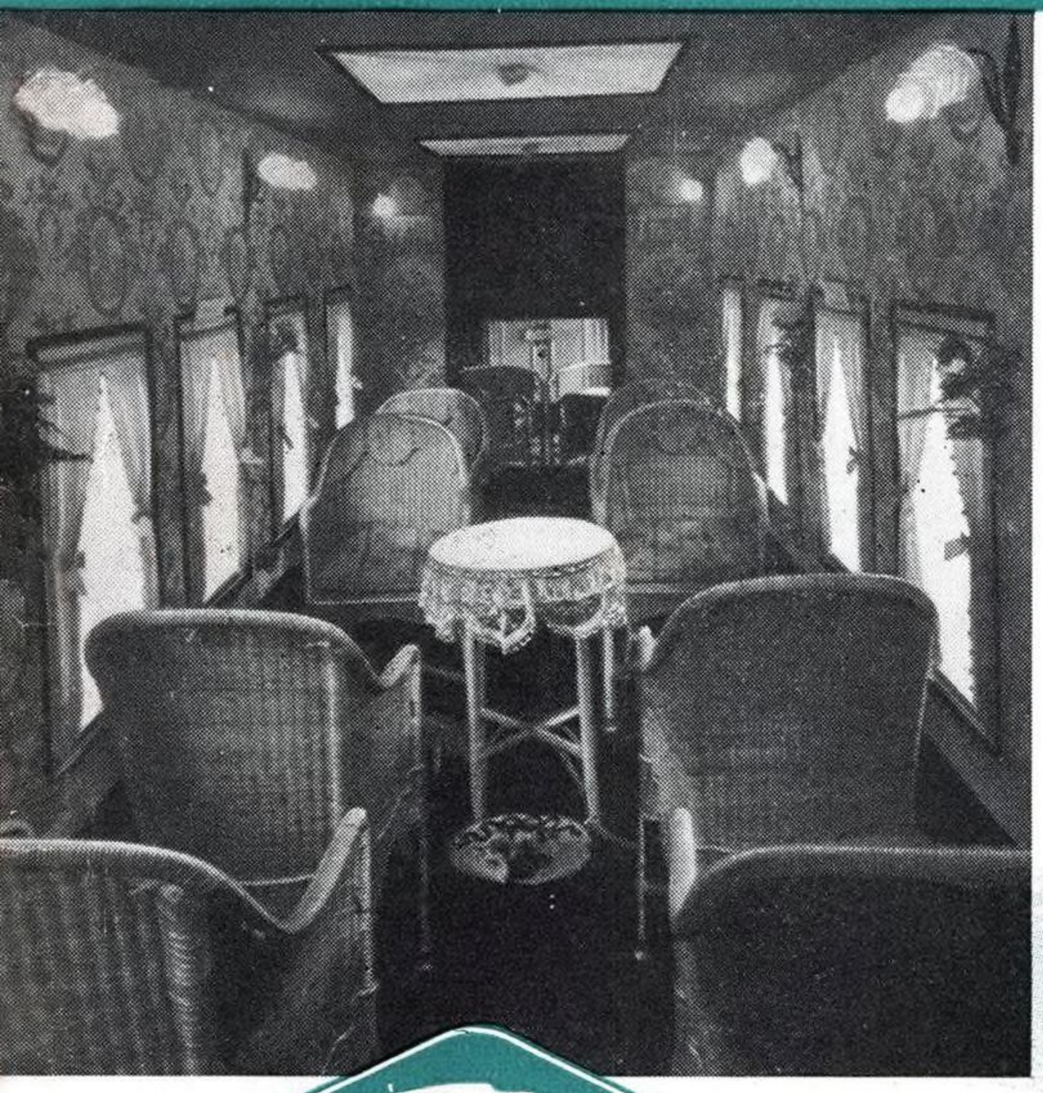
AVIATION WEEK

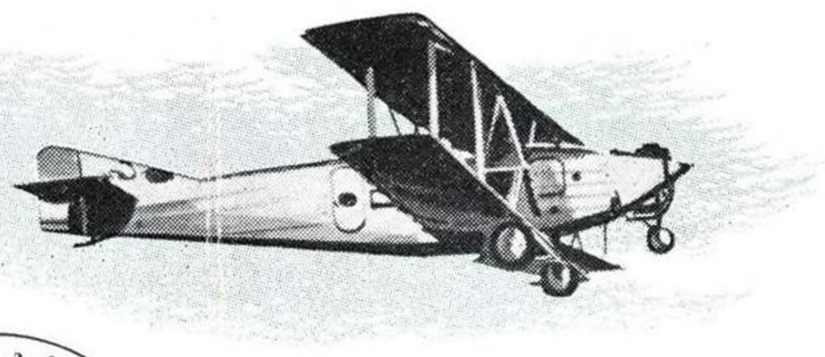
A McGRAW-HILL PUBLICATION

JAN. 5, 1953

50 CENTS



TIME WAS when this French Caudron airplane represented the height of luxury in air travel. Back in 1920, its wicker seats and flower vases were described as "regal appointments of largest passenger carrying aeroplane—the richest looking—in service. Thousands of dollars have been spent making the cabin the acme of aerial comfort."



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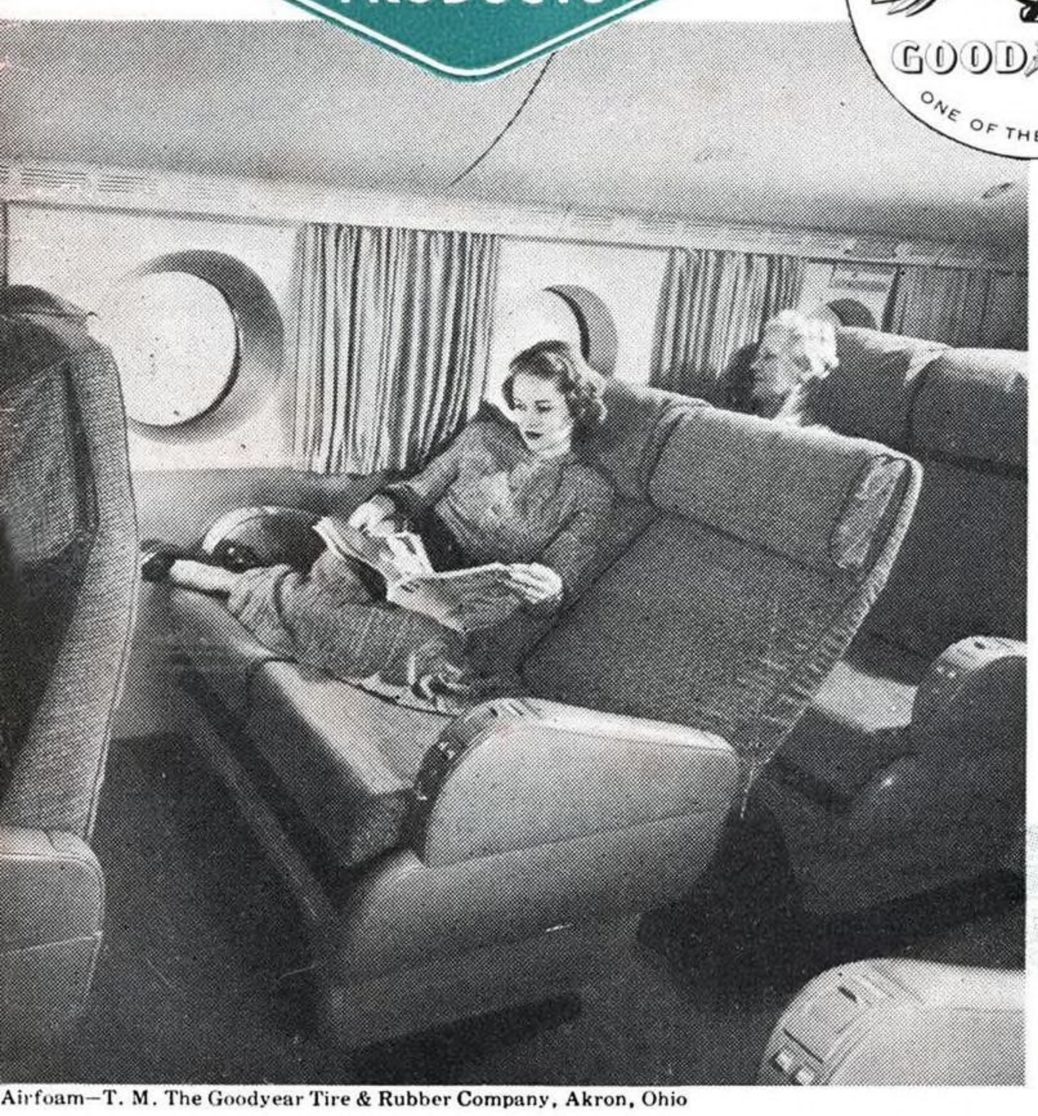

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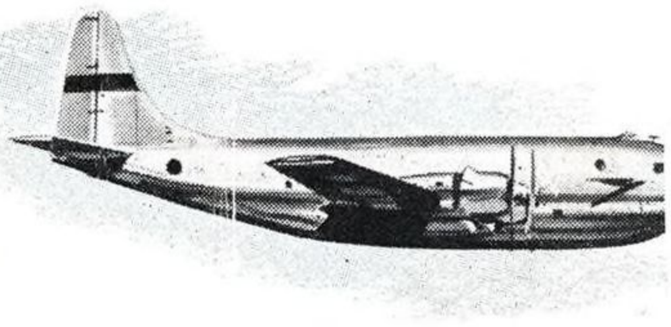

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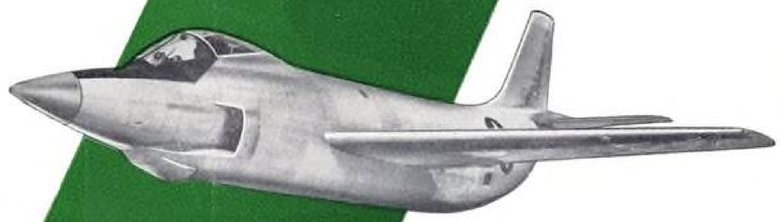

once more . . . "on the nose"

ZENITH in the McDonnell Demon

Rising swiftly from the decks of Navy carriers, McDonnell's new carrier-based jet fighter, the F3H-1 "Demon," is designed to wreak havoc on the enemy. Placed in its prow is another example of rugged ZENITH reinforced plastic construction—the type of product that has brought ZENITH to the forefront in both military and civil R. P.* production. For specific problems in this field, consult the Engineering Division of

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Aviation Week

ABP Member ABC

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NEWS DIGEST

Domestic

Indicating a switch in jet powerplant requirements, Navy has released to civilian production a new dual-purpose Westinghouse plant at Columbus, O., due for completion next summer. The plant previously was scheduled for jet engine component production, presumably for either the Westinghouse J40 or J48.

Roy T. Hurley, chairman and president of Curtiss-Wright Corp., says the Republic F-84F Thunderstreak is capable of flying 724 mi. from New York to Chicago in "approximately one hour." He says the Thunderstreak, powered by the Curtiss-Wright Sapphire turbojet engine, "outperforms any airplane in its class anywhere in the world and is vastly superior to the much-touted Russian MiG-15."

The Air Force has ordered a limited number of Temco Aircraft Corp.'s all-metal T-35 Buckaroo basic military trainer, equipped to carry two .30-cal. machine guns, gun camera, gunsight and ten 2.25-in. rockets. Temco says production of the two-place tandem trainers will get underway soon at the firm's Dallas, Tex., headquarters.

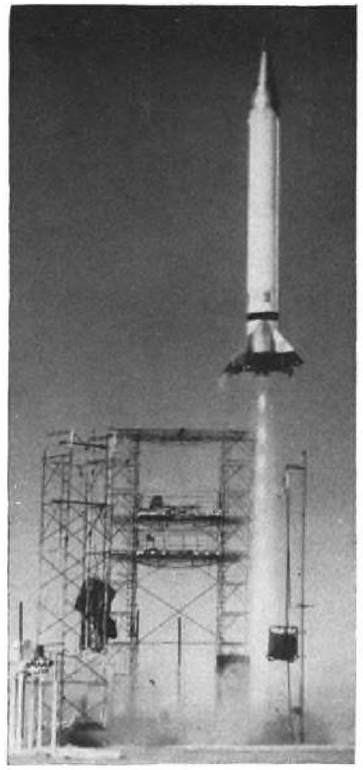
Convair's YB-60 eight-jet, long-range bomber is being put through a second phase of flight testing by a six-man Air Force crew at the CV's Fort Worth division. Maximum performance limits of the sweptwing bomber were set during eight months of flight tests conducted by a Convair crew.

Lockheed Aircraft Service, Inc., reports a record $38-million backlog in overhaul and modification of military and commercial planes, including airline orders for conversion of standard Constellation and DC-6 airliners to high-density domestic coach and international tourist transports.

Aircraft Industries Assn. says 324 U. S. civil aircraft valued at more than $2.5 million were shipped overseas during the first 11 months last year.

Aero Design and Engineering Co. will finish and flight test this month at Oklahoma City the fiftieth Aero Commander produced since the first twin-engine executive transport was approved by Civil Aeronautics Administration a year ago.

Henry I. Mahikoa, assistant vice president in charge of traffic for TPA Aloha Airline, died last month in Honolulu of a heart ailment. The 37-year-old executive was one of TPA's first employes after the airline began operating in 1947.



MARTIN VIKING 9 Navy research rocket blasts off at White Sands Proving Ground, N. M., Dec. 15 on the way to equal the previous single-stage rocket altitude mark of 135.6 mi. Note the clarity of the "shock diamonds" in the jet exhaust. Viking 9 is six-feet shorter than previous Vikings, has slightly greater diameter and smaller, triangular fins. Powerplant is a 20,000-lb.-thrust Reaction Motors unit.

Lockheed Aircraft Corp. recently signed a new contract with the International Association of Machinists (AFL) at the Marietta, Ga., plant that the company estimates will increase total salaries in its Georgia division by $1 million a year. The labor contract, covering approximately 8,000 employes, granted a blanket wage boost of 9 cents an hour, increased vacations from one to two weeks, and shifted group insurance costs to Lockheed.

Beech Aircraft recently contracted with the Mutual Defense Assistance Program to begin shipping twin-engine Model 18 aircraft next March to France and The Netherlands for use as trainers and staff transports in NATO forces.

Maj. Rudolph W. (Shorty) Schroeder, 66, died Dec. 29. He learned to fly in 1910 and during his career set up several U. S. and world altitude records. Schroeder pioneered in high-altitude flight research for the Army Air Service. Later he became vice president-safety for United Air Lines and held this post until illness, believed contracted from his early high-altitude work, forced him to retire.

Financial

Ryan Aeronautical Co. reports an all-time high net income of $878,359 was reached last year, according to preliminary financial statements. The company says its net was more than twice that of 1951, with a sales volume of more than $35 million and a current backlog of orders estimated at $70 million.

Pacific Airmotive Corp. sales reached a total of $27.5 million during the 1952 fiscal year, the highest in the company's 25-year history. Unaudited figures reported by Pacific show a sales increase of 14.88% over 1951 and a 100% rise over 1950.

Rohr Aircraft Corp. reports a net profit of $1,151,810 for 1952, a gain of $183,703 over 1951.

International

A. V. Roe Canada's CF-100 twin-jet fighter broke through the sonic barrier during 15 test dives from 30,000 ft. last month at Malton, Ont. The all-weather fighter, powered by two Orenda turbojets, was flown by former RAF Squadron Leader Jan Zurakowski.

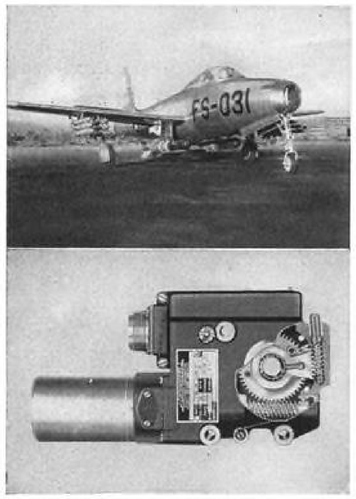
International Civil Aviation Organization says ICAO member airlines carried 45 million passengers in scheduled domestic and overseas flights last year, an increase of 13% over the less than 40 million passengers of 1951.

The Netherlands and Japan recently signed a provisional reciprocal civil aviation agreement.

Rolls-Royce Avon jet engine will be manufactured in Sweden, according to a manufacturing license granted the firm by the Royal Swedish Air Board.

Fairey Gannet turboprop anti-submarine aircraft has been ordered for the Royal Australian Navy.

Jato Release on Republic's F-84 AIRBORNE Actuated



The R-424 actuator (R-450 type) jettisons six Jato bottles after take off. The R-424 winds cables on a drum and pulls the pins.

This cutaway of Airborne's Model R-450 actuator shows the externally adjustable positive stops which, in conjunction with torque-limiting switches, provide accurate positioning at both extremes of travel. The limit may be at any value to 270°.

Projection of the splined output shaft, on both sides of the actuator, helps adapt the model R-450 to any application. The weight of this unit, with radio noise filter, is 2.7 pounds—the speed, at 26 volts and 250 pound-inch load, is 5 rpm.

See our insert in the I.A.S. Aeronautical Engineering Catalog for details on this and other Airborne actuators.

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AVIATION CALENDAR

Jan. 8-9—Symposium on Industrial Application of Automatic Computing Equipment, sponsored by Midwest Research Institute, Hotel President, Kansas City, Mo.
Jan. 12-16—Annual meeting and engineering display of Society of Automotive Engineers, Sheraton-Cadillac Hotel, Detroit.
Jan. 13-30—Fifth Institute of Industrial Transportation and Traffic Management, American University, Washington, D. C.
Jan. 14-16—AIEE-IRE-NBS Conference on High Frequency Measurements, Statler Hotel, Washington, D. C.
Jan. 15-16—Fifth Illinois Custom Spray Operators Training School, University of Illinois, Urbana, Ill.
Jan. 19-23—Plant Maintenance Conference, Public Auditorium, Cleveland, O.
Jan. 19-23—Winter general meeting of the American Institute of Electrical Engineers, Hotel Statler, New York, N. Y.
Jan. 26-29—21st Annual Meeting of Institute of Aeronautical Sciences, Hotel Astor, N. Y. Honors Night dinner Jan. 26.
Feb. 12-13—National Aviation Education Council annual meeting, Atlantic City, N. J.
Feb. 18—New York Section of the Instrument Society of America, Hotel Statler, New York, N. Y.
Feb. 18-19—Eighth Annual conference of the Society of the Plastics Industry, Reinforced Plastics division, Shoreham Hotel, Washington, D. C.
Mar. 10-11—Eleventh Annual Conference, Society of the Plastics Industry Canada, Inc., General Brock Hotel, Niagara Falls, Canada.
Mar. 25-27—National Production Forum of the SAE, Hotel Statler, Cleveland, O.
Mar. 31-Apr. 2—First International Magnesium Exposition, National Guard Armory, Washington, D. C.
Apr. 4-12—Second Annual International Motor Sports Shows, Grand Central Palace, New York, N. Y.
Apr. 20-23—Aeronautic Production Forum, National Aeronautic Meeting and Aircraft Engineering Display (SAE), Hotel Governor Clinton and Hotel Statler, New York, N. Y.
May 11-13—IRE National Conference on Airborne Electronics, Dayton Biltmore Hotel, Dayton, O.
May 18-22—Fifth National Materials Handling Exposition, Convention Hall, Philadelphia.
June 9-11—Second International Aviation Trade Show, Hotel Statler, New York, N. Y.
Sept. 7-13—1953 SBAC Coronation Year Flying Display, Farnborough, Hampshire.
Sept. 14-17—Fourth Anglo-American Aeronautical Conference, London.
Oct. 10—International Air Race, England to Christchurch, N. Z., entry deadline Jan. 31.

PICTURE CREDITS

7—Glenn L. Martin Co.; 9—USN; 13—Wide World; 14—Lockheed Aircraft Co.; 15—Nardi; 16—(top, center) Beech Aircraft Co.; 20—(top right)—Aluminum Co. of America; 41;—McGraw-Hill World News; 56—Bell Aircraft Corp.; 94—INP.

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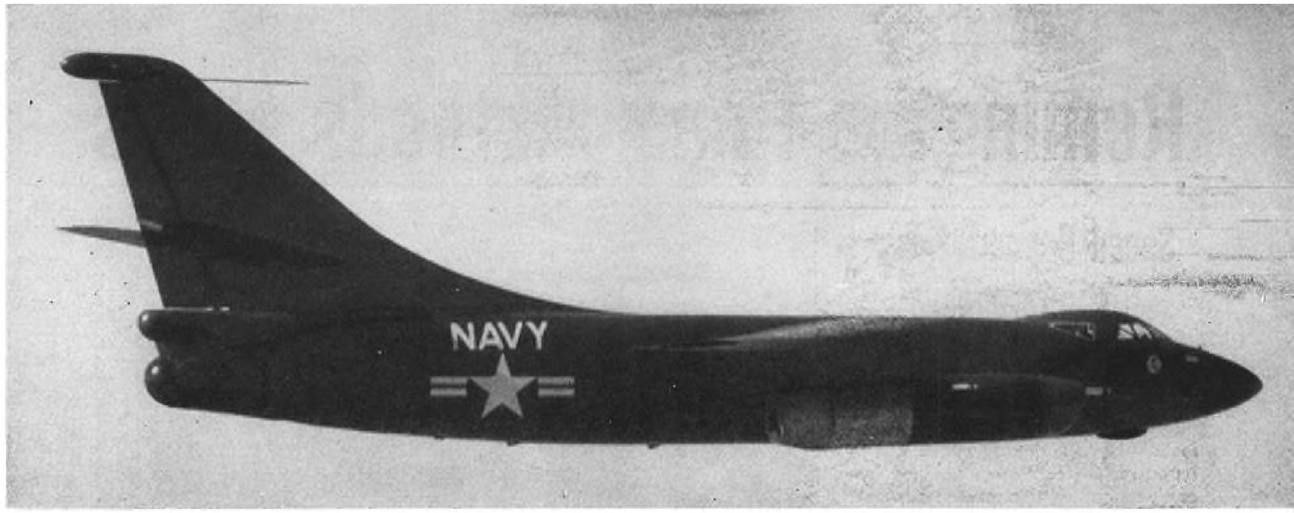

NAVY XA3D-1 PROFILE—The lean fuselage and large vertical tail of Navy's latest carrier-based jet bomber are highlighted in side view of the big 70,000-lb. plane. These new exclusive photos were taken as the craft underwent tests near Edwards AFB., Calif.

Douglas Jet Bomber Tries Its Wings

FRONT VIEW—XA3D-1 has four-wheel landing gear, including tailwheel to prevent fuselage scraping in high-angle landings and take-offs. Its two Westinghouse J40 jets are slung under the wings in pods. Main wheels retract into fuselage side behind large, long bomb-bay.

REAR VIEW—Douglas bomber has new-type cockpit canopy for resisting heat and stresses of high-speed flight, wing slats to improve flight characteristics at low speeds. Navy has ordered two XA3D-1 prototypes and 12 production versions to cost some $3,350,000 each.

WHO'S WHERE

In the Front Office

Edward Lund has been named president of the Babb Co., Newark, N. J. wholly owned subsidiary of the Atlas Corp. Lund joined Babb in 1937.

C. W. LaPierre, general manager of Aviation Gas Turbine division, General Electric Co., has been designated a vice president of GE. He will continue his responsibilities at the Evendale, Ohio, jet engine plant.

Wilbur Morrison has been appointed an executive vice president of Pan American World Airways to supervise operations throughout Latin America from PAA's U. S. gateways.

C. J. Jump has been designated vice president-administration and finance for Railway Express Agency. He has been active in directing the REA's Air Express division.

Peter J. Byrne has been promoted to assistant vice president of Emery Air Freight Corp., freight forwarders. He will continue his headquarters in Chicago.

IAS Elections

Charles J. McCarthy, vice president of United Aircraft Corp., has been elected president of the Institute of the Aeronautical Sciences for 1953. Named vice presidents: **George W. Brady,** engineering director, Propeller division, Curtiss-Wright Corp.; **Clarence L. (Kelly) Johnson,** chief engineer, Lockheed Aircraft Corp.; **James S. McDonnell, Jr.,** president, McDonnell Aircraft Corp.; and **Ernest G. Stout,** staff engineer, Convair. IAS treasurer for 1953 is **Preston R. Bassett,** president Sperry Gyroscope Co., Sperry Corp.

Changes

Rollin M. Russell has been designated executive engineer in charge of Pacific Coast operations for Continental Aviation & Engineering Corp., Detroit, Mich.

Frederick R. Brewster, formerly with Pratt & Whitney Aircraft division, United Aircraft Corp., has joined Sabena Belgian Airlines to handle advertising and press relations.

Egan D. Foy has joined Chance Vought aircraft as assistant project engineer.

Tom Hall Miller has joined North American Airlines as public relations representative in Washington, D. C., with offices in the National Press Building.

C. E. Lehman has been named to head newly organized Lighter-Than-Air Production division of Goodyear Aircraft Corp., Akron, Ohio. Other new Goodyear appointments: **W. D. Burns,** manager of Parts Manufacturing division; **Albert Goulding,** manager of Airframes division; **R. B. Willett,** manager of Special Products division, and **C. H. Zimmerman,** manager of the Wheels, Brakes and Rockets division.

Harold Raynor has been designated administrative director for the Missile and Control Equipment Departments at North American Aviation's Downey, Calif., plant.

INDUSTRY OBSERVER

► Pentagon officials deny it, but the rumors persist that Lockheed will modify a Super Constellation as a special "plush" personal transport for President-elect Eisenhower to replace President Truman's DC-6 "Independence." USAF has a number of Super Connies on order as early-warning radar pickets. "Ike" used Constellations as personal transports during his regime at SHAPE in Europe and also did the flying portion of his Korean trip in a Lockheed transport.

► **No decision has been reached yet, but a proposal is circulating around USAF headquarters to eliminate all but a small part of the Boeing B-52 production program. Feeling in some USAF quarters is that the difference between B-47 and B-52 performance is not worth the cost of the latter program. Strategic Air Command also anticipates getting supersonic bombers soon enough to make the B-52 strictly a short interim measure.**

► USAF expects to increase its contracts with private industry for maintenance modernization and overhaul by 50% during 1953. USAF now farms out about 40% of this work to private firms and plans to increase it to 60% next year and possibly higher in the future as the full load of maintaining a 143-wing force is felt (AVIATION WEEK Dec. 15, p. 13).

► **Navy's Bureau of Aeronautics credits the use of non-inflammable hydraulic fluid with saving more than $15 million in new prototype aircraft. Both the McDonnell XF3H and the North American XA2J experienced hydraulic failure that resulted in hydraulic fluid spraying onto hot areas with no fire resulting during test flights.**

► Allison division of General Motors Corp. reports that its J33 centrifugal-flow turbojet has been authorized by USAF to go 1,200 hr. between major overhauls at bases where minor repair facilities are available. USAF also has the Allison J35 axial-flow turbojet up to 800 hr. authorized between overhauls. Allison already has begun overhaul work on J35s under a USAF maintenance contract (AVIATION WEEK Dec. 15, p. 13).

► **There still is enthusiasm for the super-giant 75,000-ton forging press and the 25,000-ton extrusion press, but actual decision on construction has been deferred although engineering work has been completed. Some industry opinion believes that, despite the huge cost, these presses soon would pay for themselves in operation.**

► Preliminary analysis of 4,000 airborne checks on omnirange accuracy made in a nationwide Air Transport Assn. survey showed that the combined airborne and ground equipment errors were less than 3½ degrees in 95% of the stations checked. TWA, United, Delta, American and Capital pilots co-operated in the ATA survey.

► **Principal advantage of Monsanto's new entry (OS-40) in the non-inflammable hydraulic fluid market (Aviation Week Dec. 22, p. 57) is expected to be its performance at the extremely low temperatures encountered during high-altitude flight. The latest version of Monsanto-Douglas Skydrol is designed to function down to temperatures of −65F.**

► Goodyear Aircraft Corp. plants at Akron, Ohio, and Litchfield Park, Ariz., will make major components for the Beech twin-engine T-36A trainer. The Arizona plant will manufacture the complete canopy assembly, the cabin section of the fuselage and the tail cone. The Akron plant will build trailing edges for wings and flaps, landing gear doors and access doors and panels for engine nacelles.

► **An expert on Redux metal bonding, Dr. N. A. de Bruyne, manager and technical director of Aero Research, Ltd., Duxford, England, will visit U. S. major airframe companies, technical societies and colleges on an 8- to 10-week lecture tour during the first three months this year. He will speak on application of Redux and development of aircraft with rivetless structures. The tour is sponsored by British Ministry of Supply, with USAF and Navy approval.**

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JANUARY 5, 1953

New Safety, Traffic Marks

U. S. domestic and international scheduled airlines set new marks in safety and traffic in 1952, according to Dr. Lewis C. Sorrell, director of research, Air Transport Assn.

Last year the air transport industry flew more than 27 million passengers, up 9.7% compared with 1951; more than 16.6 billion revenue passenger-miles, a gain of 17.3% over last year, and accomplished this with only five fatal accidents compared with 10 a year ago. Passenger fatality rate was only 0.9 per million domestic and international passenger-miles, compared with 1.3 the previous year. Domestic fatalities were less than 0.4 per 100 million passenger-miles as against 1.3 in 1951.

Cargo and mail also showed new gains: up 2.1% to 400 million ton-miles for 1952 for cargo and a 7% increase to more than 97 million ton-miles for mail. Total revenue ton-miles were 1,886,000,000, up 14.3%. Operating revenues climbed 13.8% to more than $1.2 billion (AVIATION WEEK Dec. 29, p. 50).

Passenger traffic in 1952 accounted for 77% of the ton-miles of service handled and brought in 79% of the revenues. Passenger gain increment was much higher than that for mail and freight.

Sorrell believes that if business activity continues at the present pace, carriers will experience a further 10%-15% growth in 1953.

Airlines Set Safety Record

- **Only .38 fatalities per 100 million passenger-miles on domestic routes last year, CAB summary says.**
- **Low-fare coach service is almost doubled in 1952; government cut airmail subsidies $16 million.**

Three "dynamic" airline developments were reported in a year-end Civil Aeronautics Board summary as the most important aviation trends of 1952:

- **All-time safety record of the domestic lines**—0.38 fatalities per 100 million passenger-miles.
- **Almost doubling low-fare coach service** within one year.
- **$16-million subsidy cut** in mail rates through downward adjustment for both domestic and international lines.

Total airline passenger traffic gained 17% over 1951 to 15½ billion revenue passenger-miles. Load factor dropped one point, from 66% to 65% of available seat-miles flown. Overall cargo volume gained 9%. Nonscheduled airline business is estimated at 1.3 billion passenger-miles—about 8½% of total scheduled airline volume.

The sharp increase in scheduled coach travel, which is mostly longhaul, resulted in a 7% gain in average passenger trip distance—to 572 mi.

▶ **Coach Progress**—CAB statistics show the scheduled airlines' coach business increased from 15% of total passenger volume in 1951 to 25% in 1952. Domestic passenger-miles gained 89% in the one year to 2.4 billion, while first-class traffic increased only 8%. International coach increased 67% to 672 million passenger-miles while first-class gained only 7%.

▶ **Safety Record**—The CAB year-end summary, prepared before Christmas, assumes approximate traffic estimates for the full year and assumes no fatal airline crashes the last week of the year. The all-time domestic safety record of 0.38 fatalities per 100 million miles for scheduled airlines compares with 1.3 in 1951 and 1.1 in 1950, the previous record year. The international safety record is not so good: 3.1 fatalities per 100 million passenger-miles in 1952—highest since 1946. The poor showing results from three major crashes last winter and spring—a Northwest-operated DC-4 on the Pacific airlift, a Pan American DC-4 off Puerto Rico, and a Pan American Stratocruiser in Brazil.

The nonscheduled airlines had only one fatal crash during 1952 and therefore had a record year for safety, 2.0 fatalities per 100 million passenger-miles—considerably better than the 7.2 the previous year and also better than the international record of the scheduled airlines for the year.

Non-airline flying safety approximated that of 1951, when 3,824 accidents were recorded. This is a marked improvement over 1947's poor record of 9,253 accidents.

▶ **Mail Subsidy Rate Down**—Unit cost to the government for mail pay was reduced about 14% from the 1951 average to $1.12 per ton-mile, CAB estimates. CAB adjusted many airlines' rates downward during 1952. The reductions saved an aggregate of about $16 million over what the pay would have been had 1951 subsidy rates prevailed.

Of the $128 million slated for mail pay to airlines in fiscal 1953, $70 million, or more than half is subsidy, according to the Board's administrative separation of subsidy from compensatory mail pay.

Plane Production Tops 1,000 Monthly

The rapidly expanded aviation industry last year set new production records that culminated in military planes coming off the lines at the rate of 1,000-1,100 monthly at the end of 1952, Adm. DeWitt C. Ramsey, president of the Aircraft Industries Assn., reports.

Although the large share of plane output (estimated at about 95%) went to defense, commercial transports at year's end were coming off the lines at the second highest rate in history, with approximately 400 units being delivered during 1952. Of these, some 240 were twin-engine executive craft and 160 were 36-passenger or larger types.

Smaller aircraft, of the utility type, showed production increases of approximately 33% last year over 1951 to an estimated 3,200 units.

▶ **Total Employment**—A good measure of the industry's growth can be found in employment gains—last year personnel directly connected with aviation production had increased to approximately 750,000, a three-fold gain since June 1950. Including personnel of major suppliers and subcontractors there were more than a million persons working on aircraft production in 1952.

Sales figures for last year showed large gains, more than 50% over 1951 totals. It is estimated that the 15 largest aviation firms' 1952 total sales volume will exceed $4.3 billion as compared with the previous year's $2.6 billion. Profits for the past year are expected to reach $95 million, but the profits to sales ratio of 2.2% will be considerably down from 1951's 6.2% average for all manufacturing industries.

The helicopter industry, which reportedly set new production marks almost every month last year, had a dollar backlog production of well over $500 million.

▶ **1953 Prospects**—The new year will see continued acceleration by the industry, with production, measured by airframe weight, increasing into the third quarter of 1953, although military output will level off at about December 1952's 1,000-1,100 planes monthly, Ramsey reported. Trainers, liaison planes and other small types will be cut down and heavier combat aircraft stepped up.

Thus the forecast for 1953 will give the 15 largest aviation firms an estimated $5.5 billion in sales, up $1.2 billion from last year. Transport output is expected to be approximately the same as last year, but utility plane production is expected to increase again to reach the highest level since 1948.

Although it is anticipated that the 1954 fiscal year budget will show some cuts for aircraft and related procurement, it is not expected that these reductions will have an appreciable effect on the industry next year since they will not be translated into completed aircraft until 1955 or 1956.

New SAS Service

(McGraw-Hill World News)

Johannesburg—Scandanavian Airline System is starting direct, 36-hr. service between Stockholm and Johannesburg Jan. 8. Its African terminal will be the new Jan Smuts Airport, opening next year. SAS planes will make stops at Copenhagen, Hamburg, Zurich, Rome, Athens, Khartoum and Nairobi.

Explosive Seats

- **Stratojet now being fitted with escape devices.**
- **AF denies charge first B-47s were death traps.**

Boeing B-47 Stratojet bombers now coming off the production line at Wichita are fitted with explosive ejector seats for the crew, and a "retrofit" is being made on an undisclosed number of earlier bombers not so equipped, AVIATION WEEK learned last week.

Meanwhile, an Air Force spokesman denied New York Herald Tribune reports calling the earlier B-47s without ejector seats "death traps," and stated that escape through the hatch at the bottom of the three-man cockpit has been demonstrated practical as long as the airplane is under control. "Under control," he said, means if the airplane can be slowed down for the bailout. He would not comment on a press statement that the hatch was "suicidal" unless the wheels were retracted and the bomb-bay doors closed.

▶ **It Means Less Fuel**—Earlier B-47s were ordered by the Air Force without the ejection seats because of the weight problem, although provision for them was in the original Boeing plans, AVIATION WEEK learned. It is understood that the explosive seat arrangement adds approximately 200 lb. to the weight of the plane for each seat. With a crew of three this means 600 lb. additional, or less fuel capacity for the six fuel-hungry jet engines of the bomber—when USAF is trying desperately to stretch the B-47 range as far as possible.

Additional fuel storage on later B-47s and improved fuel consumption and power of later engines, plus the development of aerial refueling to a more exact operation, has made it now more feasible to add the extra weight of the ejection seats while still achieving the range necessary for the bomber.

The Air Force spokesman said that the earlier B-47s without ejection seats can be operated under safety precautions as training planes, that Strategic Air Command expects to continue to use them, at least until sufficient new ejection seat models become available.

He said that a search of available records of B-47 crashes did not indicate any case in which the explosive ejection seats would have saved the crew.

AF Chief Says Reds Ahead in Air Buildup

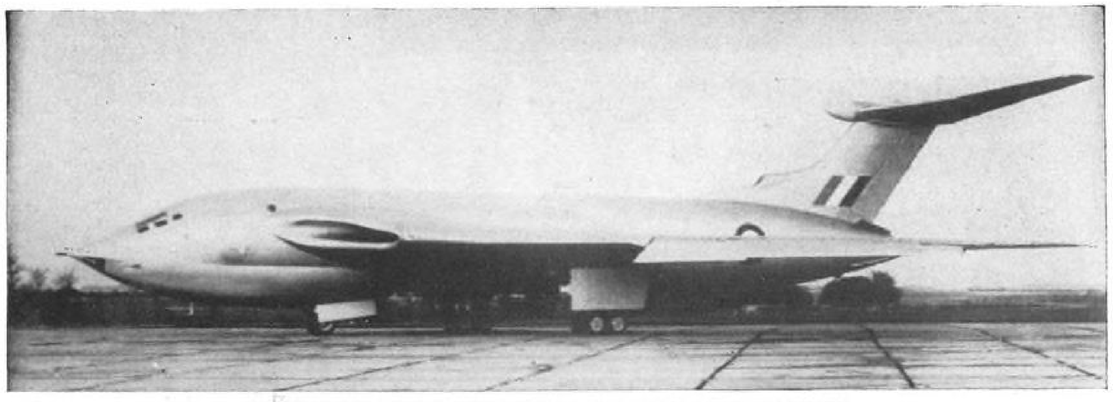
Gen. Hoyt S. Vandenberg, Air Force Chief of Staff, says Communist Russia is capable of launching a military air armada at least five times as large as the United States.

America has produced only half of the 143-wing Air Force started two-and-a-half years ago, Vandenberg says, and more than 50% of the aircraft still used by the U.S. Air Force is obsolete.

Vandenberg warns that the Soviet Union is far ahead in the race for air power, despite an estimated 15,000 military planes delivered by U. S. aviation industries to the armed forces.

He says Russia got the jump on the U. S. by building up Communist air power immediately after World War II while America "depended for security upon its short-lived atomic monopoly."

"During these years, while America took a holiday, the Soviets continued



NEW HANDLEY PAGE CRESCENT-WING JET BOMBER

Handley Page H.P. 80 crescent-wing bomber designed for the RAF displays its unusual configuration prior to first flight Dec. 27. The H.P. 80 is powered by four Sapphire jet engines buried in the wings with intakes in the leading edges. Among the noticeable features are an unusual T-tail and multiple-wheel landing gear. Crew compartment is of escape capsule design. The RAF has ordered the H.P. 80 "in quantity" for Bomber Command. The maker states that "no other bomber flies as fast, as far and as high with as great a bomb load." No details as to dimensions or performance have been released.

military spending at a rate which was 55% that of their wartime peak," the Air Force chief says. "They raced forward in developing advanced military aircraft, expanding plane production facilities and turning out the thousands of modern jets which now equip the Red air force.

"We continued to maintain an insufficient force at a cut-rate price. Equally dangerous, we were unable to press forward at a rapid-enough pace with research and development on new products.

"Even today, the Russians are equaling our output or perhaps bettering it."

Vandenberg says the U. S. is entering a new period of international crisis now that Russia holds the atom bomb, a threat that must be countered by meeting in full the American air power goals.

"We must meet our air power goals . . . to counter the threat against our national security and peace of the world," the AF Chief of Staff says.

Nonsked Probe

- **Three more dismissals asked by CAB examiners.**
- **Carriers refuse to give individual exhibits.**

Civil Aeronautics Board's investigation of how to regulate nonscheduled airlines moves back from Miami to Washington next week, with hearings planned for 21 nonskeds. Also on the agenda is conclusion of some scheduled airline testimony started last fall before the hearings moved from Washington to Miami.

Surprise development at the close of Miami hearings for holiday recess was the CAB examiners' recommendation that three more nonskeds' applications for certificates or exemptions be dismissed for failure to furnish individual written exhibits despite repeated examiner directives to do so.

Recommended for dismissal were applications by Argonaut, Continental Charters, and Miami Airlines. Similar action on a Peninsular application is expected as soon as the hearings reconvene next week. A fifth nonsked, Aero Finance Corp., also was recommended for dismissal at the start of the Miami hearings for failure of a witness to answer questions about stock ownership. All five—Aero, Argonaut, Continental, Miami, and Peninsular—are believed by some observers to be linked through contract arrangements or common financing.

CAB members have not yet acted upon the examiners' recommendation for dismissal of the applications.

Testimony in the nonsked hearings that started last September now has reached 9,800 words and the case has only begun. After Washington, it moves to Los Angeles, then Seattle.

▶ **Miami Hearing Results**—Highlights of nonsked testimony at the examiner hearings in Miami:

• **Aero Finance Corp.** was told to submit by Jan. 8 final briefs to the CAB on the recommendation for dismissal of its application.

• **All-American Airways** testimony during cross-examination by CAB counsel brought out certain connections between the Miami nonsked's management and R. Paul Weesner while he was vice president of Resort Airlines. Former AAA president Robert Smity, who was killed during a ferry flight delivering Weesner's own C-46, and William Boyd, new AAA head, were long-time Weesner associates. Cross-examination attempted to discover whether Boyd and his wife are actual or only professed holders of controlling interest in All-American. Weesner has resigned from the Resort Airlines management.

• **American Air Export and Import Co.** Testimony brought out no unusual events or recommendations. Aaxico, a maintenance and parts sales company, also carries out commercial and military transport charters. The company has an individual exemption granted by CAB for such irregular air service.

• **American Air Transport** president, J. H. Patterson, proposed that CAB allow limited route-type operation by qualified nonskeds. He said 15 trips a month between CAB-designated pairs of cities would be a fair yardstick. CAB revoked AAT's Letter of Registration this winter for flying more than was permitted by restrictions on nonskeds.

• **Conner Airlines,** holding an individual exemption from CAB, indicated it would remain a charter operator.

• **Argonaut, Continental, and Miami** presented joint exhibits. They were recommended for dismissal by the examiner for not filing the individual exhibits as requested. Peninsular is similarly cited, and also may be recommended for dismissal. The joint exhibits were prepared by Harold Wein, former Washington consultant and also an assistant to the president of Slick Airways.

Official observers were stumped as to why the carriers refused to submit the requested individual exhibits. Counsel for the carriers, Ben Ivan Melincoff, said there were good reasons. But he did not specify them to the satisfaction of the examiners.

Aero Finance Corp. was linked to this group when Aero testified that it might submit an "agreement" with Peninsular and others at a later date.

FIRST LOCKHEED-BUILT B-47 FLIES

The first Boeing-designed B-47 six-jet bomber built by Lockheed Aircraft Corp., Marietta, Ga., is seen (top photo) shortly after takeoff from adjacent Dobbins AFB, Dec. 16, approximately two months ahead of schedule. Lower photo shows Lockheed's B-47 production line which now is almost completely tooled up for output of the 600-mph. medium bombers for USAF. Employment at Marietta is approximately 10,500. Lockheed received the initial B-47 contract in April 1951.

Locked Controls Blamed in Crash

Locked elevator and rudder controls caused the crash of a Douglas C-124 transport at Larson AFB, Wash., Dec. 20, an Air Force investigating board found last week.

The board, headed by Maj. Gen. Victor E. Bertrandias, deputy inspector general, said investigation showed that elevator and rudder control surfaces were in locked position prior to the impact.

USAF headquarters took two actions as a result of the finding:

• All commands operating C-124-type aircraft received orders emphasizing necessity for strict compliance with the existing requirement that control surfaces be moved and checked visually before takeoff.

• Air Research and Development Command received a directive for development of a method to prevent the throttle from being unlocked while control surfaces are locked.

The board pointed out that one mechanical control handle locks four separate controls of the C-124—throttles, elevators, ailerons and rudders—when the plane is parked on the ground. Moving this handle through its complete travel locks or unlocks all these.

▶ **Throttle Unlocked**—Investigation of the crash indicated that the control handle was moved partly but not completely through its full travel before takeoff. Result was that the throttle was unlocked, permitting full takeoff power to be applied while the elevator and rudder locks continued effective.

Three other generals participated in the investigating board, assisted by two Douglas Aircraft engineers and a Douglas test pilot.

USAF headquarters said that almost 200 of the C-124 transports are in operation and have flown more than 25 million miles. They have piled up a record of more than 30,000 takeoffs. In only one of these takeoffs, that at Larson AFB, has the locked control caused an accident.

USAF also reported that the work of the Office of Flight Safety Research and efforts of all USAF commands to concentrate on flying safety in the last two years has resulted in continued reductions in accident rates, and the year 1952 is expected to be the lowest yet.

Piper Output Upped To Meet Orders

To meet an unprecedented number of orders for civilian Tri-Pacers and Super Cubs, Piper Aircraft Corp., Lock Haven, Pa., has stepped up its production rate to eight planes a day and beginning Mar. 1 will go to 10 daily.

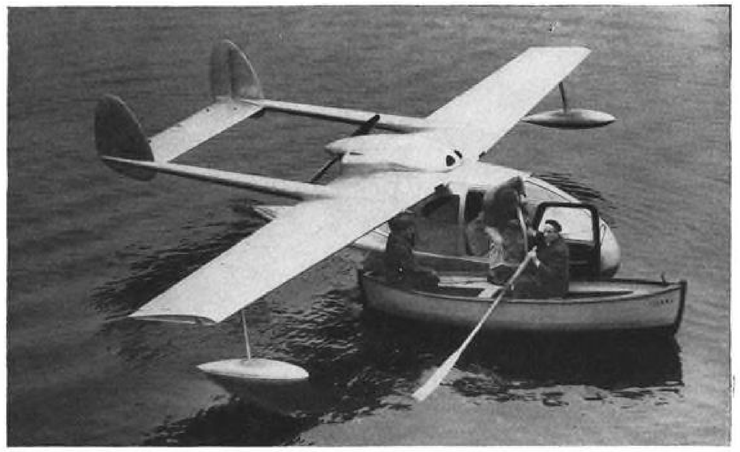
The new schedules are designed to ease the plight of Piper dealers who now have to quote deliveries as of May 1953. Majority of the orders are for the four-place Tri-Pacer, which is popular among business users, who have been taking 95% of those planes sold, sales manager J. Willard Piper reports. A recent company survey indicates that average annual use is 325.24 hr. or 40,000 mi.

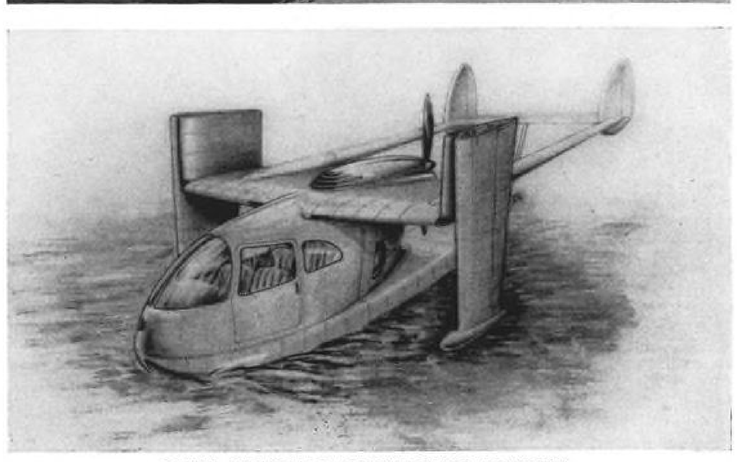
The large backlog does not include orders for military Piper planes:

• **PA-18T,** a 105-hp. Super Cub trainer for flight indoctrination of USAF air cadets. Nearly 300 have been ordered.

• **L-21B** liaison plane for U. S. Army.

• **Super Cub** observation reconnaissance model for NATO nations.

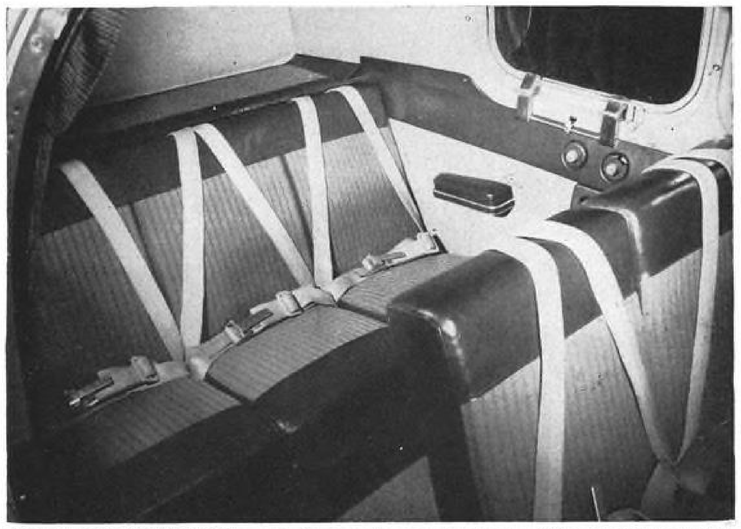




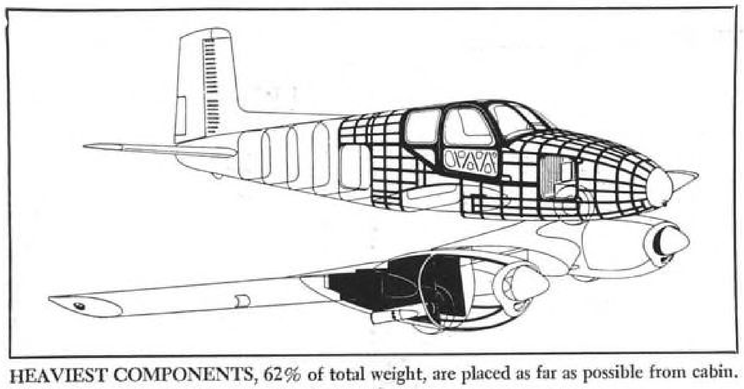
NEW ITALIAN AMPHIBIAN TESTED

Flight test program has been started on the novel Italian Nardi F.N.333 all-metal amphibian shown in photo and sketch above. The three-place plane is designed for private use and military liaison duties. Two models have been designed: one with a 145-hp. Continental engine and the other with a 225-hp. Continental engine and hydraulically folding wings, as in sketch. Note that the wingtip floats are retractable. An automatically adjustable pitch pusher prop is fitted. Span is 32 ft. 9 in., length 23 ft. 11 in., height 8 ft. 9 in., wing area 145.3 sq. ft. Gross weight with 145-hp. engine is 2,000 lb., empty weight 1,320 lb. Top speed is given as 156 mph. and maximum still air range with 450-lb. payload is 1,000 mi. The company is located in Milan.

LONG NOSE of Twin-Bonanza is designed to provide safety cushion in event of crash.



SHOULDER HARNESSES are standard equipment. Also, backs of front seats are padded.



HEAVIEST COMPONENTS, 62% of total weight, are placed as far as possible from cabin.

Twin-Bonanza Built for Safety

Beech executive plane has heavy keel, collapsible nose and crash cushion designed for passenger survival.

By Alexander McSurely

Wichita—Manufacturers of small airplanes are going to be up against a hard-to-beat argument—safety—when Beech Aircraft's Model 50 Twin-Bonanza gets out in quantity for civilian use within the next few years.

Unbiased safety engineers who have studied the Twin-Bonanza design told AVIATION WEEK the small transport is the first U.S. airplane of its size deliberately engineered from the drawing board to incorporate newest approved postwar safety practices for crash survival. They forecast an excellent safety record for the Twin-Bonanza in preventing deaths and serious injuries in crashes.

This record is expected to show up positively as the new Model 50 gets out to civilian consumers beginning this spring. Of the first 11 pre-production Twin-Bonanzas, two have been delivered to Carco Airline; one to Lycoming division, Avco; four to the U. S. Army; one to Brazil; and two are being retained at the Beech plant.

Beech also is getting set for its first production deliveries of the L-23A military Twin-Bonanza, which the Army is buying for use as "aerial staff cars." The military version is expected to give further proof of sound safety engineering in the Twin-Bonanza during actual flight experience.

▶ **Safety Factors**—Ralph Harman, assistant Beech chief engineer and project engineer on the airplane, sees three principal safety factors in the Twin-Bonanza design—plus a considerable number of details designed for safety.

The main factors:

- Designing the airplane to an 8G flight load safety factor, considerably higher than the 5.7G ultimate factor required by Civil Air Regulations for non-carrier airplanes. On important structures, the Twin-Bonanza is beefed up to take a 20% marginal load beyond 8Gs, Harman says.
- A forward compartment ahead of the cabin absorbs energy in a crash, and a heavy keel structure under the cabin safeguards passengers and crew in event of an emergency landing.
- Passengers sit on top of the main weight factors in the airplane because of a low-wing arrangement with the engines that puts more than 62% of the total weight of the Twin-Bonanza below and forward of the occupants.

The collapsible nose section follows recommendations by crash injury research at Cornell University for a forward structure that will act as a shock absorber at initial impact. The Beech design provides a tightly sealed compartment for baggage or equipment, with a husky baggage door and heavy lock. Air locked into the compartment is expected to have a powerful cushioning effect in an emergency.

▶ **Tires Cushion Impact**—In addition to the keel structure, protection for a wheel-up landing is provided by a landing gear retraction arrangement. Wheels are hauled up into the two nacelles vertically, with about three inches of the wheel exposed at the bottom of the nacelle. The inflated tire acts as a cushion in a wheels-up landing. A bumper at the tail also gives protection.

▶ **Keel Proved in Crashes**—In two incidents with pre-production Model 50s, the keel-and-wheel protection has worked well. In one incident, a nosewheel actuator let go and the airplane nosed over just after landing. The keel structure protected the passengers and the airplane against serious damage.

In the second incident, the Twin-Bonanza slid on its belly down a runway after the wheels were retracted inadvertently just as one engine was cut during a pilot check out on aborted takeoff procedure. After the aircraft was jacked up and its wheels extended, the fuselage was found unharmed.

Harman says the tire bumper gives between two and three inches positive clearance along the airplane's underside. The arrangement was the result of a series of tests on how far the retracted wheels could extend below the nacelle without seriously increasing the drag on the airplane. Bumper blocks within the nacelle wheel wells prevent the gear from traveling higher for more complete enclosure.

▶ **Fire Prevention**—Fuel is away from the passengers in four wing tanks, two main tanks inboard and two 20-gallon tanks outboard. These are behind the protective main wingspar structure and encased in protective wall structure.

The most protection against engine fire, in Harman's opinion, is the jet augmentor tubes for the Model 50's engines—two Lycoming GO-435-C2 engines of 260 hp. each. The tubes exhaust below the nacelles, and Harman says they are expected to blow an engine fire out if full pumping effect is used.

In the case of an engine fire, recommended procedure for the Model 50 is to open throttle to get the maximum pumping effect.

▶ **Shoulder Harness**—The Beech-designed shoulder harness is provided as standard equipment in the Model 50. The harness was developed after a series of tests with a rubber man-sized figure that was accelerated and brought to an abrupt stop in a Beech Model 35 Bonanza fuselage with a device similar to an aircraft carrier arresting gear. The experiments continued under an increasing series of G loads until the test airplane was destroyed. Nylon webbing used in the harness is stressed for 2,000-lb. pull strength, or 4,000-lb. load in each two-strap seat belt.

▶ **Other Features**—Here are some of the other details designed for safety in the Twin-Bonanza:

- The cabin is ventilated through an opening in the nose, away from engine fumes.
- None of the crew or passengers is seated in line with the whirling propeller blades.
- Nosewheel strut is inclined forward so that the nosewheel tire is the farthest forward part of the airplane, lengthening the wheelbase to 10 ft. 9⅜ in. Nosegear piston is the same size as on the main gear, giving added strength.
- Control wheel is the approved curved-chest protector design advocated by crash injury research. The wheel is made of a ductile cast alloy that bends, rather than shatters, under heavy impact or pressure. It has been tested with heavy sandbag drop tests.
- Instrument panel has been moved forward 2 in. at the bottom and 3½ in. at the top from the original design for more headroom. The panel is made of ductile metal.
- Front seats are padded in back to provide protection for backseat passengers, and the front seats also tilt forward.

CAB Attacked

- **S&W chief says Board retards airfreight.**
- **Huge increase in cargo predicted by 1955.**

Raymond A. Norden, president of Seaboard & Western Airlines, attacked Civil Aeronautics Board last month as the "greatest and most consistent barrier to the development of trans-Atlantic airfreight."

Norden told the New York Society of Security Analysts that commercial airfreight flown over the North Atlantic will increase 340% over last year's traffic by 1955 despite CAB's "philosophy of protecting the grandfather passenger airlines against competition."

A total of 160 million ton-miles of cargo will be flown within the next three years through use of larger and faster air transports, he said, and airfreight will increase 180% over the 1955 peak to 450-million ton-miles by 1960.

The S&W president said his predictions are based on an industry-wide survey of new aircraft scheduled for trans-Atlantic freight flights.

Norden said two U.S. certificated freight lines, Pan American World Airways and Trans World Airlines, flew a total of nine all-freight trans-Atlantic flights last year while foreign carriers made 339 crossings, 63% of the total airfreight traffic.

Seaboard & Western, a non-subsidized airline, flew 174 all-freight flights in 1951, Norden said.

▶ **CAB "Paternalistic"**—"The Board is dominated by a philosophy of protecting the grandfather passenger airlines against competition, rationalized under a theory that traffic from all sources—whether passenger or freight—is constant," he said. "It is a self-evident truth that passenger and freight traffic are constantly expanding quotients as evidenced in the growth of the sum total of domestic and foreign transportation."

Norden charged CAB with adopting a "paternalistic attitude" toward airlines given more than $500 million in subsidy payments since the end of World War II.

He also accused the Board of taking longer to hand down a decision on applications for freight certificate where no subsidy is necessary than in cases involving subsidized passenger-mail-express routes.

S&W applied nearly five years ago for a certificate to operate an all-freight service between the United States, West Europe and the Middle East, Norden said, but CAB still has not reached a final decision on the application.

He said they reached decisions in from 19 to 22 months on applications which were made by subsidized passenger airlines.

▶ **Super Connies Scheduled for Freight**—Of the increase in trans-Atlantic cargo traffic, Norden said the boost will begin this year with a total of 46 million ton-miles—upping 1951's airfreight by an estimated 25%.

Norden said Seaboard's air tonnage will be increased in 1954 by the delivery of all-freight Super Constellations, which he predicted will add at least $16 million to S&W's operating revenues.

"The impetus given trans-Atlantic air trade by use of Super Constellation equipment will see airfreight increase, in our opinion, to 160 million ton-miles in 1955," he said.

He said airfreight traffic also will be increased by improved technical refinements and operating techniques that will reduce the costs of trans-Atlantic operations.

Surplus Plane Bids

(McGraw-Hill World News)

Melbourne—The Australian government is asking for bids on a quantity of obsolete aircraft, engines and other materiel.

Already large quantities of such equipment have been disposed of, most of it going to U. S. firms and individuals.

Bids are invited on 26 PBY Catalina flying boats and 62 P&WA R1830 engines.

In the very near future, the government will put up for sale 73 Airspeed Oxford twin-engine planes, 106 spare Oxford engines and 35 North American Mustang fighter airframes. A quantity of Perspex transparent material and other miscellaneous products will be disposed of.

Aircraft Dividend Record

Company	Total Paid In Cash[1] (Calendar Years) 1952	1951	1950	1949
Beech	$1.05	$0.80	$0.80	$0.85
Bell	1.50	1.13	0.88	0.50
Bendix	3.75	3.00	5.00	3.50
Boeing	2.67	2.00	2.00	1.33
Cessna	0.50	0.40	0.20	0.25
Consolidated Vultee	1.75[2]	1.40	1.00[4]	None
Curtiss-Wright, Common	0.60	1.00	1.00	1.00
Curtiss-Wright, "A"	2.00	2.00	2.00	2.00
Douglas	3.75	3.50	3.13	4.63
Fairchild Engine	0.60	0.40	0.60	0.35
Garrett Corp	1.60	1.60	1.90	0.92
General Dynamics	2.25	1.00	1.25	1.50
Grumman	2.00	2.00	2.00	1.00
Lockheed	1.20[2]	1.10	1.50	1.00
Martin	None	None	None	None
McDonnell	1.00	1.00	1.00	None
North American	1.50	1.25	1.25	1.25
Northrop	1.00[2]	None	None	0.23
Republic	1.25[2]	1.00	0.50	None
Ryan	0.50	0.40	0.20	0.10
Solar	1.05	1.00	0.70	0.70
Sperry	2.00	2.00	2.00	2.00
Thompson Products	2.00	2.00	1.46	1.25
United Aircraft, Preferred	5.00	5.00	5.00	5.00
United Aircraft, Common	2.00	2.00	1.67	1.67

Notes: [1] *Adjusted for all stock splits per share.* [2] *Plus stock dividends.* [3] *Plus 1/11 share of San Diego Corp.* [4] *Plus 1/10 share of Air Fleets, Inc.*

Why Investors Turn to Air Shares

They are attracted by regularity of payments, a result of increased stability, exclusive AW survey shows.

Cash dividends paid to stockholders by aircraft builders in 1952 were the highest ever.

Increases in annual dividend disbursement rates were very pronounced. And where a boost in dividend payments was not effected, the rate established during 1951 was maintained with but one exception. These conditions are revealed in an exclusive survey conducted by AVIATION WEEK, summarized in the accompanying table.

If nothing else, the payments to stockholders last year further strengthened the basis of regular dividend income that is becoming a major attribute of the aircraft industry.

▶**As Predicted**—This characteristic of greater stability—regularity of dividend income—was projected here more than 16 months ago (AVIATION WEEK Sept. 10, 1951, p. 60). There is no doubt that the investment standing of the aircraft group is being constantly improved by the development of longer strings of dividend disbursements among its members.

Past conditions in the aircraft industry had hardly encouraged any expectations of stability in operations and earnings which could form the basis of regularity in dividend payments.

During World War II the aircraft industry submitted to a tremendous expansion of plant facilities, both government-owned and self-financed. This placed a heavy burden on working capital requirements. Immediately following the war, many units in the industry purchased government-owned facilities. But this was accompanied by cutbacks and reconversions, making for extensive upheavals in the corporate affairs of most aircraft companies.

After this process was completed, a change in national policy took place calling for a reversal of the downward rate of aircraft procurement. This program was soon sharply accelerated by the Korean war.

▶**Speculative Background**—The aircraft equities found their greatest investor support from those seeking capital appreciation, giving these stocks a highly speculative tinge. Long-range views were required, which meant evaluating a company's ability to keep ahead of current technological aeronautical advances, obtain orders, and convert such business into a profit.

While very much of the same approach underlies investment thinking toward the aircraft industry today, constantly mounting airplane procurement programs have transformed the immediate outlook for the group.

▶**Easy Financing**—To finance its huge backlogs, the aircraft industry has found sufficient accommodations available in the form of self-liquidating bank credits. Banks have been eager to advance funds to finance the defense effort and can avail themselves of Federal Reserve Bank V-loans with the Air Force or Navy serving as guarantors. With its plant and inventory needs thus well financed, most aircraft manufacturers have been in a position to make liberal dividend disbursements in relation to available earnings.

Uncertainties, such as price redetermination, renegotiation and the contracting nature of the industry, have not proved as troublesome as expected. With subcontracting, it has been difficult to complete deliveries on specific contracts to conform with fiscal years.

▶**Shorter Periods**—This condition led many aircraft companies to follow irregular dividend policies. The inclination was to make the bulk of disbursements to stockholders at the year-end when results for the past period were more fully known. Semi-annual payments were a compromise still followed in a number of instances. An increasing number of builders, however, have now adopted quarterly dividend policies.

The accompanying table reveals the dividend records for all leading aircraft builders together with a number of aircraft accessory companies.

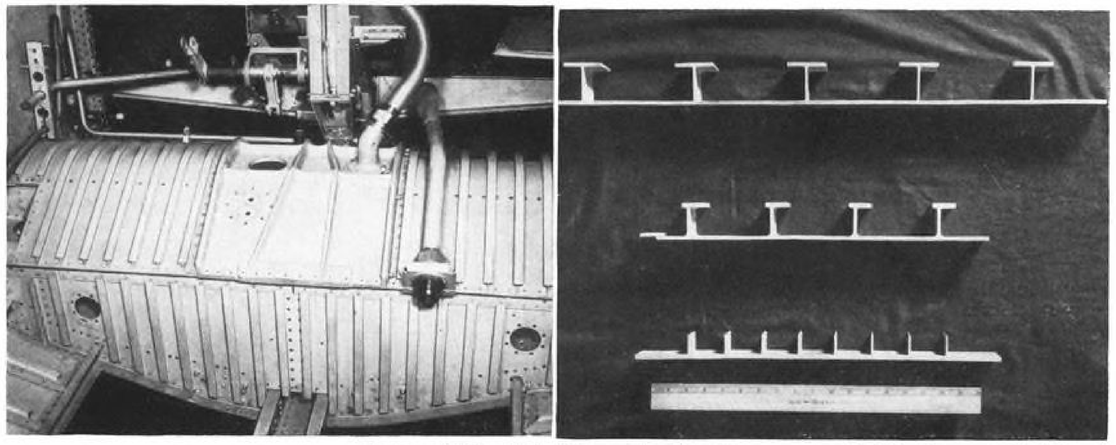
The only company failing to pay any dividends last year was the Glenn L. Martin Co.

▶**Stock Disbursements**—In addition to increasing cash payments, a number of companies made various disbursements in stock. For example, Lockheed, Northrop and Republic each declared a 10% stock dividend. In addition to conserving cash, these stock dividends also serve as a device to increase subsequent income payments if the same dividend rates are maintained.

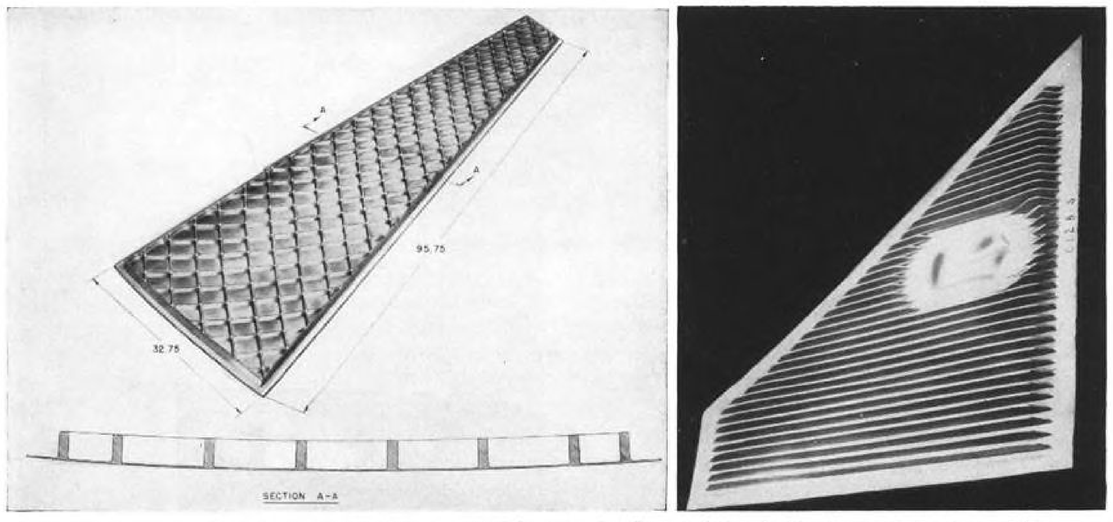
In any event, current earnings are materially in excess of dividend payments. This supports the belief that liberal aircraft income yields which have prevailed for years may continue.

It has been inevitable that improved dividend yields would attract the attention of staid, conservative investors. Small wonder, then, that the country's largest investment trust recently invested more than $2,285,000 in three leading aircraft enterprises.

—Selig Altschul



INTEGRAL STIFFENING lowers weight and simplifies construction of components. Lockheed sump tank, left, and Alcoa-produced wing panels, right, illustrate possibilities of this fabrication method.



WAFFLE & STRIP patterns have been suggested for integral stiffening of aircraft skin structures. Forging at left was proposed by Lockheed. Experimental panel, right, was forged by Wyman-Gordon on 18,000-ton press.

Experts Analyze Heavy Press Problems

Advantages of integral construction are presented by Lockheed representative; fabrication advances told.

By Irving Stone

The magnitude of Air Force's heavy press program is unprecedented in any industry. Coupled with the fact that the heavy forging and extrusion arts are still in their infancy, this produces a myriad of difficult problems. But the problems are being met—and solved.

• **Know-how** is gradually being accumulated in the phase just before actual operation of the giant presses, which are scheduled to expand the aviation industry's potential.

• **There is growing understanding** and appreciation of refinement troubles.

Some of industry's progress was outlined by airframe builders, raw material suppliers, forging and extrusion producers, and machine builders at the recent heavy press session for light metals, sponsored by the American Society of Mechanical Engineers at its annual meeting in New York. Cosponsors of the session included the Institute of the Aeronautical Sciences, the Society of Automotive Engineers and the American Institute of Mining and Metallurgical Engineers.

▶ **Airframe Factors**—Lockheed Aircraft Corp.'s production engineering manager, George W. Papen, offered examples of advantages and economies in integral structures, in which extrusions and forgings can play a large part.

Papen points out that there are two ways to boost the load-carrying efficiency of a structural element (with efficiency being considered as the weight of material required to support a given load):

• **Use a higher strength-weight-ratio** material.

• **Obtain more efficient distribution** of the material used.

Progress in metallurgy is affording continual improvements in the physical properties of materials, but additional benefits can be derived through mechanical processes. Thus, the use of larger extrusion press cylinders and pressures will afford greater reduction ratios, which have a direct effect on the final physical properties of an extrusion alloy.

The increased pressures available with the new giant machines will result in more efficient distribution of material through greater detail refinement in both forgings and extrusions, thinner sections, closer tolerances and less draft, Papen says.

These advantages are also available to reduce weight and cost of smaller forgings and extrusions—an important consideration too often overlooked in the face of the "more glamorous large extrusions and forgings," Papen says.

▶ **Integral Makeup**—In addition to offering greater structural load capacity, large forged and extruded elements also figure in the method of construction of aircraft. It appears more advantageous, Papen says, to use a single-piece, 30-ft. wing beam produced by extruding or forging, than by utilizing two 15-ft. spliced sections. And it is better to increase the cross-section of a beam cap or bulkhead flange by upping the dimensions rather than achieving the additional area through builtup structure. It is more economical, too, to double the size of skin sheet and plate than to obtain this increased surface area by splicing two or more pieces.

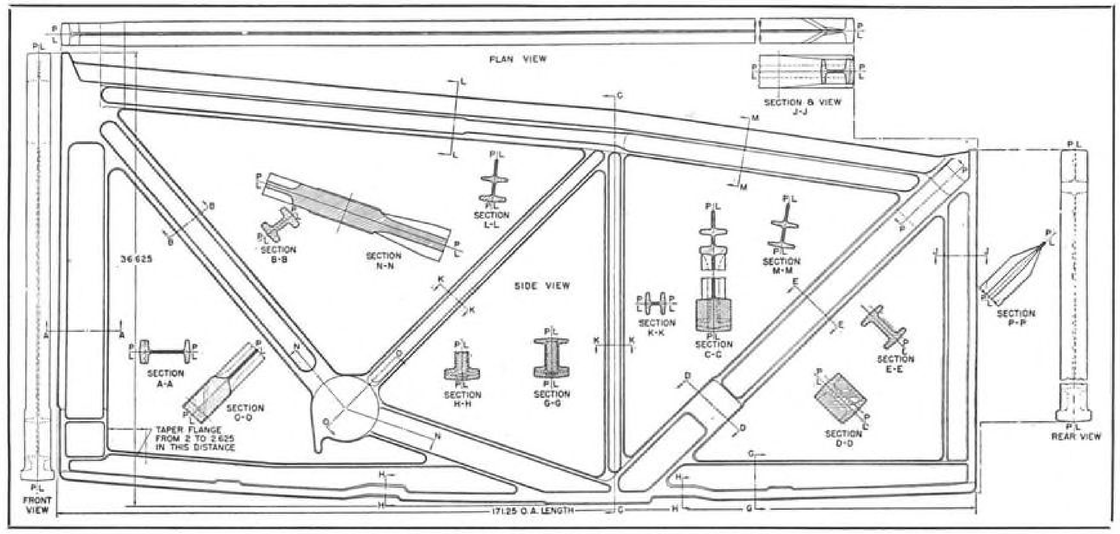
As an example of savings possible with integral makeup, Papen cites the wing inner lower surface of the Super Constellation. The tabulation on page 23 draws a comparison between the conventional bits-and-pieces makeup and the integrally stiffened structure.

Integral makeup, compared with standard assembled stiffened-skin construction, offers distinct structural advantages.

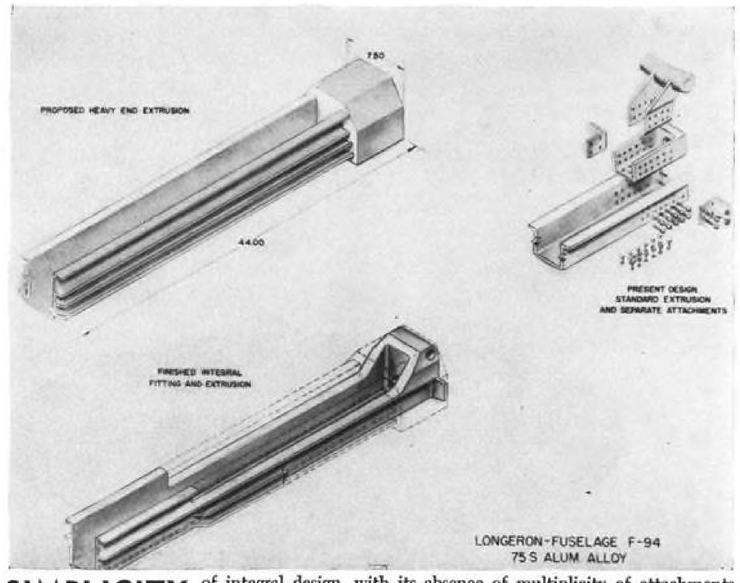
With attached stiffeners, there are definite practical limits to the closeness of their spacing. As a result, only about 80% of the skin area can really be effective in skin gages in customary use.

With the integral type, 100% skin working area can be obtained, Papen reports.

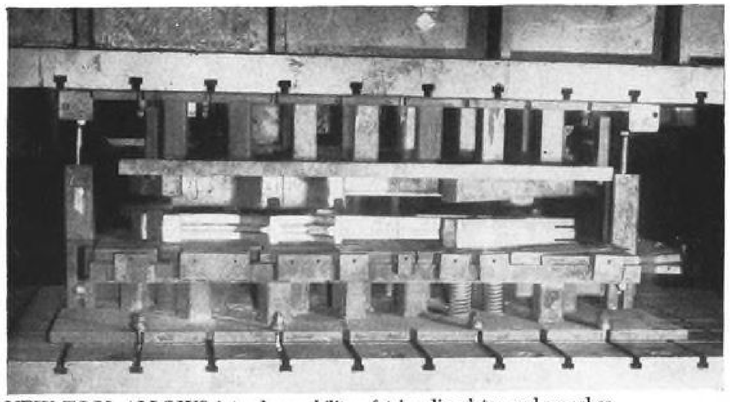
Also, there is unavoidable overlap in stiffener attachment areas and a reduc-



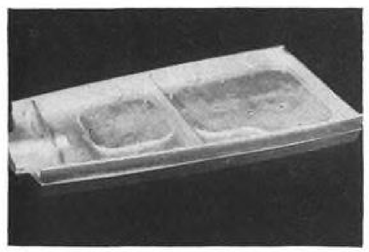
INTEGRALLY FORGED wing inboard rib of 75S aluminum alloy, shown in this Lockheed drawing, was designed to replace a complex and expensive assembled structure of machined components.



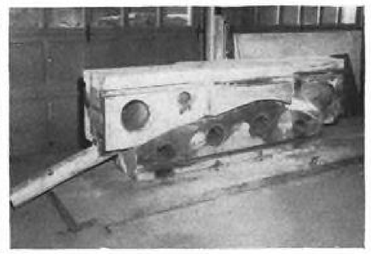
SIMPLICITY of integral design, with its absence of multiplicity of attachments and detail parts, is shown in this 75S extruded fuselage longeron.



NEW TOOL ALLOWS interchangeability of trim die plates and punches.



FORGINGS require raised relief pad.



KIRKSITE bending die cuts cost.

tion in net areas due to stiffener and other attachment holes which go along with assembled construction. This is eliminated wherever integral structure can be applied.

► **Smoothness, Sealing** – Aerodynamic smoothness is proportional to the stiffness of the skin between stiffening elements, the type of substructure, number and types of attachments through the skin and the number of surface joints. Integrally stiffened structure combines the skin with the substructure, makes possible closer stiffener spacing, reduces the number of attachments and surface joints. All this cuts surface irregularities and promotes an aerodynamically smooth surface.

Sealing considerations are also simplified in integral structures. There is a reduction in the number of joints, attachments, faying surfaces, in the amount of sealing materials needed, and the manhours required to apply the sealant.

► **Wide Application**—The same thinking can be applied to beams, spars, bulkheads, ribs, flooring and other components. The structural advantage of integral makeup, Papen says, is in the more efficient distribution of material, fewer splices, less material to be removed for attachment holes—all contributing to less weight.

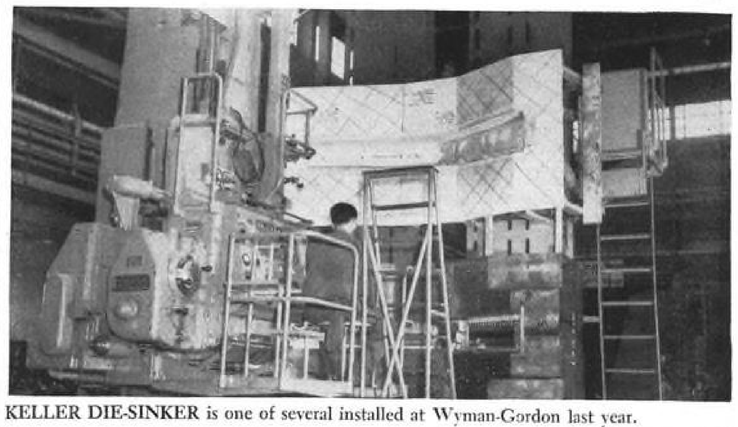
A section-property comparison of a forged integral wing beam with a standard, builtup member of extruded capstrips and a shear-resistant web of plate stock is favorable to the former. Attachment holes of the web assembly to the capstrip and to the upright stiffeners can reduce the structural efficiency of the web, Papen reports.

He points out that, in any comparison of integral wing beam construction with the conventional extruded capstrip type, it must be remembered that these extruded, machined, tapered capstrips (of the conventional builtup structure) are in themselves limited

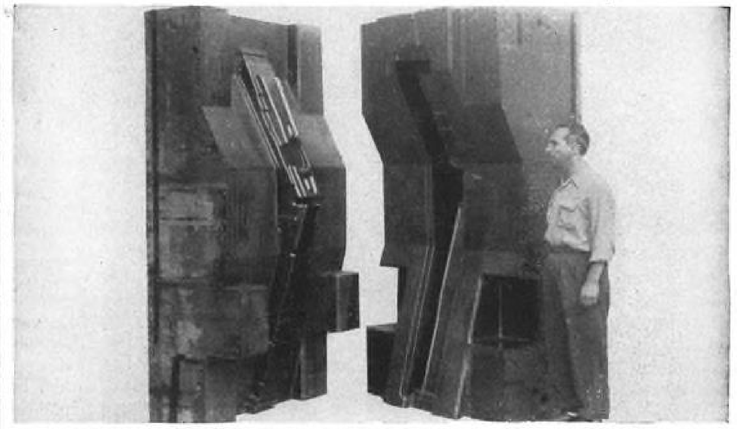
How Integral Stiffening Saves

Lockheed 1049 Constellation Inner Wing Lower Surface

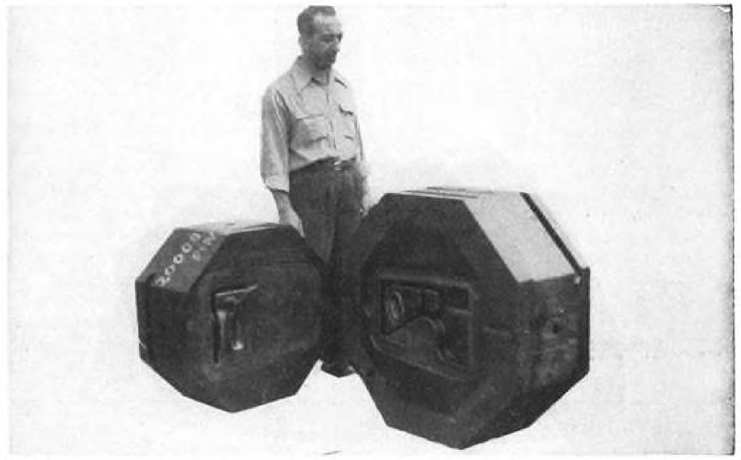
	Conventional Design	Integrally Stiff Design	Savings	Percentage Savings
Total number of detail parts	1,806	334	1,472	81.5%
Total attachments (rivets, screws, bolts, nuts, etc.)	41,000	7,224	33,776	82.4%
Weight of sealant (lower portion of wing only), lb	80	30	50	62.5%
Total weight of structure including all parts & sealant, lb	1736.9	1442.4	294.5	17.0%



KELLER DIE-SINKER is one of several installed at Wyman-Gordon last year.



LARGE DIE is used by W-G on its 18,000-ton Mesta press. Compare it with . . .



SMALL DIE, one of the first used on the Mesta. Die problems are being solved.

examples of integral construction, comprising up to 90% of the beam cross-section area.

As a result of the high efficiency of this type of semi-integral construction, there is not obtained as sharp a definition of the advantages of the proposed 100% integral construction here, as can be obtained elsewhere. This is particularly true in the 12% thickness wing and holds down to the thinner wings approaching about 3% thickness. Here, genuine integral construction shows overwhelming advantage, Papen contends.

► **Production Savings**—In addition to

the feasibility of increased performance and weight reduction without increased cost through the use of large integral pieces, production saving possibilities appear considerable.

- Savings in overall manufacturing time can be realized.
- Production control, stocking, inspection, transportation and tool planning are almost directly proportional to the number of parts made.
- Assembly labor and assembly tooling are also proportional to the number of parts which must be put together.

▶ **Many Ways**—Integral structure can be obtained by rolling, casting, machining from plate and billet, as well as by forging and extruding. However, machining from plate or billet requires tremendous machines and time, much of the stock goes into chips, and the part is not as consistent in physical properties as that obtained by forging or extruding to finished or nearly finished dimensions.

Mechanical properties in the center of a thick plate or billet are questionable. But a forging has the added advantage of variable grain direction, which can generally be tailored to the stress pattern of a specific design, Papen claims.

Casting materials do not have sufficiently high physical properties, he says, nor have casting techniques been developed to the point where efficient metal distribution and thin sections can be obtained.

Castings cannot be considered for primary structural elements until a casting technique is developed which will eliminate the casting design factor now required, Papen says. Improvement is needed in casting alloy physical properties to values which can absorb this factor and still compete with the wrought alloys.

While each of these forms fits areas where they have some advantage over the others, for overall usefulness and general application, the most efficient structures for lowest cost appear to result from large forged and extruded elements.

▶ **Room For Improvement**—In keeping with the trend in aircraft performance, improvements in large forged and extruded parts must be made over those available today. Papen mentions these fields where effort must continue:

- **Draft angles** must be held to a minimum. Practically all material in the draft reduces section efficiency. There are occasions when draft angle can be used to advantage, but in general, as forgings get larger, continued use of today's percentage of draft material, would mean high overweight. This must be corrected during the forging process—not by machining in the airframe plant.

Draft angles, too, may interfere with

mating surfaces, and it is not economical to machine inside faces of items such as bulkheads and ribs to remove draft when flat bolt pads are desired. It is not practical now to establish any standard draft angle, but those of 1, 3, 5 deg. must be made available.

• **Tolerance requirements** are also reflected by an increase in weight or machining. Draft and tolerances can require rework of as much as 288 lb. from a 400-lb. forging before it is satisfactory for aircraft. The greater precision of presses over hammers, elimination of high impact loads, use of die holders, and close control of temperature by internal heaters are factors which promote close tolerances.

In the extrusion field, bettering tolerances is primarily a matter of improving die material and die-making precision, and accurate control of the extrusion operation.

• **Section refinement.** Increased pressures and know-how advancement should make available forgings and extrusions with thinner webs, greater ratio of section thickness differences, greater ratio of height of stiffener, leg or protuberance to thickness, and reduced fillets and corner radiuses.

• **Procurement time.** Large forged and extruded elements must be designed into the prototype of an aircraft. Efforts to reduce prototype time on many models to 18 and 24 months, make it mandatory that forgings and extrusions be available in not more than 6 to 9 months from order placement. It may be necessary to establish a die-block material pool and come up with a solution for the shortage of die sinkers in training. Both of these are potential bottlenecks.

▶ **Forging Ideas**—A paper on large forging press operations and production problems was delivered by Wyman-Gordon Co.'s G. W. Motherwell, vice-president in charge of manufacturing. Data on the subject was prepared by Motherwell, A. L. Rustay, the company's chief metallurgist, and J. R. Douslin, plant superintendent.

The forging supplier is cognizant of the desire of the airframe designer for units requiring a minimum of machining. This would mean less draft, thinner webs, smaller fillets and radiuses, closer tolerances. But right now these factors can be satisfied only by a compromise between ultimate requirements and the practical methods available. The new, big presses undoubtedly will open new doors of achievement; but even here, operators will have to feel their way.

▶ **New Approach**—Pressure relief pads are required on some parts to get better die closure, and these have to be machined off by the customer. In one example mentioned, where the panel thickness of the forging is about 0.600

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in., the pad now required is about one inch thick.

A new approach is being considered, using a set of pre-forming dies. This pre-blocker will forge the web to less than the desired thickness at the center, and the reduced section will be brought back to the required dimension in the blocking and finishing operations.

This isn't the answer to all thin web problems, Motherwell says. Solution will depend a great deal on the forging design and the relationship of the web to adjacent sections.

► **Friction Cut**—Frictional force between the die and the forging is a big problem, since much of the available pressure for flowing stock is used in overcoming friction between at the die-metal interface.

There's good news here. A modified graphitic die-lubricant recently has been developed that has materially reduced the number of passes needed to finish a large forging. Die closure improvement has been outstanding on a number of difficult jobs—particularly those having a raised parting line where the stock tends to be trapped in the die cavity, or where the area is so great that the available pressure is low.

Motherwell reports that on a recent run, which commonly needed 20% strikecover to fill, more than 1,200 forgings were made without a reject for underfill.

► **Die Factors**—Forging dies involve a combination of design, die-sinking and tryout.

Therefore, design and development of forged parts for a complete plane should begin well in advance of the required delivery date, Motherwell contends, because of the many problems in connection with achieving the best design, in material procurement, time for sinking and checking, and finally, die development.

Much valuable time is saved, he says, if information from the customer is accurate and complete and if the plane designer understands the development and production problems of the forger. Particularly in the case of large complex forgings, each project introduces its own development problems and points up the increasing need for close designer-producer cooperation.

► **Today's Delay**—There is now a delay on delivery of die blocks for large forgings, Motherwell says. Also, there has been quite an increase in size between early dies and those used now on Wyman-Gordon's 18,000-ton press. Maintaining a stock of the large blocks used today would not be economical, but that is one possible solution if present procurement time can't be tolerated.

On the question of die breakage on units which take a considerable time to make, it is deemed advisable to have duplicate die sets on hand. Informa-

tion indicates that 10 ship sets of parts will pay for tooling costs of the duplicate sets.

► **Extrusion Side**—Some of the production aspects of the large extrusion press were outlined by Aluminum Co. of America metallurgist T. F. McCormick.

The extrusion process, he says, comes very close to satisfying all the whims and fancies of the design engineer. When properly controlled it gives a high quality product with good mechanical properties. Sections may be simple or complicated, balanced or unbalanced, symmetrical or nonsymmetrical, solid or hollow.

Alcoa will get a 13,200-ton extruder—the first of the large presses slated to go into operation. This is a big boost in capacity over the largest available now (5,500 tons) and still more so in comparison with a 2,500-ton unit commonly used for producing aircraft extrusions.

It will mean a big increase in size of light metal shapes and tubes that may be extruded. And because of the big jump, new production problems will arise, only some of which can be predicted.

► **Larger Ingots**—With present extrusion presses, the bore of the largest cylinder liners will handle ingots about 18 in. in diameter and 44 in. long. In aluminum alloy such an ingot should give a finished extrusion of about 800 lb.

For aircraft extrusions, cylinder liners fitting ingots 11 and 14 in. in diameter are used most extensively in the present presses, although 16-in. diameter ingots can be extruded into certain types of sections from the strongest alloys. The usual limit of extruded shapes with present equipment is about 600 lb.

On Alcoa's 13,200-ton press, inside diameter of cylinder liners will vary from 15¼ to 29¾ in.; it will handle ingot lengths of 70 in. Contemplated manufacturing limits for solid shapes on this press and its auxiliary equipment have been established with a maximum length of 90 ft. of heat-treated aluminum alloy extrusion, a maximum weight of 2,300 lb., and maximum cross-section to fit within a 23-in.-diameter circumscribing circle. Under certain conditions, this may be exceeded.

► **Stepped Units**—Production of stepped extrusions—used extensively for aircraft wing spars—is a feature of the large press, McCormick says. A die to produce a stepped extrusion is made in several parts. Some parts may be replaced with others to give larger openings at one or more stages during extrusion.

Higher than normal pressure requirements are dictated to allow extrusion of an initial small section and sufficient

TOMORROW'S AIRCRAFT: What barriers remain?

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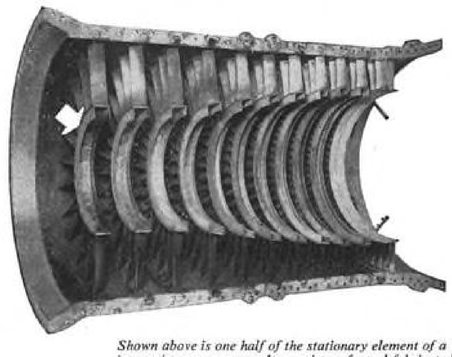
Westinghouse early recognized the need for extra reliability of compressor stationary diaphragms. Today, Westinghouse stands first for their contribution in stationary or stator blade design and construction. How well they have developed a thoroughly dependable shrouded steel stationary blading on the compressor is dramatically demonstrated by Banshee performance over Korea. For the fact is . . . there has not been a single operational loss of the Banshee (with Westinghouse J-34 turbojet engines) because of stator blade damage. Breakage at this point would be serious of course, ripping out all the other blades in the compressor. Westinghouse construction avoids a complete break, the blades may bend if hit, but won't tear out . . . both ends hold tight to the shroud.

Lighter, more durable jet engines, like the powerful, new J-40 which recently passed the Defense Department's grueling 150-hour qualification test, will aid our country's defense. Though other jet aircraft problems remain to be solved, Westinghouse axial-flow design, proved over Korea, points the way to the solution of future jet fighter and transport problems.

Westinghouse is investing millions of dollars and man-hours to help build American jet-propulsion leadership. Jet engines are produced at South Philadelphia and Kansas City plants by Westinghouse, America's Jet Engine Pioneer. J-91002



Shown above is one half of the stationary element of a Westinghouse jet engine compressor. It consists of steel-fabricated diaphragms assembled in machined grooves in a cast aluminum housing. The white arrow above indicates one of the inner steel support shrouds.

THE SCOPE OF WESTINGHOUSE IN AVIATION

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cylinder size for adequate extrusion ratio for the larger final section.

► **Taper and Tubes**—Extrusions tapered from end to end have received consideration from several experimenters, McCormick reveals. It is generally conceded that the best method of producing tapered sections is to group a number of them in a symmetrical design around a mandrel contoured to produce the desired shape, he says.

Production of this type of section is limited with present extrusion presses, but the very large presses will make the method more attractive.

It is now possible to produce extruded tubes to close dimensional tolerances, where formerly it was considered necessary to use cold drawing for a sizing operation. This development has markedly decreased the cost of light metal tube and pipe.

► **Extrusion Ratio**—A factor having a definite effect on the pressure required for extruding is the extrusion ratio. This is the relation of the cylinder cross-sectional area to that of the extrusion. As this becomes smaller, less pressure is required, within limitations.

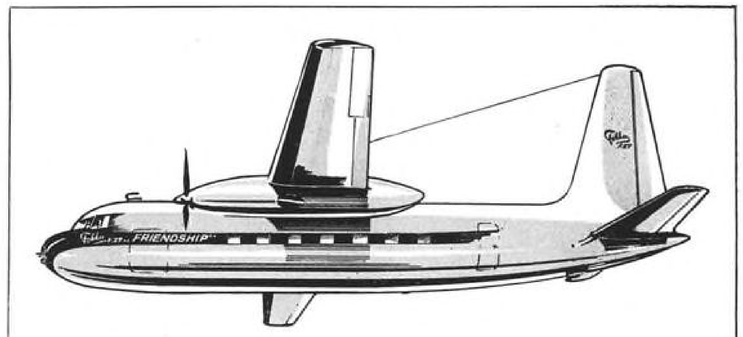
In usual practice, McCormick says, the ratio will vary from a minimum of 10 to more than 100. One of the reasons for the large presses is to give large extrusions which are sufficiently worked to have completely wrought structures.

► **Stretching Equipment**—Equipment for stretching will be a big factor in supporting the large presses. Stretching relieves internal stress resulting from heat-treat quenching and substantially minimizes distortion in the extruded part, which may occur in the contour milling operation.

Largest stretcher now available will exert a pull of 750,000 lb.—sufficient to handle a 75S extrusion with a 15-sq. in. cross-section. But complementing the 13,200-ton press scheduled for Alcoa's Lafayette, Ind., plant is a stretcher with 3,000,000-lb. pull, now under construction. This puller will straighten 75S extrusions with a cross-sectional area as high as 60 sq. in.

► **Ingot Quality**—A prime consideration for the production of large, high-quality extrusions is the quality of the ingots. McCormick says these must be sound, have uniform fine-grained structure free from porosity, segregation and surface defects. Ingot casting, he reports, has kept pace with procurement of the larger presses.

Kaiser Aluminum & Chemical Corp. has done some notable work in this field (AVIATION WEEK, July 21, 1952, p. 38). Kaiser's director of research, Paul P. Zeigler, told the meeting that the company has cast ingots of 75S in 32-in.-diameter pieces, 95 in. or more in length. Facilities for producing 38-in.-diameter cast ingots already are in the design stage.



Fokker's Play for DC-3 Market

Specifications have been announced for another possible DC-3 replacement, the Fokker F.27 Friendship, 28-passenger twin-turboprop airliner now under development by the Royal Dutch Aircraft Factories.

Engine is scheduled to be the Rolls-Royce Dart RDa. 3, but for customers who want piston-engine power, alternate powerplant offered is the Wright Cyclone 955 C9HE2. Another F.27 version also is under consideration—a cargo plane known as the Freightship.

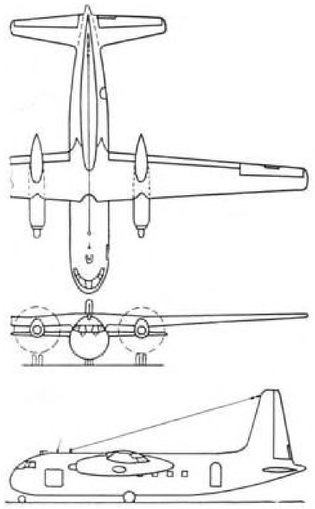
► **Performance**—For the turboprop-powered F.27, takeoff rating at 14,500 rpm. is put at 1,400 shp. plus 365 lb. of thrust. At 20,000 ft., maximum speed is 274 mph., cruising speed 246 mph. Corresponding figures for the Freightship at 10,000 ft. are 270 and 225 mph., respectively. Service ceiling is 33,500 ft. Takeoff and landing distance over 50-ft. obstacle (ICAO) is 4,200 and 3,770 ft. respectively. Stage length at cruise equals 310 mi., while block speed is 208 mph. (197 mph. for the Freightship).

► **Dimensions, Weights**—Span is 95 ft., length 65.5 ft., height 25 ft., wing area 754 sq. ft.

Empty weight is 19,950 lb. (18,860 for Freightship). Load for 28 passengers, luggage and freight totals 7,850 lb. (cargo load for the Freightship is tagged at 8,450 lb.). Maximum takeoff weight equals 31,950 lb. Wing loading, 42.4 lb./sq. ft.

Fuselage accommodations are arranged in seven rows with two seats each side of the aisle. Seats face rearward. There is stowage space between cabin and cockpit and aft of the lavatory in the rear. The cabin is pressurized for 8,000 ft. at 20,000 ft. altitude.

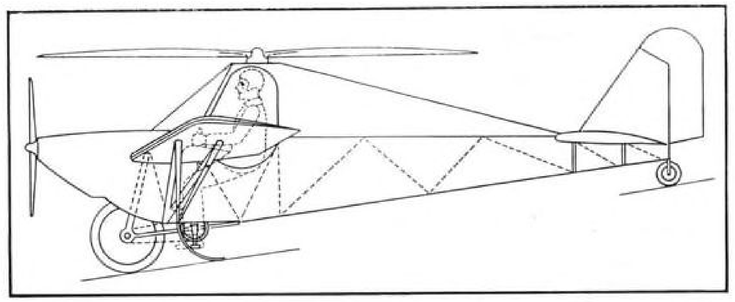
Hydraulic actuation is used for the tricycle landing gear, brakes and flaps. The F.27 may be built in this country by Fairchild Airplane & Engine Corp., as a Fokker licensee. As such, it may prove stiff competition for the projected Canadair CL-21.



F. 27 Friendship

• Powerplants	4 Wright C9HE2	4 Rolls-Royce* Dart RDa3
• Takeoff power	1,525 hp	1,400 shp.*
• Propeller dia., ft.	13	12.5
• Empty weight, lb.	21,845 (21,300)‡	19,950
• Fuel weight, lb.	1,950 (1,920)‡	3,375
• Cargo, lb.	770	1,232
• Max. takeoff weight, lb.	31,400 (same)‡	31,950
• Max. landing weight, lb.	30,950 (same)‡	31,300
• Wing loading, takeoff, lb./sq. ft.	41.6	42.4
• Wing loading, landing, lb./sq.ft.	41.1	41.5
• Power loading, lb./sq. ft.	10.3	10.4
• Speed, mph./altitude, ft.	254/15,000 (252/10,000)‡	274/20,000
• Economical cruise speed, mph./altitude, ft.	245/15,000 (234/10,000)‡	246/20,000
• Service ceiling, ft.	25,100 (same)‡	33,500
• Service ceiling, ft., one engine	9,200 (same)‡	11,800
• Takeoff distance over 50-ft. obstacle (ICAO), ft.	4,200 (same)‡	4,200

* Plus 365 lb. jet residual thrust.
‡ Data in parenthesis is for non-pressurized F. 27.



Glider-Copter-Bike-Plane Planned

(McGraw-Hill World News)

Rome—The latest Italian proposal for an ultra-light plane—the M.d.B. 52—combines the features of glider, powered aircraft, helicopter and bicycle.

This four-way compromise, invented by Col. de Bernardi, one-time Schneider Trophy winner, is, according to him, about to be built on an experimental basis.

The plane is to take off normally enough, using an engine which ". . . need not exceed 10 hp.," and at the desired altitude, the powerplant is shut down. The pilot then turns his energies to the bicycle pedals which are connected to the prop shaft. By pedaling vigorously, he is able to halve his usual glide angle and cover greater distances than under normal glide conditions.

As an added attraction, a rotor is fitted to the craft and permitted to autorotate—like an autogyro rotor—in forward flight. The rotor is fixed during climb to altitude.

De Bernardi says that the drawings have been completed and that the cost of building the two planned prototypes should not exceed three million lire (about $5,000).

Construction of the little craft is all-wood. Wingspan is 27.9 ft. and rotor diameter is about 10 ft.

Estimated top speed is about 75 mph., with cruising speed calculated at 68 mph. Takeoff distance is given as about 100 ft. Range is estimated at 280 miles.

De Bernardi estimates that in high-volume production his winged scooter would cost about a half-million lire ($800). For the future, he sees a two-place tandem model with somewhat more power.

Rocket Society Papers Summarized

The American Rocket Society heard 23 technical papers and speeches at its recent seventh annual convention in New York. Summaries of six papers are presented here. The first six were summarized in AVIATION WEEK Dec. 22, p. 31.

► **A Method of Using Small Orbital Carriers for Establishing Satellites, Krafft A. Ehricke, Guided Missile Development Group, Redstone Arsenal.**

Small manned vehicles, capable of attaining orbital speeds with a payload of about 11,000 lb., will be available before the construction of large satellite ships. These small rocket ships can be used as orbital carriers for establishing and maintaining satellites.

Payload of several of these carriers is transferred—in an auxiliary orbit above the atmosphere—to a space ferry which moves between the auxiliary and the satellite orbits. The ferry is refueled by orbital carriers.

By this method satellites of different size can be established in different orbits and supplied with equal efficiency of the supply ships. The inherently difficult supply problem can thus be solved economically, avoiding the delay and expense resulting from the development of booster stages for very large satellite ships. Single orbital carriers with reduced payload for passenger transport can reach the satellites in direct flight.

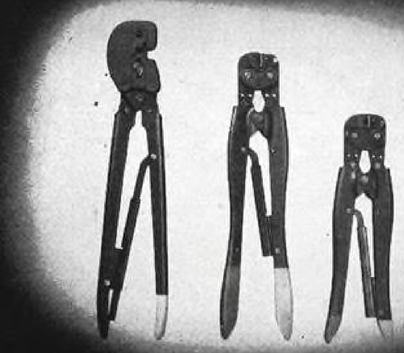
► **Rockets Behind the Iron Curtain, George P. Sutton, Aerophysics Laboratory, North American Aviation, Inc.**

This paper summarizes and interprets a set of unclassified references on rocket activities behind the Iron Curtain. The discussion is very speculative because the data upon which it is based is not reliable and is obtained from questionable sources, says the author.

Evidence of notable Russian rocket work appeared as early as 1903. During World War II, Russian rockets were used in the field prior to the extensive use of rockets by our armed services.

Recent articles indicate Russian activity in the development of liquid-propellant auxiliary rockets for installation in jet fighters. These engines may be advanced German engines, or recent Russian ones.

With the captured V-2 rockets, the Russians undoubtedly have engaged in advanced guided-missile development. Reports indicate they have produced a missile with greater range than V-2. The Russians also captured two German flak missiles—



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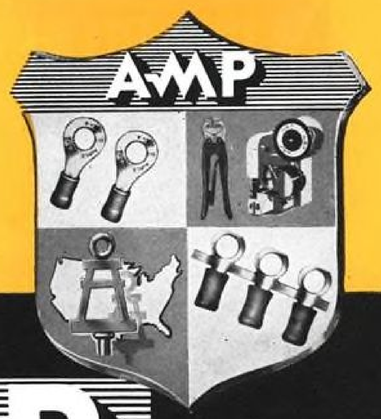

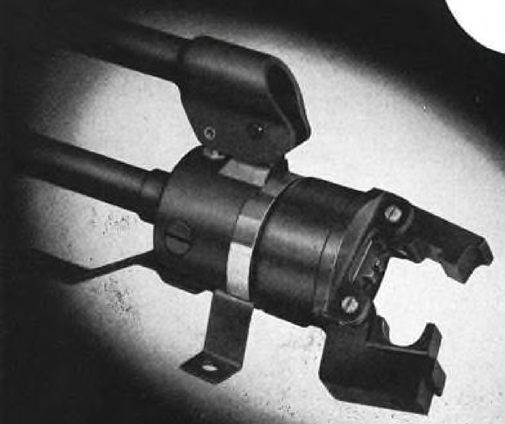

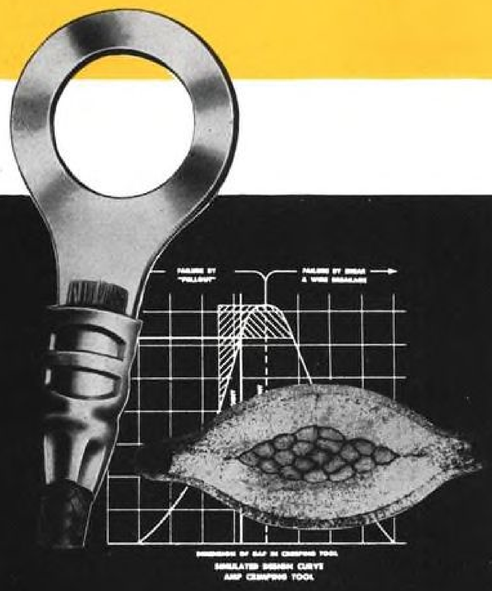

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Taifun and C2—and it appears that these, or Russian equivalents, have been adopted for anti-aircraft defense of Soviet Navy vessels.

Two large, long-range missiles requiring high-thrust (264,000-lb.) rocket engines, and a small 40-mi. range tactical missile reportedly are being developed. There are indications that Russian interest in rocket-propelled spaceships has been quite active recently; Russian articles on travel to the moon and reported plans for a Soviet moon rocket may also be significant.

▶ Application of Analog Techniques to Control Design for Aircraft Engines, W. C. Shaffer, Wright Aeronautical div., Curtiss-Wright Corp.

Wright Aeronautical has been developing analog techniques for the last five years, and has used analogs extensively for the solution of control problems for jet engines. The principal equipment used has been of the highspeed electronic type developed by G. A. Philbrick of Boston. Mechanical and pneumatic analogs have also been used.

The discussion is limited to a resume of applications of the highspeed electronic analog at Wright.

As a research tool for the investigation of control theory and application, the analog reigns supreme. Also, it has been an excellent means for training control engineers. It has simplified the design of control circuits.

Analogs investigate the causes for apparent control malfunction, and have been used by Wright for study of stress, vibration, thermal and trajectory problems. Techniques currently being developed are demonstrating great utility and promise even more for the future.

▶ Determination of the Pressure-Time Curve for Motors of Gun-Launched Rockets, Eric F. Lype, Armour Research Foundation, Illinois Institute of Technology.

Gas pressure in the motor chamber of a gun-launched rocket during its travel through the gun is determined by the amount of gas produced by the burning propellant in the motor and by the amount of gas flowing through the orifice of the motor. This flow is directed first from the gun barrel into the motor, and later from the motor into the gun barrel.

Application of the Law of Conservation of Energy to the gas in the rocket motor permits, in conjunction with the burning law for the rocket propellant, the equation of flow through the orifice and the equation of state, establishing the differential equations for pressure and temperature of the gas in the motor chamber.

By integration, various types of pressure-time curves are obtained showing the characteristic appearance of the experimentally obtained curves.

▶ Telemetry Instrumentation for Rocket Flight Tests, R. P. Haviland, Aeronautics and Ordnance Systems divisions, General Electric Co.

Instruments for operation with the Hermes telemetry system are described. (The Hermes system accepts input signals from 0 to 5 v. d.c. Thirty channels are provided, of which two are used for recorder synchronization, and one to three for calibration monitoring. Sampling rate is 33 per second.)

The author describes pressure, acceleration, temperature, position and velocity sensors, and monitors and isolators.

▶ The Effect of Chemical Reactions Upon Predicted Performance of Rocket Motors, Dr. R. L. Potter, Bell Aircraft Co.

It has been shown how the equations governing steady fluid flow are modified by chemical reaction. A lengthy method is outlined for obtaining a complete solution to these modified equations.

An approximation is introduced whcih gives a valid description of events taking place according to the modified equations over a part of the rocket nozzle. It has been shown how to obtain the exact solution by a repeated use of this approximation.

It is found that the mass velocity at the throat of a rocket nozzle is the local velocity of sound in a reacting gas mixture. For given temperature and composition, the velocity of sound in a reacting gas mixture is less with reaction than without.

A method for computing adiabatics for the reacting gas mixture is given, again by using the approximate forms of the equations.

Finally, a criterion is presented which will enable one to see whether chemical equilibrium in an expansion helps in the thrust.

PRODUCTION BRIEFING

► **Consolidated Industries, Inc.,** West Cheshire, Conn., has installed new aging furnaces to increase by 100% capacity to heat-treat aluminum forgings.

► **Thompson Products, Inc.,** Cleveland, is expected to get the go-ahead from Navy soon to commence construction of an ultramodern jet engine test laboratory at Painesville.

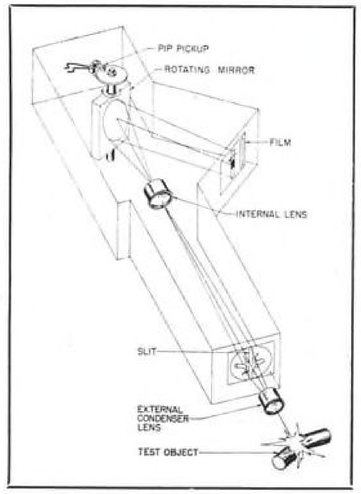
► **Westinghouse Electric Corp.** has received an order for nearly $100,000 worth of additional electrical equipment for Thule AFB, Greenland, from North Atlantic Constructors, Norfolk, Va.

► **Boeing Airplane Co.,** Seattle, has awarded a contract to the division of industrial research, Washington State College, to conduct development in production of precision castings for the Boeing gas turbine.

► **Aviation Products Co.,** Wichita, has been appointed representative of Transco Products, Inc., Los Angeles, in Kansas, Missouri, Oklahoma and Texas for Transco's motor and manually operated coaxial RF switches and motor-actuated and manually operated ram and hot air aviation valves.

► **SPO, Inc.,** and Shellmold & Machine Co., Inc., both of New York, have agreed that SPO's manufacturing and distribution facilities will be available to Shellmold for production and distribution of shell molding machinery and auxiliary equipment.

► **Solar Aircraft Co.** has retained Paul Mantz for flight-testing Solar's small airborne gas-turbine driven auxiliary power units for USAF in Mantz' converted B-25 medium bomber.



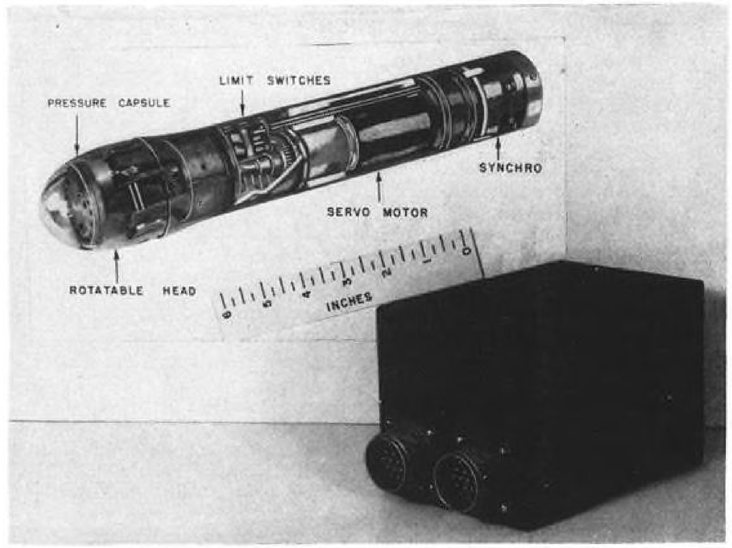
'Smear' Camera Aids Spark, Flash Studies

Explosive, flash and spark-discharge studies can be photographed with a new smear camera developed by Beckman & Whitley, Inc., San Carlos, Calif.

Action of the research tool is based on a mirror, rotating at speeds up to 50,000 rpm., which wipes the test image onto film at a sweep rate of about five millimeters per microsecond.

With this arrangement, the sequence of events taking place is smeared or spread across the film as a plot against time. Interpretation of the test pattern can be facilitated by using separate images of the test made with the mirror fixed. This produces a vertical line on the film which serves as a reference for measurement.

Standard 4 x 5-in. camera film is used. Lenses are color-corrected for 4,500-Angstrom region, are coated, and have a resolving power of 30 lines per millimeter. The stainless-steel rotating mirror is optically flat to one circular fringe and can be rotated from 3,000 to 50,000 rpm. Sweep rate is variable from 0.327 to 5.466 millimeters per microsecond.



BULLET HEAD always points into apparent wind, giving yaw or attack angle.

2-in-1 Unit for Yaw, Attack Angles

High accuracy and sensitivity when operating over a wide speed range is claimed for the new device.

By Philip Klass

Rockets launched from fighters and interceptors head off at approximately the same angle of attack and yaw as the launching airplane has at the instant of launching, regardless of aiming direction. For this reason the fighter gunsight computer and the interceptor fire control computer need to know the airplane's angle of attack (A/A) and angle of yaw (A/Y. This use of such data is in addition to previous applications for cruise control and stall warning.

The fast-growing field of devices to measure and indicate these angles now has a new entry, a servo-driven, balanced-pressure type which can measure and indicate both angle of attack and yaw simultaneously. It is made by the newly formed Young Instrument Co.

▶ **Performance**—Here's what Donald W. Young, the device's inventor, claims for the new unit:

• **Accuracy.** Measures local angle of attack and/or yaw within 0.1 deg.

• **Sensitivity.** Responds to pressure differentials as small as 0.002 in. of water.

• **Dynamic response.** Output signal is flat within 10% for A/A or A/Y variations at frequencies up to ½ cps.; a high-performance version of the device is flat out to 1.8 cps.

• **Lowspeed operation.** Operates at airspeeds as low as 25 mph., which permits its use on helicopters.

• **Highspeed operation.** Has been flown at Mach 0.75, and with proper choice of heads can be used at higher speeds.

• **Useful output.** Provides either synchro or potentiometer type output signal, or both if required.

The new transducer can be furnished as either a single-function device to measure either A/A or A/Y, or as a dual function unit to measure both. For use with gunsight or fire control computers, the system consists of a transducer element and an amplifier.

If visual indication of A/A or A/Y is required, a small panel indicator is added.

▶ **Single-Function Transducer**—The single-function transducer element consists of a fixed boom (attached to the airplane) which supports a pivotally mounted bullet-shaped head. The head's mounting gives it freedom to move vertically (or horizontally if used for A/Y measurement) with respect to the boom. A small d.c. motor in the boom drives the head to keep it always pointed into the apparent wind. As a result, the deflected angle of the head relative to the boom is the desired angle of attack (or yaw).

Two pressure orifices located equidistant of and on either side of the head's center are vented to a small pressure capsule in the head. Inside the pressure capsule a set of contacts is arranged so it will close when pressure at the top orifice is greater than at the bottom orifice; the contacts will open when the reverse is true. The contacts operate through a separate vacuum tube amplifier to cause the motor to position the head to equalize pressures at the two orifices.

The same motor drives a small synchro or potentiometer shaft through an angle proportional to head deflection to generate the A/A or A/Y signal.

▶ **"Hunting Servo"**—In most servo systems, the motor stops when the "null" or desired position is reached. Not so in the Young device. To obtain maximum sensitivity, the motor operates continuously between the contact-open and the contact-closed positions at a frequency of 100 to 200 cps. This hunting frequency is so high, and the amplitude is so small, that it has no adverse effect on a gunsight computer or panel indicator operating from the device.

At first glance the continuous servo hunting action would seem to court contact-life problems. However Young says the contacts carry only 0.5 ma. current.

He adds that the system operated on a B-45 at Wright Air Development Center for a year without difficulty.

▶ **Dual-Function Unit**—The combined A/A and A/Y unit is essentially a combination of two single-channel units. The head is gimbaled to permit both horizontal and vertical motion and it is driven by two separate motors, one for each axis. The rotatable head has four orifices, and the amplifier contains two separate channels.

The single-function transducer weighs 1.8 lb.; its amplifier weighs 4.8 lb. The dual channel transducer weighs 3.3 lb.; its amplifier weighs 5.5 lb.

Young attributes the transducer's good dynamic performance to the following design characteristics:

• **Pressure capsule** is located close to the orifices, thereby eliminating pneumatic lag.

• **Powered servo system** enables the servo motor, rather than slipstream forces, to perform the "horsework."

• **Null system** permits pressure capsule to operate in a comparatively narrow range, resulting in high sensitivity over wide range of airspeeds and angles of attack.

▶ **Other Details**—Thermostatically controlled electrical heater elements are incorporated in the transducer head to prevent binding at low temperatures. Young says his system has operated at temperatures of —38F to 120F and that the pressure capsule has been tested

at 180F with no ill effects.

The servo amplifier for each channel consists of a 6SN7 voltage amplifier and two thyratrons operated push-pull. The amplifier requires 115 v. 400-c. and 28-v. d.c. power.

► **Interesting History**—The new device was developed by Young for wind-tunnel use while he was employed at the Wright Air Development Center in Dayton. The government obtained a non-exclusive royalty-free license to the device but government policy enabled Young to retain and exploit his personal patent rights.

To do this, Young has raised capital and formed the Young Instrument Co. He says that the company is tooled for production on both single- and dual-channel units and can offer 90-day deliveries.

Company address: P.O. Box 176, Station A, Dayton, Ohio.

PAA Finances Monrovia TVOR

Pan American World Airways' terminal omnirange (TVOR) station, believed to be the first airline-financed installation of its type, is expected to go into operation within 60 days at Roberts Field, near Monrovia, Liberia. The installation is a high-powered version of the TVOR developed last spring under Air Transport Assn. sponsorship.

PAA lost a Constellation at Monrovia in June 1951 during an instrument approach using Monrovia's low-frequency radio beacon which suffered interference from the nearby beacon at Dakar. The new TVOR replacement, operating in the VHF band, is expected to prove a more useful and dependable navigation aid, particularly during the frequent tropical storms.

► **High-Powered TVOR**—The PAA installation is a TVOR in the sense that it is installed at the runway intersection, permitting its use for instrument approaches as well as for en route navigation.

The equipment resembles the CAA omniranges (VORs) in that it has a full 200 watts (compared with 50 watts for the regular TVOR. Another difference is that the PAA station will have dual equipment with provision for automatic switchover in event of failure.

► **Alford Antenna**—Location of the TVOR at the runway intersection is made possible by the use of an Alford slot antenna which keeps total equipment "shack" and antenna height under 15 ft. A PAA spokesman says that the normally exposed antenna slot has been covered with a plastic material to keep out torrential rains experienced in the Monrovia area.

Wilcox Electric VHF transmitters will power the new TVOR; Maryland Electronics Co. is supplying the goniometers. All equipment has been treated to withstand tropical environment, according to a PAA spokesman.

GE Designs Rugged Radar TR Tube

General Electric has announced a new tube for X-band airborne radar whose all-metal construction increases tube strength and reduces tube weight.

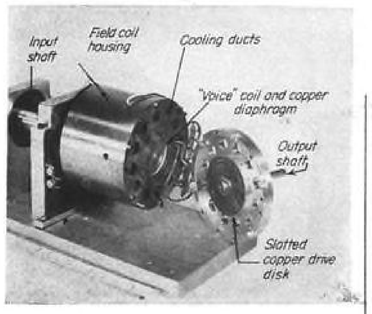
The new tube is a TR type. (TR tubes are used to decouple the radar receiver from the common transmitting and receiving antenna during transmission to prevent transmitter output from damaging the sensitive receiver.)

Designated the GL-1B24-A, the tube

is an integral-cavity, tunable type designed for pulsed microwave circuits which don't require a fixed electrical position for the short-circuit.

GE says the GL-1B24A may be operated with 100-kw. peak power transmitters and that it has a recovery time of four microseconds, with 3-db. attenuation, at 10-kw. peak. Leakage power is listed at 30 milliwatts. The tube weighs ¼ lb. and can be operated from 8,490 to 9,600 mc.

Tube Dept., General Electric, 1 River Road, Schenectady, N. Y.



Fast-Acting Clutch Developed by NBS

National Bureau of Standards has developed a new fast-acting magnetic clutch for instrument servos or control systems such as are used in highspeed computers.

It develops its maximum output torque in less than a third of a millisecond. The device, called a "loudspeaker" clutch because it uses a moving coil element similar to a loudspeaker voice coil, was developed by Jacob Rabinow who, several years ago, developed the fast-acting fluid magnetic clutch at NBS.

The clutch is a low-torque device. Rapid clutch response is made possible by low inertia of the moving element which engages the input and output shafts, and by a compensating coil which reduces the inductance of the actuating coil. This permits rapid build-up of the actuating coil's magnetic field, which in turn engages the magnetic clutch.

The present experimental NBS loudspeaker clutch delivers 10 in. oz. maximum torque. When 300 v. are applied to the actuating and compensating coils and to a third coil—the permanent field winding—the output shaft begins to move within 0.2 millisecond and reaches full speed in 0.3 millisecond, NBS says. Response goes down slightly with lower field voltages. Initially high field voltage needed for fast response must be reduced immediately after engagement to prevent burnout of the coils, NBS warns.

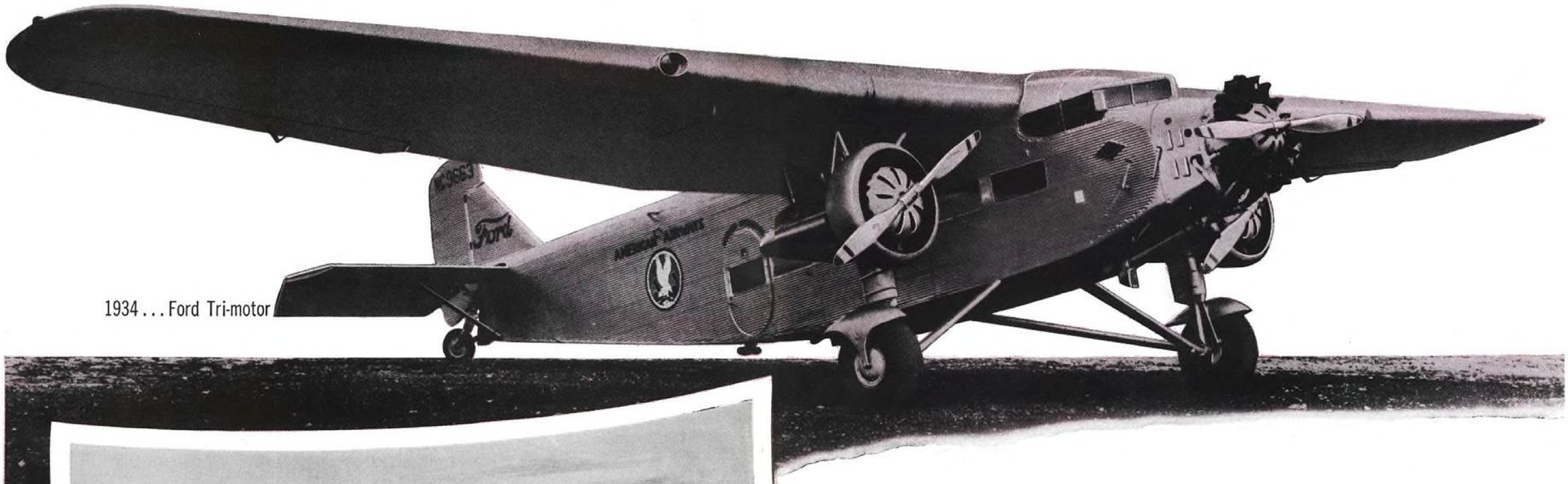
FILTER CENTER

► **Cooling Design Manuals**—Design manuals to help engineers design adequate heat transfer provisions into electronics equipment are being prepared by Cornell Aeronautical Lab under BuShips contract. CAL has made a nationwide survey of heat transfer techniques in current use as part of program.

► **Airline DME Tests Begin**—TWA, American, Eastern and United are installing CAA-loaned DME (distance measuring equipment) for operational tests on the Chicago to New York airways which are now equipped with DME ground stations. Each airline received two sets, one for use as a spare.

► **HUP-2 To Use M-H Autopilot**—Piasecki has ordered more than 50 of the new Minneapolis-Honeywell E-12 helicopter autopilots for use on its Navy HUP-2s. This plus previous $4.5 million order from USAF for Piasecki H-21 autopilots establishes M-H firmly in the new helicopter stabilization field.

► **Antenna Company Moves**—Dorne and Margolin, a firm which specializes in high-frequency antenna development, particularly for aircraft use, has moved to a new plant in Westbury, L. I., N. Y.



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Helicopter Mail Rings Bell in Chicago

- **PO shows airmail rise since service started.**
- **HAS lauds reliability of its six 47Ds.**

By George L. Christian

Chicago—In three years Helicopter Air Service has operated its six Bell 47D helicopters 19,000 hours and flown over 1,000,000 revenue miles without scratching a machine. And it has completed 96% of its schedules—no mean feat in the Windy City.

The Bell is proving to be a highly reliable machine, C. W. Moore, HAS' vice president, operations, says. "We haven't lost a mile due to mechanical failure in at least six months," he says. This is particularly significant because HAS' Bells, with one exception, are the oldest 47Ds in operation. Each of its machines has accumulated over 3,000 flying hours.

►**PO Happy**—The Post Office is enthusiastic about HAS' service. Edward P. Freeman, assistant general superintendent for air, 6th Division, told AVIATION WEEK that helicopter service in the Chicago area has increased airmail from suburban post offices 60-65% since service was inaugurated in August 1949. Evanston, Ill., largest town on the operator's route, showed a 93% increase in one year.

HAS helicopters pick up and deliver mail thrice daily to 33 cities and towns which serve 50 post offices. HAS operates an additional 18 daily roundtrip shuttle flights from Chicago's Midway Airport to the downtown 13-story post office. The copters make the trip in 10 min. (opposed to about one hour on the ground).

As to the advantages of helicopter mail delivery, Freeman estimated that the service expedited morning mail delivery some 24 hours. HAS' own estimate was a saving of from six to 36 hours. On special occasions, such as holiday weekends, two to three days may be saved.

►**Stripped for Action**—As HAS began operating its Bells, it found some changes and improvements desirable to make the machines more suitable for the particular job at hand. These are some modifications initiated by HAS:

• **Enlarged side bins** by four inches, increasing capacity about 30%.

SNOWY ROOF atop Chicago's 13-story post office is hub of HAS' copter routes.

GRASSY CIRCLE above is typical of Helicopter Air Service's suburban heliports.

• **Removed co-pilot's seat,** making room for 100 lb. of mail up front.

• **Installed rear bin** where another 60 lb. of mail may be carried.

• **Improved the harness.** HAS installed Packard Electric ignition harnesses in place of the original installation. The Packard equipment saves about five pounds, 50% of harness weight; it is easier to maintain, and costs only 25% as much as the original harness.

• **Installed duct zipper** to simplify spark plug removal. Previously a cloth air duct leading from cooling fan to oil cooler made removal of three spark plugs difficult. Better accessibility is particularly important when you remove plugs every 25 hours, as HAS is now doing.

• **External power supply** may be tapped into an HAS-installed electrical plug for starting the engine.

• Automatic fuel pump switch was in-

BELL 47Ds, with compact main rotors, do not take up much room in the hangar.

stalled to prevent sudden loss of power should the main fuel pump fail. Switch automatically starts the auxiliary pump if carburetor fuel pressure drops to 2 psi.

• **Heating system** for the bubble-enclosed cockpit was simplified. HAS ducts the heat rejected by the oil cooler to an opening in the upper rear of the cockpit. Heat is also directed upward on bubble to act as a defroster. A butterfly valve dumps heat overboard when not needed. The system incorporates no motors, has only one valve and weighs one pound.

• **Replaced wheels with skids.** The simple skid installation saves 45 lb.; requires less maintenance because there are no tires, bearings or shock absorbing mechanisms to take care of; gives increased safety in case of a forced landing—wheels dig into pot holes or soft ground and may flip the copter over.

• **Removed boom covers,** lightening the craft by 20 lb.

Maintenance

Generally speaking, HAS is pleased with the reasonable maintenance requirements of the Bell helicopter. D. S. Angstadt, superintendent of maintenance, like the 47D's compact twin-bladed rotor which takes up only 10 feet of hangar room in width. He says the machine is straightforward and accessibility is good.

HAS is very conscious of parts retirement—each part is numbered and closely watched to make sure it is retired immediately when its time runs out.

► **Plug Problem**—Initially, HAS had chronic spark plug troubles—they are responsible for the current 25-hr. mandatory plug check. Major problems, according to Moore, were missing, backfiring and plug fouling.

These are the steps HAS took to remedy the problem:

• **Winterized the engine** by covering louvers in the engine compartment housing. This prevented blower cooling air from escaping too rapidly and kept engine warmer.

• **Changed plugs** from RC88S platinum electrode to AC47 massive electrode plugs. Considerable improvement was noted.

• **Put Shell's anti-fouling** additive, TCP (tricresyl phosphate), in the fuel. Program, started last August, calls for adding TCP in the proportion of one gallon to 1,000 gal. of fuel. HAS does its own mixing in its fuel trucks. Objective of the program is to increase spark plug inspection time from 25 to 50 hours. Results to date have been difficult to evaluate, according to Moore. One reason is that HAS had its plug troubles pretty well licked before the TCP test started, Moore says, so there was little room for improvement.

Moore adds that TCP shows no adverse effect on engine parts. He expects that it will be possible to evaluate TCP's effect on plugs after more time has been accumulated.

► **Main Rotor**—Angstadt is pleased with the Bell's main rotor. Units have gone 2,500 hr., a long time for such a unit, he says. And the wood construction is good, because incipient failures are easy to detect.

Makeup of the blade, from leading to trailing edge, is: laminated birch over a steel core, spruce, balsa and a spruce trailing edge. The spruce spars are set with grain running at 90 deg. to each other. To assure matching of each pair of rotor blades, Bell makes their spruce spars from the same piece of wood, thus making certain the wood in each blade has the same specific gravity, water content, etc. Balsa ends at two-thirds of length of the blade are replaced by spruce. The leading edge is protected by a stainless steel sheath and the whole blade is covered with Fiberglas cloth.

► **Tail Rotor**—HAS is having trouble with the tail rotor. Main problem is cracking of the steel leading edges. One rotor, for example, had to be pulled with only 83 hours on it.

Another headache for HAS is cracks appearing in plastic bubble and door. Replacements are expensive.

Communications equipment in the copters consists of a dual VHF transmitter—one for company frequency, one for the tower—and a receiver.

HAS tries to keep dual spare units of all major components, such as power packs, rotors, etc., for quick replacement in case of failure.

Engine and airframe major overhaul period now stands at 300 hours.

Operations

HAS operates three routes around suburban Chicago, in addition to a shuttle service between airport and post office.

• **Route A** stretches north, partially along Lake Michigan, taking in Evanston and Winnetka, has its northern terminus at Waukegan, and swings west as far as Barrington. Total stops—12; scheduled flying time—2:05 hr.

• **Route B,** the western segment of HAS' route, serves West Chicago, Elgin, Geneva and Aurora. Total stops—12; scheduled flying time—1:55 hr.

• **Route C** loops south, taking in East Chicago, Gary, and Joliet. Total stops—12; scheduled flying time—2:00 hr.

• **Shuttle** from the airport to Chicago's Main Post Office downtown makes 18 roundtrips daily. Starting at 7:20 am., the Bells hop back and forth on a tight schedule, 10 minutes from point to point and five minutes on the ground.

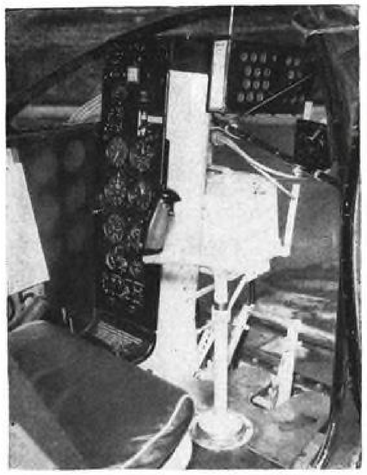
Five of the 18 trips allow longer turn-arounds for refueling and other purposes.

► **Statistics**—Here are some operating statistics revealed by HAS for September 1952 and September 1951. The 1951 figures are in parentheses.

• **Pounds carried**—270, 824 (240,058).
• **Revenue hours flown**—638:20 (467:10).
• **Miles scheduled**—34,901 (26,893).
• **Miles flown**—34,901 (26,893).
• **% performance**—100 (96.8).
• **Ton-miles carried**—2,567.3 (2,100.9).

Helicopter average payload factor is about 40% and utilization has moved up from 2:56 hr. to 3:33 hr. Utilization is cut sharply because there is no night flying. Each copter averages about 130 hours of flying a month. One machine is always in the hangar for a major overhaul.

► **Payload**—Maximum allowable gross



HAS removes co-pilot seat from 47Ds.

weight of the 47Ds is 2,350 lb.

HAS figures the crafts' payload this way: Average ship weighs 1,575 lb. empty; two gallons of oil add 15 lb., and 33 gal. of fuel another 198 lb.; add the actual weight of the pilot and subtract the total from 2,350 lb. and you have the available payload.

Since fuel consumption is approximately 1 lb./min., the craft's payload increases about 60 lb. for every hour flown without refueling.

From a practical point of view, the copters have a maximum payload of about 400 lb. on Routes A, B and C.

This is about all you could squeeze into the four compartments' total area of 45 cubic feet with the average density of mail of somewhat over 10 lb. per cubic foot.

Shuttle flights taking off from the post office are restricted to a maximum payload of 350 lb. because of the hazard of a 9-foot wall surrounding the post office roof.

Maximum load on inbound shuttle flights is fixed at 400 lb. because the tight schedule does not permit figuring exact payloads for each trip.

▶ **Demonstration Flight**—This reporter took a ride to the post office in a newly acquired 47D which still had the co-pilot's seat in it. We "taxied" from HAS' headquarters across the airport to the field post office. "Taxiing" was done at altitudes varying from six to 10 feet. Helicopters maneuvering around the field at these on-the deck altitudes are treated as taxiing aircraft by the tower. The flight from airport to downtown took seven minutes. We flew formation with another HAS ship delivering mail.

Cruising altitude was about 800 ft. and we indicated about 75 mph. Moore, the pilot, said that the bins slowed the copters down about 15 mph. Landing on the roof, 238 ft.

above the street, was smooth in spite of gusts of 40 mph.

From there, the flight went to a typical HAS heliport in the suburbs. The heliport is a wire-fence enclosed circle some 150 ft. in diameter, equipped with reflectors and a wind Tee. Upon return to the airport we tried an autorotation landing from about 600 ft. When power was cut, the copter dropped at 1,800 ft./min. with 40 mph. forward speed. Flare-out seemed easily accomplished and the machine touched down with an almost imperceptible jar and practically no forward speed.

▶ **Weather Limits**—Weather restrictions for HAS operations are: 500-ft. ceiling and ½-mile visibility at the post office. Elsewhere, minimums drop to 300 and ½. In fog and haze, visibility limit is ¼ mile.

HAS has studied the idea of night flying and come to the conclusion that night operations are not practical with the 47D. Added equipment would seriously cut into the craft's payload; electrical system would be badly strained to handle added load of landing lights; additional gyro instruments cost and weigh a lot. But HAS recognizes that night flying would be a definite improvement in its service.

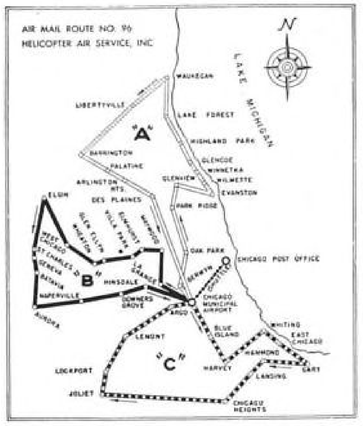
▶ **Larger Copters**—The company is seriously considering bigger equipment, possibly the Sikorsky S-55, a copter now in service on Los Angeles Airways and New York Airways. Not only would the S-55 make night flying practical, considerably improving airmail service and helping increase helicopter utilization, but it would permit route extension and possible passenger carriage. None of these developments is practical with the existing Bell because of its small size, Moore believes.

The availability of larger equipment which will permit the expansion of airmail deliveries and the carriage of passengers will govern the growth of copter service, T. H. Reidy, HAS president says. He feels that the S-55 will serve nicely as an interim machine, but says that passenger helicopters must eventually be twin-engine craft with acceptable single-engine performance.

▶ **Into the Future**—Reidy sketched these ideas for HAS's future development—all keyed to the availability of larger equipment. He intends to apply to the Civil Aeronautics Board in the near future for permission to initiate service in the Detroit and Cleveland areas. When these services have been established, they will be linked with each other and with Chicago, fulfilling what Reidy believes is the ultimate destiny of the helicopter—area service in large metropolitan districts and their suburbs, linked by feeder service. He feels that similar development will be accomplished on the East and West Coasts.

Currently, HAS receives $1.4925 per mile for hauling mail the first 30,000 miles, then 65 cents for each additional mile. (According to CAB Docket #5514, LAA's rates are $1.76 for the first 30,000 miles, then 81 cents a mile. LAA has only recently put its large S-55s in operation.)

HAS is a small company—total number of employes is 47 and average monthly payroll is about $12,000. But copters will grow, Reidy says, and so will Helicopter Air Service.



Chicago copter routes operated by HAS.

C-124s Get Solar Turbine Power Sets

A new source of auxiliary electrical power for Douglas C-124 Globemasters will be an airborne gas turbine-driven generator set, according to the turbine's manufacturer, Solar Aircraft Co. The company says it has received a large production order (over 100 units, with contract price running into seven figures) for the compact sets.

The units develop 45 hp., weigh 230 lb., measure about two feet to a side. They are started with a push-button. The turbine uses the same fuel as the plane's engines.

Designated MA-1 by the Air Force, the generators will be used to supply power to operate cargo hoists, cargo doors, etc., avoiding the necessity of hooking in outside power or running the main engines. When the plane's engines are operating too slowly to give necessary current from main generators (when taxiing, for instance), or under emergency conditions, the MA-1 will supply power.

Solar says that the turbine is also being considered for a variety of other applications, such as power for land and water vehicles, and as a source of heat.

Western Converts Convair Engines

Western Air Lines is undertaking a double-barreled powerplant standardization program, converting all its Convair R2800 Pratt & Whitney Aircraft engines from the CA-18 to the CR-16 configuration installed in airline's new DC-6B fleet.

The carrier also is installing a common type Bendix-Scintilla low-tension ignition system on all its R2800s.

The engine conversion program primarily is a change of the supercharger section that permits the engine to develop full power up to 4,000 ft. Expected benefits are:

- **Increased maintenance efficiency** and economy.
- **Uniform engine overhaul procedures.**
- **Reduced number** of spare engines and engine parts.
- **Increased payload potential** for the Convair-Liners.

The conversion program is scheduled for completion in early 1953 when Western plans to start its DC-6B service.

GIANT CHUCK

Safer machining of jet turbine wheels, disks and rings, is said to be made possible with this new giant chuck for rigidly holding large work pieces of small cross section in place. It is designed to guard these critical parts against distortion and harmonic vibrations encountered in highspeed machining operations. Manufacturer is Cushman Chuck Co., Hartford, Conn.

'Skygalleys' For American's DC-6As

A new Skygalley, created for American Airlines DC-6A cargo planes, is being designed and built for the carrier by REF Manufacturing Co. The galley will serve 12 people. It is 15 in. wide, 19 in. deep, 58 in. high.

Of aluminum and stainless steel construction, the unit will fit on the forward side of the DC-6A crash bulkhead without modification to the plane. It incorporates two one-gallon liquid containers, one of which is electrically heated. Also included are storage space, a generous size meal carrier, hot food oven, cup disposal drawer and waste bin. Construction is said to be rattle-proof.

The Skygalley is also adaptable for private and executive aircraft. REF's address: 395 Jericho Turnpike, Mineola, L. I., N. Y.

Stabilized CB for Fire Extinguishers

The incorporation of a corrosion inhibitor with CB fire extinguisher fluid prevents the fluid from corroding aluminum, according to the manufacturer, Walter Kidde & Co.

Previously, low points in aluminum tubing where CB accumulated after actuation of the plane's fire extinguishing system might be corroded through in a few hours. This necessitated the use of stainless steel in some parts of the system, canceling some of the weight-saving advantages of CB fluid.

The inhibitor chemically stabilizes the fluid and permits full use of aluminum tubing. Since it takes only half as much CB as CO_2 to do the same job, according to Kidde engineers, the weight-saving is considerable.

CB fluid has replaced CO_2 in military craft and is gaining favor with commercial users, the makers say. The inhibitor has Wright Field approval.

and is being incorporated in all CB fluid now being shipped.

Walter Kidde & Co., Aviation dept., Belleville, N. J.

Small Servo Motor

Servo motors small enough and powerful enough for aircraft and guided missile applications have been announced by G-M Laboratories, Inc. The motors are made to fine tolerances, and are designed to meet rigid military specifications with regard to humidity, altitude, vibration, temperature and other demands.

Unit illustrated is 1.7 in. in diameter. 1¾ in. long. It is available in stainless steel housing or aluminum, and for frequencies as high as 800 cycles. Stall torque is about 2 in. oz. and the output shaft can be supplied with or without an integral pinion.

G-M Laboratories Inc., 4300 N. Knox Ave., Chicago 41, Ill.

OFF THE LINE

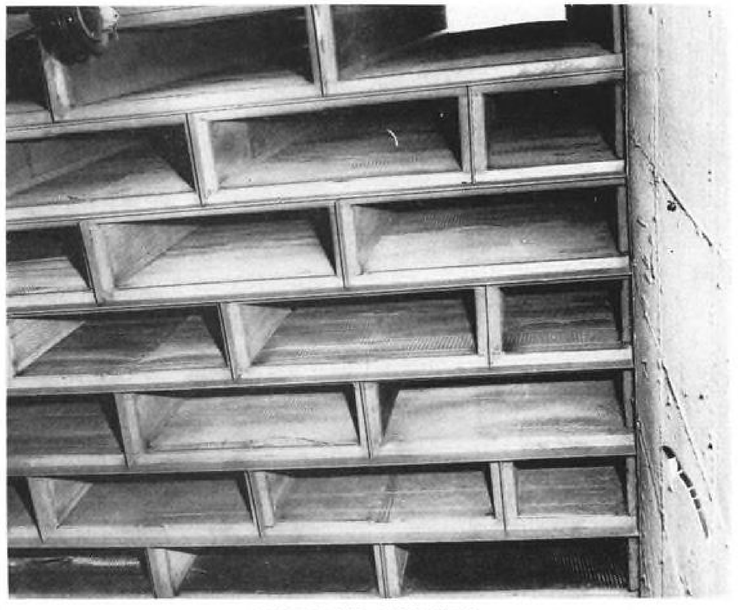
High cost of living shows up in some figures Northwest Airlines recently released that detail the price of furnishings for a modern airliner—in this case the Boeing Stratocruiser: seat ash tray—$14.40 (75 per airplane); ash tray fittings—$116; drinking glass holders—$6.77; stairwell retaining rope—$11; stairwell handrail—$70.75; seat arm rest—$192; seat covering—$40; luxury compartment chair—$1,192.

Outrigger landing gear struts tucked into the twin-jet pods of Boeing's speedy B-47 bomber have a total stroke of 24 in.—quite a distance for oleos to travel.

Douglas Aircraft has found that Teflon hydraulic system seals are a little hard to install, especially in larger sizes such as used on landing gear struts. But with a little patience, the job can be done satisfactorily, the company says.

Vickers, Inc. experiments with 5,000-psi. aircraft hydraulic systems have suffered development troubles, as might be expected when dealing with such extreme pressures, but one pump has operated 300 hr. without visible damage, according to the manufacturer. No Vickers 5,000-psi. pumps are yet on the market, says the company.

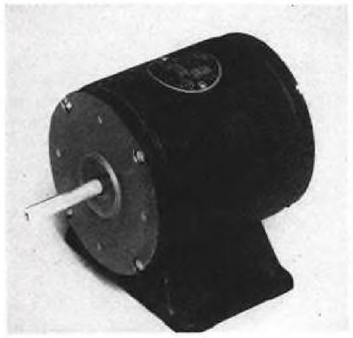
American Airlines has tried adding 5% dye to its planes' hydraulic system fluid to simplify leak detection, but tests have been unsuccessful because no dye trace was left when fluid ran off.



TOPLESS TOWERS

Dallas Airmotive, Inc.'s new H-shaped engine test building at Love Field, Tex., has one of these roofless towers at each of its four corners. Five-inch steel and fiber glass panels line the walls for sound-deadening. Each side of the H houses a tunnel 52 ft. long by 16 ft. high by 16 ft. wide. A large engine mount is suspended in the center of each tunnel by cables anchored in rubber shock absorbers. Exterior and dividing walls are of reinforced concrete, 12-in. or more thick. Engine under test draws air in through tower at one end of tunnel and discharges it up the other. Design is by W. P. Ramsey.

NEW AVIATION PRODUCTS

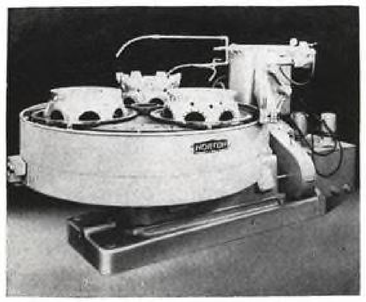


Aircraft Motors

Four electric motors designed to give continuous power in general systems of military aircraft systems have been developed to Air Force specifications by Mission Electric Co., Inc.

The Series 33N motors weigh slightly more than 15 lb. and operate on single-phase, 60-c., 115-v. a.c. current.

Mission Electric Mfg. Co., 132 W. Colorado St., Pasadena 1, Calif.



Lapping Machine

A machine for rapid lapping of large metal parts has been developed by the Norton Co.

The Norton 60 single-face flat-lapping machine is equipped with a segmental, bonded abrasive lap of 60-in. diameter, and can be used for working metal parts. It produces a smooth surface, free of grit or embedded abrasives.

The finish left by the machine saves cleaning the machined parts subsequent to milling or drilling, Norton says. Moreover, the bright finish needs no polishing to make it suitable as a seal or wear surface.

Norton Co., Worcester 6, Mass.

Hot-Cold Test Unit

A series of freezing and cycling units for rugged climatic testing of aircraft parts at low and high temperatures are

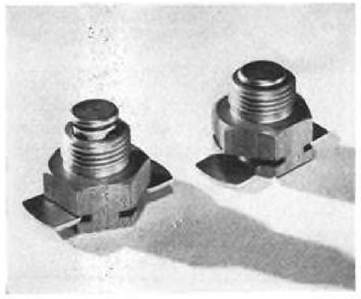
being produced by Webber Appliance Co.

The company has 36 standard models, some capable of dropping temperatures to −165F. The manufacturer reports that the low is reached in a relatively short period. Aircraft parts have been put through a temperature cycle of from 200F to −80F in one hour and 45 minutes under controlled conditions, the firm says.

For freezing treatment, Webber is producing cabinets large enough to handle aluminum sheet after removal from heat-treatment tanks to prevent age-hardening. Smaller units are available for rivet storage.

The firm claims the cabinets also increase the life of highspeed cutting tools by 400% through cold treatment. Webber says the freezing further hardens the crystalline structure of tools after heat treatment, raising the tensile strength and virtually eliminating flaking at the cutting edge.

Webber Appliance Co., Inc., 2740 Madison Ave., Indianapolis 3, Ind.



Drain Valve

A new drain valve is being marketed by Allen Aircraft Products, Inc., for close installations in aircraft engines and operating gear

The valve, designated the 3D100, extends .531 in. from the boss, weighs .075 lb. and is a little over an inch long.

Allen Aircraft Products, Inc., Ravenna, Ohio.

X-Ray Spectograph

A new X-ray spectograph has been developed for rapid and precise measurement and identification of thin deposits and films on stainless steel and component metals.

The manufacturer, Research & Control Instruments Division of North American Philips Co., Inc., says the spectrograph will make possible improved control in applying protective coatings to metals.

The instrument employs tungsten radiation and a special analyzing crystal with newly developed optics.

The company claims the spectograph will give more efficient solutions to

machine friction problems, allowing studies of the transfer of metals or the formation of superficial alloys under heat and pressure and the degeneration of bearing surfaces from chemical interaction with lubricant elements.

In metallurgy, the instrument will make possible studies of molecular or atomic migration between surfaces—especially between metal laminations.

The firm says the instrument gives a faster analysis than chemistry techniques and does not damage films or deposits taken from metals for analysis.

Research & Control Instruments division, North American Philips Co., Inc., 750 S. Fulton Ave., Mt. Vernon, N. Y.

Chemical Coatings

Chemical coatings to protect aircraft metals from scaling in intense heat and from water corrosion are being produced by Markal Co.

Markal's S-R heatproof coating is being used on exhaust stacks, blowers and mufflers—protecting the metals from scaling and corrosion in temperatures up to 1,850F, according to the manufacturer.

The D-A coating will withstand corrosive conditions caused by steam, salt spray, hot acids and mild alkalies at temperatures up to 600F, Markal says.

Both coatings may be applied by spray, brush or dip.

Markal Co., 3050 W. Carroll Ave., Chicago 12, Ill.

ALSO ON THE MARKET

Nu-Cup set screws are said to hold tighter although screwed no tighter than others, giving greater resistance to shaft reversal, especially where soft metals are involved. They are designed to make a fuller contract, with locking pressure distributed over a wider area on shaft. Set Screw & Mfg. Co., 679 Main St., Bartlett, Ill.

50G aircraft relay for 50-1,000-c. a.c. service and double pole-double throw operation is a long-life, subminiature type weighing only 1.51 oz. It is hermetically sealed with dry air or inert gas and is made by Neomatic, Inc., 9010 Bellanca Ave., Los Angeles 45.

Coded tapes for indentifying fluid lines in aircraft are being produced to recently revised standards of AND 10375. They are made of laminated acetate fiber, high-temperature fiber glass and flexible vinyl materials which are applied to the tubing by a special dispenser. Printed Cellophane Tape Co., 521 N. La Brea Ave., Los Angeles 36.

What JACK & HEINTZ *is doing about...*

Speed in getting planes in the air—off ground or carrier deck—hinges on fast starting.

It's being solved by extremely maneuverable units, delivering power from compact, dependable J&H generators, controls.

Available soon—a new 30-kva alternator to supply a-c for ground servicing of electronic equipment.

Launching an air strike effectively calls for speed and split-second timing. Dependable starting of jets or piston-engine planes is at the heart of this problem. Highly maneuverable, compact ground power units now offer controlled current ample for starting and servicing even the largest aircraft.

The development by Jack & Heintz of aircraft-type generators and control systems for these applications has permitted the design of smaller, lighter and extremely mobile units of both self-propelled and trailer-mounted types.

Illustrated is a typical self contained power unit for use on Navy carriers. Its jeep chassis equipped with a special rear wheel mounting provides extreme maneuverability in driving among closely parked planes on a carrier deck.

JACK & HEINTZ

CLEVELAND 1, OHIO

Field Offices: New York City · Washington, D. C.
Dayton · Dallas · Los Angeles · Seattle

MOBILE POWER

J&H UNITS MEET WIDE RANGE OF GROUND POWER NEEDS

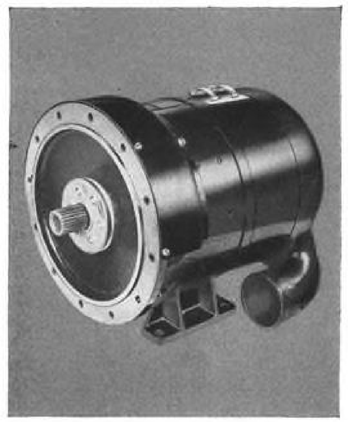
Fitting into the compact, rugged design of these mobile ground power units are a Jack & Heintz Generator and Electrical Control Panel, both offering unfailing performance in any weather and at temperatures ranging from -65° F. to +135° F.

The G32-1 Generator illustrated at right, has a 15 kw continuous rating, but is capable of 30 kw on an intermittent duty basis. The GC23-20 Control Panel, illustrated at right, offers: protection against reverse polarity and current; stable, long life voltage regulators; current regulation; and accurate paralleling.

Anticipating greatly expanded power requirements on these mobile power units, Jack & Heintz recently made available its Model G39 Generator. This 1000-ampere, 30v d-c, 4000/8000 rpm generator will supply 30 kw on a continuous basis—twice that of the largest previous production model, the G32-1 Generator described above. The G39, designed with a high overload capacity, is self-cooled by means of an integral fan, eliminating the necessity for auxiliary cooling equipment.

J&H also has available 400-ampere generators and controls.

Jack & Heintz generators and control panels are used on mobile power units being manufactured by O. E. Szekely & Associates, Beech Aircraft Corp., the Lycoming-Spencer Division of Avco Corp., and Continental Motors Corp.



J&H Model G32-1 Generator—
500 ampere, 30v d-c, 4000/8000 rpm.

J&H Model GC23-20 Control Panel—
closely regulates generator output.

J&H looks to the Future

Alternating current requirements for electronic servicing may be solved by developments under way on our new Model G181 Alternator. This is a 30-kva, 3-phase, 120/208 volt, 4800/7200 rpm machine designed to Specification MIL-G-6099*. It is controlled by our GR181, magnetic amplifier type, Voltage Regulator. This equipment also has air-borne applications.

Panelized system control equipment is available to meet the needs of each of these particular applications.

For additional information, send for our new Generator and Alternator Technical Bulletin #1200 and our Electrical Control Systems Bulletin #1150-1. Write Jack & Heintz, Inc., Department 105. Cleveland 1, Ohio.

**Military specification number as used herein is for the purpose of product identification only, and does not necessarily imply specification conformity.*

Rotomotive EQUIPMENT

Aircraft Generating Equipment—a-c and d-c—including Control Systems and Components • Electric Starters • Actuators and Special Aircraft Motors • Custom-built Commercial Motors • J&H Eisemann Magnetos

AVIATION SAFETY

CAB Accident Investigation Report

Details on NEA Flushing Crash

The Northeast Airlines Convair 240 which landed in Flushing Bay, N. Y., Jan. 14, 1952, when it undershot Runway 22 at LaGuardia Field, was making a visual approach in instrument weather. All aboard the craft were saved. This is CAB's official report:

THE ACCIDENT

Northeast Airlines' Flight No. 801 of Jan. 14, 1952, crashed in Flushing Bay, N. Y., about 3,600 ft. northeast (short) of Runway No. 22 of LaGuardia Field at about 0903.[1] Five of the 33 passengers were seriously injured; all others and the three crew members were slightly injured. The Convair, Model CV-240, N 91238, received major damage by impact, immersion and subsequent salvage operations.

HISTORY OF THE FLIGHT

Flight 801 originated at Boston, Mass., for LaGuardia Field, nonstop, with a crew of Capt. A. V. R. Marsh, First Officer Austin E. Briggs, and Stewardess Carolyn M. Hull. It departed Boston at 0745, as scheduled, in accordance with Instrument Flight Rules, via Airways Amber 7 and Red 3 to LaGuardia. Idlewild (New York International) Airport was the specified alternate. Upon departure from Boston the aircraft's gross weight was 38,023 lb., with a maximum allowable weight of 39,650 lb., and the center of gravity was within prescribed limits.

The flight proceeded uneventfully at its assigned altitude of 6,000 ft. MSL in instrument weather with almost continuous rain. No actual icing occurred although the aircraft's de-icing equipment was used as a precaution because of the near freezing air temperatures. All required position reports were routine. At approximately 0845, the flight contacted LaGuardia approach control and advised, "Northeast 801 over New Canaan—cleared to New Rochelle." (The flight had been cleared to New Rochelle by ARTC.) Approach control then requested the flight to report over the Port Chester, N. Y., fan marker, and gave it an expected approach clearance time of on the hour (0900), Runway 22, and the 0828 LaGuardia weather, as follows: "Estimated 3,000 overcast, one and one-half miles, rain and smoke. Wind southeast six, altimeter zero-zero-zero" (30.00). The flight reported over Port Chester at 0849 and was successively cleared to descend to 4,500-ft., to 3,500-ft., and to 2,500-ft. altitudes. At 0855 it was cleared to leave New Rochelle, inbound and shortly was instructed to make a 360-deg. turn to assure separation from a preceding aircraft. The flight acknowledged and complied. At 0858 it reported leaving New Rochelle and was cleared for an approach to Runway 22, and at 0859 was told that Ground Control Approach advisories were available on a frequency of 109.9 megacycles. The flight acknowledged, and then was given the 0900 LaGuardia weather; ceiling 1,700 ft. and visibility 1½ miles. Flight 801 reported leaving the LaGuardia range at 0900 and was cleared to land on Runway 22.

There was no further message from the flight. At 0903 it struck the water of Flushing Bay some 3,600 ft. from the approach end of Runway 22. A motorboat operated by the Edo Corp., docked about one-half mile away, reached the site approximately four minutes later. Passengers and crew, who had climbed out through the emergency exits and who were standing on and holding to the fast sinking aircraft, were taken aboard and then transferred to a tugboat that arrived shortly. All occupants were taken ashore and hospitalized.

INVESTIGATION

The pilots were not seriously hurt and it was therefore possible, from their testimony and that of the passengers, to reconstruct the flight's final approach with considerable accuracy. There were no eyewitnesses to the accident.

Investigation disclosed that Capt. Marsh, a company Convair captain and check pilot, occupied the right-hand seat during this flight. His piloting experience was extensive with a total of nearly 14,000 hours, of which nearly 2,400 had been on Convairs. He testified that he had made an estimated five or six instrument approaches to LaGuardia each month during the preceding ten years.

First Officer Briggs was making the approach. His flying experience was also extensive. It incuded 2,800 hours as co-pilot on DC-3s, 300 as co-pilot on DC-4s, 124 as a company DC-3 captain, about 500 as a Navy DC-3 (R4D) captain, and 700 as co-pilot on Convairs. His total piloting time was about 5,100 hours. At the time of this accident he was completing his sixth week flying as a Convair trainee-captain under the supervision of Capt. Marsh. This was in accord with the company's policy of requiring a minimum of one month of such flying before co-pilots are eligible for upgrading. Because there was no captain vacancy immediately available, Briggs had continued in training at his own request. He had a total of 83 hours as a Convair trainee-captain, of which 66 hours had been during the past 30 days. According to the check pilot, Capt. Marsh, he had satisfactorily completed his line flight training for Convairs. The company operation manual requires a minimum of 10 hours specialized training. This is completed after the required 30 days' line training. In this instance, the final check had not been given Co-pilot Briggs but was to be given him before the company formally rated him as a Convair captain. However, he had successfully completed the company's ground training program as set forth in the company's operational manual.

The authorized minimums for a straight-in approach to Runway 22 at LaGuardia for the subject aircraft are 500-ft. ceiling and one-mile visibility. The last report given the flight concerning LaGuardia weather for the 0900 sequence was, "estimated 1,700 broken, one and one-half miles . . ."

The standard range approach calls for passing over the range station, in line with and located 3.2 miles from Runway 22, at an altitude of 800 ft. With landing gear lowered and with wing flaps extended 21½ degrees, the rate of descent would be about 600 feet per minute with the air speed at 140 mph. The intervening distance from range to runway is over water. The crew testified that the range was crossed at 800-ft. altitude, whereupon the landing gear was lowered and the flaps were extended 21½ degrees.

Captain Marsh testified that he first had visual contact with the lights on the approach end of the runway at an altitude of 500 ft., and so advised Briggs, who was making the approach on instruments. Briggs testified that he glanced up, saw no lights, indicated to the captain that he had no visual contact, and continued descent by instrument. Marsh said that he then checked the flight instruments, ascertained that readings were as they should be, including an air speed of 140 mph., and then looked again at the runway lights. This was at an altitude of 420 ft. Again he checked the readings of flight in-

[1] All times referred to herein are Eastern Standard and based on the 24-hour clock.

struments and found them satisfactory, including an air speed of 140 mph. At 300 ft. he once more checked the runway lights and noted that they appeared to rise rapidly and suddenly vanish. Almost simultaneously the aircraft was in the water.

Briggs stated that at no time during the approach did he have ground reference of any kind. He noted the altimeter indicator "going through" 300 ft. and stated that almost immediately the aircraft struck. Neither pilot remembers any instrument reading below 300 ft. Both pilots testified, and the consensus of passengers' testimony concurs, that deceleration after the aircraft had contacted the water was uniform and although strong, was not violent.

Throughout the flight from Boston to the time of the crash there had been no malfunctioning of the aircraft or any of its components, including both powerplants.

Salvage operations were started as soon as feasible. They resulted in recovery of practically all of the aircraft, with the exception of both propellers. Divers furnished by the U. S. Navy were unable to recover these propellers, as the bottom of the bay in that area was littered with debris, including old pilings in exceptionally soft, deep silt.

The possibility of a malfunction causing propeller reversal during the approach was considered. As neither propeller was recovered, it is impossible to preclude absolutely this possibility. However, the testimony of both pilots makes this extremely remote.

Examination of the recovered wreckage failed to reveal any indication of a structural failure or defect of the aircraft proper. Examination of the engines likewise failed to reveal any suggestion that they had not been operating properly at the time of impact. The landing gear was extended and locked at the time of impact and the wing flaps were extended to the approach position of 21½ degrees. The empennage was practically intact and all empennage controls were fully operable. All trim tabs were likewise found intact and operable. All three of those trim tabs were deflected, as shown by their indicators, amounts well within what would be expected for a normal approach.

Although the underside of the fuselage was generally collapsed, the forward portion of this fuselage underside was not comparably damaged, indicating that contact with the water was made in a tail-low attitude. The cabin floor buckled upward under hydraulic loads.

Both altimeters were found set at 30.00, the setting last given the flight. One altimeter had been damaged to such an extent that it could not be functionally tested; the other was tested and proved to be within normal tolerances.

The matter of possible altimeter error was thoroughly explored as a result of this accident. It was developed that there are eight possible ways in which an altimeter can be in error. It is also shown that even if, by the most remote possibility, all eight of these errors had happened simultaneously, and further, if they had been additive, also a highly remote possibility, the total amount of the altimeter's erroneous indication would be put in the order of 110 ft.

Both air speed indicators were found to be within allowable tolerances when functionally tested. Both the captain and the

co-pilot testified that the powerplant settings during the approach were about 2,300 rpm. and 21 in. of manifold pressure, and that the settings were not changed after crossing the LaGuardia range. Both also stated that air speed and rate of descent were approximately 140 mph. and 600 fpm., respectively, during the entire approach. However, the captain testified that the aircraft's nose may have been slightly up just before contacting the water.

Weather reports available to Flight 801 before departure from Boston showed ceiling mostly around 3,000 ft. with other layers above, light rain and fog at many points, surface winds mostly southerly and very light, and winds at the cruising level southwesterly about 20 to 30 knots. The 0725 weather at LaGuardia was: ceiling estimated 3,000, broken, overcast 6,000, visibility 2, light rain and smoke, temperature 43, dewpoint 41, wind SE 5, altimeter setting 29.99. The 0725 weather at Idlewild, the alternate, was: scattered clouds at 3,000, overcast with a measured ceiling of 5,500, visibility 4, light rain and fog, temperature 41, dewpoint 39, wind NW5 and altimeter setting 30.00.

Forecasts for the route, available before departure, indicated overcast with bases ranging from 2,500 to 5,000 ft., gradually lowering in the New York area to 1,500 to 3,000 ft., with tops of clouds ranging from about 7,000 in the New York area to 18,000 at Boston. Visibility was forecast to be generally 2 miles or better with light rain drizzle.

The terminal forecast for LaGuardia was: from 0800 to 1400, ceiling 2,500, overcast, visibility 2, smoke, occasional light rain. The forecast for Idlewild was identical to that for LaGuardia with the exception that visibility was expected to be three miles.

During the descent and approach to LaGuardia an observation was taken that showed the first definite deterioration of weather and was as follows: ceiling measured 1,700, broken, with an overcast at 2,800, visibility 1½, very light rain and smoke, wind ENE 4. This was given to the flight at 0900. Following this the visibility at LaGuardia dropped to one-half mile at 0909 (six minutes after the accident), and the ceiling was reported to be 600 ft. at 0910 because a low broken stratus layer moved over the field. However, at Idlewild, the alternate, the ceiling did not drop below 2,700 ft., nor visibility below one mile, up to and including 0923.

A very low layer of stratus coupled with poor surface visibility lay north of LaGuardia at the time of the approach of Flight 801 and possibly before that time. However, weather reporting stations were unaware of this condition, and its presence had not been reported by any pilot. Surface and low altitude wind at LaGuardia had been light southeasterly but shifted to ENE at 0900 and to N by 0910, causing this low stratus to drift across the airport. It is possible that a continuous watch by a weather observer might have revealed the moving in of the low clouds a little sooner than was reported, but probably not in time to have given it to the flight. This condition of surface weather at the time and place of the crash is well substantiated by passengers, both pilots, and rescue personnel. Their testimony indicates that there was a horizontal surface

visibility of one-half mile or less with no wind, resulting in an unusually smooth (glassy) water surface. Pilot reports from flights operating at LaGuardia shortly after the accident confirm rapid fluctuation of weather conditions. One flight approaching the same runway went to its minimum altitude of 500 ft. and executed a missed approach because of a local and heavy rain shower. On the second approach this flight became contact at 500 ft. and landed at about 0849, 14 minutes before the accident.

Flight 801 was given advisory reports by GCA during its approach. Because the direction of this approach is opposite that of the ILS approach, there is no glide slope provided. The GCA advisories for the subject approach do not include deviation from the desired altitudes, but merely deviations of azimuth at fixed distances from the runway. Such advisories are customarily not acknowledged by the incoming flight. During this approach they were received by the flight, and appropriate corrections in azimuth were made by Briggs. Indication of the aircraft vanished from the GCA scope at a point about one-half mile northeast of the end of Runway No. 22.

ANALYSIS

It was developed during investigation that this accident was of an operational nature with no malfunctioning of the aircraft or its components, or any of the ground aids. Therefore, the following discussion will be confined principally to the operational aspects.

The operating procedures of this carrier are set forth in its Operating Manual. The manual is explicit as to minimum altitudes during approaches. The minimum altitude for a standard range approach, as was being made, at LaGuardia for Convairs of this carrier is 500 ft. There is, however, an additional 50 ft. allowed as an operating tolerance to take care of certain intangible factors. When the flight went below an altitude of 450 ft. on instruments, it was in violation of the company's procedure and consequently of the CAA-approved operating specifications. It was clearly the responsibility of the pilot in command of the flight, Capt. Marsh, not to allow his co-pilot to go below 450 ft. unless the aircraft was being flown visually.

As Captain Marsh stated that he had the runway in sight from 500 ft. on down, it was his duty to take over the flying of the aircraft when Briggs indicated to him at an altitude of 500 ft. that he (Briggs) did not have visual contact, or to instruct him to start a missed approach. To allow the co-pilot to continue a descent on instruments was clearly contrary to the carrier's CAA-approved operating procedure, because the meaning of a minimum altitude is that all flight below that level shall be made exclusively by visual means.

Mention has been made earlier in this report of the possibility of altimeter error, and it was shown how relatively negligible such accumulative error could be. But the fact remains that once the aircraft was below its specified minimum, it should have been flown exclusively by visual reference to the ground, with little or no aid from altimeter readings in making the approach.

Of course there remains the possibility that the aircraft was being flown visually by

Briggs. Adding weight to this possibility are a number of facts which are not to be overlooked. First is the weather. It has been shown that it was deteriorating rapidly at the time and place of the accident. There were clouds and/or fog patches below the 500-ft. level and in the aircraft's path. The nature of the damage to the aircraft, as well as Capt. Marsh's testimony that the aircraft's nose may have been raised slightly just before the impact, strongly suggests that the approach was being made visually by Briggs and that he inadvertently caused, or allowed, the air speed to drop markedly below the specified 140-mph. approach speed, and to near the stall speed with its attendant extremely high sinking rate. This could well account for the similar testimony of both pilots in that neither remembers any instrument readings, including altimeter, during the last 300 ft. of descent. The surface of the water was glassy, limiting its use as a medium of depth perception.[2]

An important psychological factor enters into making an approach under the subject conditions. It concerns the erroneous impression of altitude and is described in "The Sensory Illusions of Pilots," by P. P. Cocquyt, chief pilot of Sabena, the Belgian airline, published by the Flight Safety Foundation, Inc. He writes, ". . . The illusion of flying horizontally with respect to a landmark when flying more nose up than imagined is dangerous because the pilot believes himself to be higher than he really is. The angle at which a pilot observes a point of light on the horizon depends on his altitude and his distance from the point. Evaluation of that angle is not a matter of mathematics but is one of feeling (purely subjective). This illusion may sometimes have serious consequences. In fact if the pilot without realizing it changes the angle of his airplane with respect to its initial position by even as little as one degree, this error translates into differences in altitude of:

- 17.5 meters for a landmark 1 kilometer away.
- 35.0 meters for a landmark 2 kilometers away.
- 87.5 meters for a landmark 5 kilometers away.
- 175.0 meters for a landmark 10 kilometers away.[3]

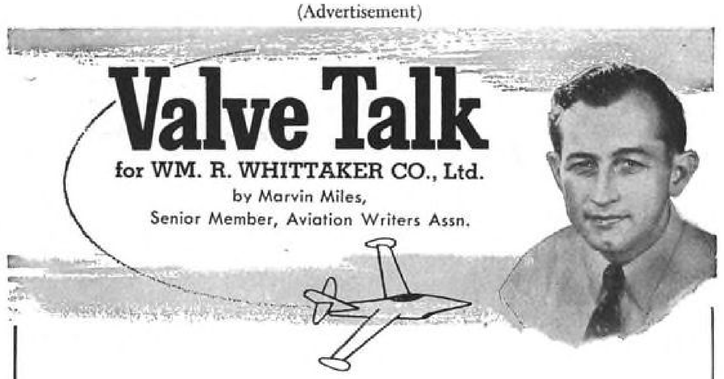
"The illusion cited above must certainly be a cause of many aircraft accidents occurring just before the airplane reaches the airfield, especially when no adequate landmark can be found in the approaches (for example: an airdrome located on the edge of the ocean). . . ."

In the above passage the author refers to a night approach toward a lighted airport, and particularly when this approach is over water. However, this particular accident happened under quite similar conditions, despite its being daylight. The runway lights were on and the last 3.2 miles of approach were over water. Inasmuch as the surface visibility at the airport was being reported as only 1½ miles and was much less at the

[2] Seaplane and flying boat pilots are acutely aware of the dangers attendant to landing on a "glass" surface.

[3] In English units, these figures correspond to approximately 92 feet at one mile, 184 feet at two miles, etc.

(Advertisement)



A new year—and the fiftieth anniversary of the Wright brothers' first flight.

Fortunately or unfortunately my years are insufficient to send memory back to the era of that memorable December 17, 1903, at Kitty Hawk.

So perhaps you'll not mind if, as a Whittaker tribute to aviation progress, I tip my recollections just into the past twelve months. At random, then, and without hoping to touch more than a few of the highlights as they impressed me:

Watching the sleek, F-86D Sabre shatter the world's speed record, on the deck, below sea level . . . atomic aircraft and powerplant developments, with the awesome possibilities that lie ahead . . . long-awaited first flight of the javelin-like X-3 supersonic research plane . . . heated arguments over the new phonetic alphabet.

Sabre kills over the Red MIG in Korea rising to a September climax of fifteen to one . . . the nation's airlines for the second successive year exceeding the country's railroads in first class passenger totals . . . flight of the tiny jet jeep, one-man pulse jet helicopter and its antithesis, the gigantic XH-17 twin-jet Flying Crane. Guarded announcements on jet transport projects, with the majors working like the devil in secret to outrace each other and overtake the British.

The coordinated attack on the administration stretch-out of production schedules . . . the growing discussion of complexity in military aircraft and the trend toward reduction or simplification—or both . . . a B-50 Superfort, its four props feathered, cruising under the thrust of a single J-57 Jet . . . the swept-wing Cougar as successor to the Navy's straight-wing Panther.

Flattops off Korea flying, in two months, more sorties, more tonnage, than any of the carriers in all of World War II . . . industry's pushing of cost reduction programs on all phases of design and manufacture . . . fully automatic GCA under test . . . merger rumors . . . the XF2Y jet seaplane, equipped with water skis, that may bring back water-based fighters to the Navy . . . a tiny jet engine that will give additional boost and prolonged life to twin-engine cargo ships.

The airlines' crackdown on "no shows" with a ticket reconfirmation policy to protect passengers . . . first flight of the A3D swept-wing twin-jet, an extension of the Navy's punch. The new stable of Air Force fighters over-the-hundred mark, F-100, F-101, F-102, F-103, F-104 . . . the delta F-102 ordered as the nation's first supersonic interceptor, possibly the last manned fighter before missiles take over.

The new XF4D Skyray in speed passes and startling landing attitude . . . first flight of the new twin-jet A2J Savage . . . first turbo-prop light plane, the XL-19B . . . latest in ejection seats, fully automatic parachutes and fantastic seat capsules. The big new transports; plush, sectioned interiors, compound engines, more passengers, greater speed, higher efficiency.

Rocket sleds testing man up to forty-five G's in deceleration studies . . . advanced prop design looking toward turbo-prop development up to speeds of 1000 m.p.h. . . . Navy's announcement of the diagonal landing deck upcoming for the Antietam, eliminating crash barriers . . . mice and monkeys rocketed eighty miles into space . . . telemetering for instantaneous ground information on high speed flights.

New automatic pilots to match higher bomber speeds . . . the massive size and strike capabilities of the swept-wing B-52 intercontinental behemoth . . . the all-weather interceptors, Sabre, Starfire, Scorpion, with their enclosed rocket launchers and semi-automatic operation. **Typical jet fighter costs, $179,309 in 1952 as against $26,741 for a piston fighter in World War II.** Air refueling for Navy carrier planes . . . the esoteric and closely-guarded field of guided missiles, the XF-98 Falcon, XF-99 Bowmark, the Snark, the Loki, Hermes, Rascal, Sparrow, Terrier . . . the myriad problems of missile guidance, beam riding, active and passive homing, command, magnetic field, automatic celestial navigation.

These, but a thimbleful of the year's developments, come swarming to mind—along with the men and the genius, the work, courage and the taxpayer dollars that made them possible.

And what of 1953?
Where by 1963?

crash site, the flight had no adequate ground reference, merely lights on the approach end of the runway. Riker's Island was to the right and ahead of the aircraft at its point of contact with the water and only approximately one-fourth mile away. Capt. Marsh, on the right side, stated that he saw the near end of this island, but at best he could have seen it but vaguely and fleetingly; otherwise, he could have used it as a visual altitude reference.

The lights on the approach end of the runway, as reportedly seen by the captain, can well be considered as a single visual reference point because of their apparent close spacing from an aircraft an appreciable distance away. Thus, we have a set of conditions closely simulating those of the above-quoted passage. The captain stated that he could not dismiss the possibility of having had an erroneous illusion of altitude and distance due to weather.

Strong, but not violent, deceleration as described by aircraft occupants seems to be convincing evidence that contact with the water was at a speed far less than the recommended approach speed of about 140 mph. In fact, it seems unlikely that a modern transport with landing gear extended and carrying 33 passengers could be ditched at 140 mph. during a no-wind condition without widespread serious injuries to its occupants.

If we pursue further the hypothesis that Briggs was attempting to make the approach visually, it appears probable that he allowed the aircraft's speed to fall constantly as he eased the control wheel backward. This hypothesis is further strengthened by the nature of the aircraft's damage. The central and rear portions of the underside of the fuselage were completely collapsed, whereas the forward portion of the underside of the fuselage had comparatively little damage. This indicates that the aircraft went into the water in approximately the same attitude as does a flying boat under a practically full stall, tail-first touchdown.

Inasmuch as there was no malfunctioning of any kind, it appears that this accident was the result of the series of events as described in the above hypothesis. The prescribed let-down procedures during a standard range approach are rigid. They include control of air speed by appropriate power settings and degree of flap extension. If the air speed had been maintained, the aircraft could have descended to the level of the runway only on the runway and near its approach end, assuming no change in power settings, as appears to have been the case. It must, therefore, be concluded that an air speed of about 140 mph. was not maintained but was allowed to decrease to such an extent that the aircraft settled rapidly to the surface.[4]

As previously stated, the flight departed from Boston at 0745 and there was attached to the clearance the 0725 weather report for LaGuardia, which was: ceiling estimated 3,000 broken, overcast 6,000, visibility 2, light rain and smoke. The weather at LaGuardia continued to de-

[4] On July 3, 1952, the CAA filed complaints against both pilots, charging violation of CAR Sec. 60.12 (careless and reckless operation) and violation of CAR Sec. 61.272 (failure to comply with CAA-approved landing procedures).

teriorate during the next two hours. The pilot did not request nor was he transmitted directly additional LaGuardia terminal weather while he was en route. The terminal weather at LaGuardia for 0825 was available to the flight by means of the 0845 broadcast. That report was: ceiling estimated 3,000 overcast, visibility 1½, moderate rain and smoke. After the flight had been cleared for approach to Runway 22 by LaGuardia Approach Control, the pilot received the 0900 LaGuardia weather, which was: ceiling 1,700 and visibility 1½ miles. The aircraft struck the water in Flushing Bay at 0903. The weather reports show that by 0910 the visibility at LaGuardia had dropped to ½ mile and the ceiling was reported to be 600 ft.

It was self-evident to the pilot that the weather was deteriorating. However, there was no reason for him to believe that the ceiling was close to minimum until he was on final straight-in approach. He could, of course, have asked for and received the use of the ILS runway. As this report explains, there was no reason for any ground personnel to believe this necessary.

The Civil Aeronautics Board has initiated action with the proper Government agencies, i.e., the Weather Bureau and the Civil Aeronautics Administration, both of the Department of Commerce, and the Air Navigation Development Board, to improve and speed up the reporting of weather conditions on approach paths and at terminals when those conditions are close to marginal and deteriorating as was the case in this accident.

FINDINGS

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

1. The carrier, the aircraft, and the crew were properly certificated.
2. The flight was properly dispatched and cleared according to Instrument Flight Rules.
3. Until final approach at the destination, the flight was routine in all respects.
4. The flight was given, and acknowledged, the 0900 LaGuardia weather and was cleared to land on Runway No. 22.
5. The weather data included a ceiling of 1,700 ft. and visibility of 1½ miles.
6. Authorized minimum ceiling and visibility for the subject approach were 500 ft. and one mile, respectively.
7. Instrument weather was encountered during the approach.
8. The approach was continued visually, despite the instrument weather.
9. Air speed was decreased and the aircraft settled rapidly to the water at 0903.
10. There was no malfunctioning or failure of the aircraft, or any of its components.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the failure of the captain in command to monitor the co-pilot's approach and take corrective action when the aircraft first went appreciably below a normal approach path.

By the Civil Aeronautics Board:

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

Airlines Protest 'Arbitrary' Regulation

- **Scheduled and nonsked carriers form solid front against CAB proposal for reserve "safety" fund.**
- **Companies argue that holding back cash may endanger maintenance and safety expenditures.**

Scheduled and nonscheduled airlines this week will form a temporary, but probably effective, alliance against "arbitrary" government regulation. They will argue before Civil Aeronautics Board Jan. 8 against a new "safety" proposal that would force airlines to keep enough cash available at all times to carry through a hypothetical two weeks' operation without income.

The CAB Safety Regulation Bureau and the Board members themselves have proposed this rule on the theory that the less cash a carrier has on hand, the less safe its operation will be. In an attempt to set up an exact minimum yardstick with which the CAA could administer such a safety principal, the Board proposed the following (Draft Release 52-29):

"Applicant (for an air carrier operating permit) shall show sufficient cash on hand or credit available to him to insure that for a period of at least two weeks all current operating expenses will be met as they come due without regard to income received during such period."

The Board proposes to enforce this rule continually by empowering CAA to suspend operation of any carrier whenever its cash position falls below the equivalent of two weeks' expenses.

However, the airline industry almost unanimously has come out in opposition to such a law, and even suggests that if enforced it would make airlines less safe instead of safer.

▶ **Industry vs. Government**—Air Transport Assn., Air Coach Transport Assn., Frontier, Standard Air Cargo, Northeast, Mohawk, and National airlines already oppose the proposed regulation officially. Here are major points cited in their letters to CAB:

• **ATA.** "At its meeting Dec. 9, 1952, the board of directors . . . unanimously opposed . . . the proposed amendments. . . . They do not believe . . . the Civil Aeronautics Act can be read to include the power to prescribe tests of minimum economic strength as a condition to the issuance or continual effectiveness of an air carrier operating certificate."

ATA adds: "Quite apart from . . . legal authority, it was the consensus that the proposed amendments are unwise . . . purely arbitrary. . . . A carrier . . . might well forego maintenance and repair expenses which . . . would reduce its cash supply below the minimum provided by the proposed regulation."

• **ACTA.** Representing a majority of the nonskeds, ACTA says: "The effect of . . . this regulation may defeat its very purpose. . . . A carrier will be tempted to husband its cash reserves to meet the proposed requirement and stay in business. . . . Since the very existence of a carrier may depend on the keeping of this reserve, (it) . . . may tend to deter the carrier from making expenditures for safety purposes, which otherwise would have been made."

ACTA also argues that this would discriminate against the nonsked, adding that the law would, in effect, contradict other CAB regulations forbidding nonskeds from offering scheduled service: "The expenses of an irregular carrier for any two weeks in the future are highly speculative from the very nature of their business and impossible of advance determination."

ACTA argues that this proposal, like some previous CAB economic regulations placed on nonskeds, divests them of property without the due process of law. The present proposal would be a retroactive condition placed on a nonsked's Letter of Registration after it had been issued, the association reasons. The federal courts rejected this type CAB move, ACTA adds, in the case Standard Air Lines v. CAB, in which the court stated: "The government cannot make a business dependent upon a permit and make an otherwise unconstitutional requirement a condition to the permit."

ACTA concludes that this proposal is totally impractical, and if carried through in present form would require a carrier to "freeze a cash reserve probably equal to as much as 8% of his total (annual) expenses."

• **Northeast.** This scheduled regional airline says: "Cash on hand and maintenance standards have no direct and simple relationship. Indeed, the proposed amendment may actually encourage the very practice which it seeks to penalize."

• **Mohawk.** "(The proposal) would place economic controls in the hands of CAA . . . (and) make it extremely difficult for local service carriers . . . to remain . . . operating under a temporary mail rate. . . ." Mohawk also points to the effect of such insecurity on stockholders: (It would be) "unfair to the stockholders of a carrier to place their company under the constant threat of revocation. . . . (It is) a serious infringement of management prerogative."

• **National Airlines.** "National Airlines opposes. . . ."

• **Frontier.** "The proposed rule, if at all legal, is not clear. . . . Adequate provisions are already available as a part of the economic regulations. . . ."

Frontier also notes that the CAB Safety Bureau proposal is inconsistent with subsidy policies of the Economic Bureau, which tries to keep carriers' working capital below three months' cash operating expense. "Since working capital consists mainly of accounts receivable and inventory . . . there is little leeway left for the accumulation of large cash deposits."

• **Representatives.** Keating, Arnold & Zack, Los Angeles, writes CAB: "We are writing to you on behalf of our clients in the large irregular carrier industry to protest. . . ." The firm adds: "The fitness . . . of large irregular air carriers . . . will be duly passed upon by the Board, after each applicant has had an opportunity to present its case before the examiner (in the Board's large irregular carrier economic policy investigation)."

George Berkowitz writes: "Power would be improperly conferred on the Administrator. . . ."

• **Standard Air Cargo,** nonsked passenger division, says: "At the present time the CAB is so top-heavy with paper work, it seems illogical that an unwieldy proposal such as this would serve the public interest. . . ."

▶ **A Few for It**—Two nonskeds officially support the proposal. Speaking for Overseas National Airways, Attorney Coates Lear says: "Although there is no correlation between the size of irregular air carriers and their financial stability, there does appear to be a correlation between those companies which

have suffered accidents and their financial stability." And Air America, Inc., sends a two-line note to the effect that "We are heartily in accord" with the Board's proposal.

Ozark, a scheduled local service operator, says that the proposal "appears to be wise" for regulating nonskeds but "should not be applied to the certificated scheduled carriers."

▶**CAB Safety Bureau View**—Safety Regulation Bureau Director John Chamberlain explains the new regulation proposal this way. The CAB safety rules always have had an "economic strength" requirement.

The following was placed in the original "Part 40" before World War II: "Applicant shall show economic strength and financial strength sufficient to establish a presumption of ability to operate the air carrier with reasonable safety as related to the service offered for a period of at least one year." That rule still stands.

However, when CAB set "Part 41" in 1944, no such rule was put in those regulations. At that time, the Board decided that such economic fitness belongs in the Board's economic—not safety—regulations, and is not something for CAA to administer.

Last summer the Board debated this question and decided at least to "propose" a new economic strength criterion, and to put it in such concrete terms that a CAA safety agent could apply it without having to make subjective analysis of the carrier's overall financial fitness.

Chamberlain and CAB member Adams told AVIATION WEEK they admit this specific proposal may be poor, but they said they want to find some rule-of-thumb that will serve to prevent airlines from offering public transportation when and if they are financially unfit to provide adequate maintenance.

From the looks of the industry comment, however, it appears they will search a long time before finding an acceptable rule-of-thumb for judging minimum financial fitness for safety, capable of interpretation by CAA safety agents and applicable continually to various type airlines under various circumstances.

Need for Twin-Engine Airline Copters Seen

Civil Aeronautics Board, with more than 25 applications for metropolitan and intercity helicopter certificates, is inclined to agree with American Airlines' engineering vice president, William Littlewood, that twin-engine copters are required for safety over densely populated areas.

This may mean CAB will certificate few, if any, more than the three present metropolitan copter operations in Los Angeles, Chicago and New York until later in this decade.

However, another side of the picture is that CAB is pouring many millions of subsidy into fixed-wing feeder service and only a fraction of that amount into the three copter operations. The coming Republican majority on CAB may try to get more balance in that subsidy take, especially since the military is far more interested in copter development than in fixed-wing local service.

Philippine Route Via Tokyo Opposed

Despite an all-out effort by the Philippines to get a U. S. permit to fly a direct route from Tokyo to San Francisco, Civil Aeronautics Board and State Department refused to grant it.

CAB member Joseph Adams, representing the Board, and several State Department officials stood their ground against this request of Ambassador Carlos P. Romulo throughout a week's intensive negotiations.

Talks finally were recessed for the Christmas holidays without final decision. The Philippines are expected to press their attack again this month, but to little avail.

Philippine Air Lines wants the U. S.-Philippine Air Transport Treaty of 1946 amended to allow Tokyo as a revenue stop on its Manila-San Francisco route. But U. S. carriers—Pan American and Northwest—argue that this is an entirely new route application in effect. CAB and the State Department agree.

What rankles the Philippines is watching preparation of former enemy Japan to serve Tokyo-U. S., while the Philippines are prevented from serving that promising trans-Pacific route.

However, this country argues that the Philippines already have a fair bargain from the U. S., since PAL gains access to a greater potential market here, on its present routes, than U. S. carriers get serving the Philippines.

Seaboard Gets Irish Atlantic Service

Seaboard & Western Airlines' activation of trans-Atlantic coach service for previously dormant Irish Aer Linte brings the number of trans-Atlantic competitors to 12. Seaboard's contract with the Irish national airline calls for a minimum of six roundtrips a week next summer, using DC-4 coaches.

The route will be New York-Boston Shannon. Service starts Apr. 1. The Seaboard operating contract runs from then to the end of 1956.

S&W will furnish, maintain and fly the planes. The Irish line will handle sales and hostess service.

London Heliport Plans

(McGraw-Hill World News)

London—A proposal for a heliport over the junction of Charing Cross railway bridge and Victoria Embankment in the heart of London is to be submitted to the Ministry of Civil Aviation.

Recent tests on the South Bank are said to have proved this site unsuitable because of noise disturbances.

Although detailed estimates for the new proposal have not yet been completed, it is estimated that the copter station would cost between $11 million to $16 million. The heliport would have a platform 100 ft. above street level, with a lower platform providing hangar space.

PHILADELPHIA INTERNATIONAL'S NEW TERMINAL

Architect's drawing of the new $8-million terminal building nearing completion at Philadelphia International Airport, Pa. The finger-like structures extending onto the ramp are of aluminum, steel and glass and are designed to take retractable gangplanks so that passengers can enter or leave planes in comfort regardless of weather. Observation deck features buried piping to melt snow. Radiant heating is used in lobby and offices. Architects are Carroll, Grisdale and Van Alen.

TWA Pacific Bid

- **Airline wants overseas and inland Asia routes.**
- **Great traffic potential is seen in Far East.**

By Scott H. Reiniger

Trans World Airlines, making its first bid in the Pacific, wants to start passenger service between Bombay, now its eastern terminus, and Tokyo by next July.

Route of the proposed service has not been firmed up, but indications are it may compete almost stop-for-stop with Pan American World Airways' Karachi-Tokyo operation. TWA intends to request this eastern extension of its international network at Civil Aeronautics Board March hearings on the "Trans-Pacific Certificate Renewal Case" to determine re-allocation of U.S. air routes over half the world (AVIATION WEEK Dec. 15, 1952, p. 80).

In addition to this new route, TWA wants to retain a parallel "inland" route—for which it already holds rights—from Bombay to Shanghai for the day when that service can be activated in a friendlier international climate. This route includes stops at Calcutta; Mandalay, Burma; Hanoi, Indo-China; and Canton, China.

▶ **Calcutta Stop**—The airline may lay claim to Calcutta as a stop for the new Bombay-Tokyo route on the basis it already has the right to go there by virtue of its Bombay-Shanghai franchise, which "it has no idea of relinquishing."

While PAA has a much larger network of international routes, TWA has a vast transcontinental network in the U.S. to feed its international service. If the airline adds the Bombay-Tokyo segment to its routes, it will be taking a long step toward establishing a 'round-the-world network with through service from most major U.S. cities to Europe and Asia.

No other airline now can give this direct service.

▶ **North-South Routes**—A possible Bombay-Tokyo route, described as "logical" by a top spokesman of the airline, would fan out initially in two directions: flights going alternately north across the heart of India to Calcutta, and south below the tip of the continent to Colombo, capital of Ceylon Island, British dominion.

Bangkok, Thailand, across the Bay of Bengal from India, would be the next stop, where the route, split between Calcutta and Colombo, would rejoin. This would form from Bombay to Bangkok a huge, diamond-shaped flight pattern stretched across the Asian subcontinent.

A weather alternate to Bangkok could be Rangoon, Burma.

Next stop after Bangkok could be Hong Kong and its alternate, Manila. Taipei, Nationalist China's capital on Formosa, appears highly favored as a stopover on the last leg of the journey to Japan, judging from the interest shown this city by TWA officials after a recent visit there. Okinawa might be the final stop before Tokyo. Lockheed Constellation 749As would be used initially to carry passengers from Bombay to Tokyo. In the northern half of its route, TWA would be competing with both Pan American and Northwest Airlines.

Possible path of the northern route is indicated by the itinerary of a 30,000-mi. survey flight to the Far East, recently completed by TWA board chairman Warren Lee Pierson and other top executives and advisers of the carrier.

Main stops made were Paris, Rome, Cairo, New Delhi, Bombay, Colombo, Calcutta, Rangoon, Singapore, Bangkok, Hong Kong, Manila, Taipei, Okinawa and Tokyo. The group also stopped at Wake and Honolulu during the 34-day tour, possibly indicating other TWA future route hopes.

▶ **Formosa Potential**—On his return to New York, Pierson described stops at Delhi, Singapore and Manila as courtesy visits to Prime Ministers Nehru of India, Phibun Songgram of Thailand (Siam), and President Quirino of the Philippine Republic, rather than air traffic appraisal studies. But in noting the stopover at Taipei and talks with Free China Premier Cheng Chen, Pierson stressed commercial possibilities of Formosa and need of improvement of airport facilities at Taipei for large transport activity.

He cited the airports at Rangoon and Bangkok, which have runways up to 10,000 ft., for strong praise, and said heavy trade is making Bangkok an "increasingly important city" that exports more than it imports.

The potential of Colombo, Ceylon, as a tourist center also was raised by the TWA officials. They said Colombo is in an almost straight line with Bangkok, Hong Kong, Taipei and Tokyo. All flights from northern India, the officials said, eventually must work south to bypass Communist China and hostile portions of Indo-China.

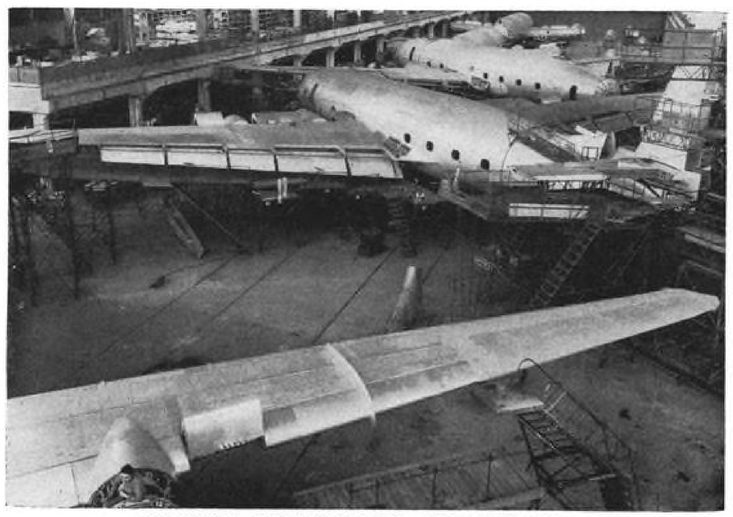
▶ **Eager for U.S. Trade**—The reception given the TWA group by all chiefs of state and other government officials was highly encouraging, Pierson said, and ". . . eagerness of commercial interests to do business with the United States was everywhere apparent."

Pierson cited these favorable points for the northern route:

- It would open western India to through flights from Tokyo by U.S. planes for the first time.
- With China cut off, Japan's commercial interest in India is high.
- India has great potential as an exporter of raw and finished goods if its manpower is properly directed, "particularly toward light industry." India also wants to expand production and export of pig iron, rather than ore.

But for all this, a "guesstimate" given by one TWA executive is that 50% of the travel in the foreseeable future on the Bombay-Tokyo route would be Americans, so expanded have our overseas interests become.

TWA statements indicated its request for the Far East route will be based partly on the view that there "is more traffic potential in this area than anywhere else in the world" and there is room for everybody; that European airlines are getting the jump on us and "stepping up service," while the U.S. is "not pushing"; ". . . the apparent recognition by other airlines in the area that an additional service would not result in further dividing existing traffic but would help stimulate more travel for all."



FRENCH TRANSPORTS ON THE LINE

A group of big SNCASE Armagnac transports seen in final assembly at Toulouse, where the last of eight ordered is scheduled for completion this month. Production lines utilize U. S. machine tools obtained through Mutual Security Agency. The four-engine 83-ton transport cruises at 270 mph. and can seat 84 passengers. Military troop carrier version could seat 156 soldiers with equipment.

CRAF Officers Are Called by MATS

Military Air Transport Service has called to active duty for 60 days key reserve officers of the airlines' Civil Reserve Air Fleet (CRAF).

Heading the MATS-airline Military Transport Operation Planning Committee is Brig. Gen. Henry C. Kristofferson of Pan American World Airways. Other members: Weldon E. Rhoades, Charlie F. Skannal and Wharton E. Larned of United Air Lines; Edgar B. Franklin of CAA; Emery M. Ellingson of Air Transport Assn.; William T. Arthur of Chicago & Southern, and Joseph A. McKeown of Airline Engineering Pilot Consultants.

They, with regular MATS officials on the committee, will review operations plans for future airlift eventualities.

French Service to Bogota

(McGraw-Hill World News)

Bogota—Air France has signed an agreement with the Colombian government permitting the former to establish a fortnightly service between Paris and Bogota alternating with Avianca's similar service in the other direction.

Further extension of these services will be shared on equal basis by the carriers. Avianca is building a $600,000 hangar to house two Super Constellations at Barranquilla, Colombia.

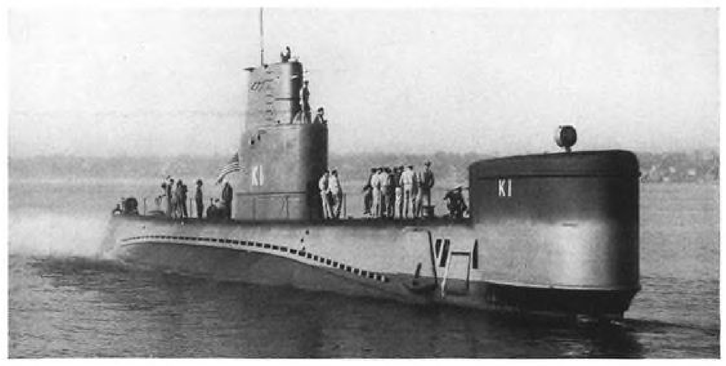
Pilots Seek Pay Raise

(McGraw-Hill World News)

Melbourne—Qantas Empire Airways pilots are asking that commanders of Constellations, and later on the Super Connies on order, be given a special new grading and maximum salary of close to $10,000 annually.

This amount will give them ap-

NEWS Edo NOTES



What's a picture of a submarine doing in AVIATION WEEK? No good reason except that this latest K-1 killer submarine has better performance and striking effectiveness thanks to development work in several fields of an extremely advanced nature by Edo engineers. Much has stemmed from their long experience in developing and improving Edo seaplane floats.

This picture of the K-1 submarine also points up the great diversity of activity at our College Point plant, just a mile across Flushing Bay from LaGuardia Field.

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proximately $1,000 more than the top rate sought by pilots flying domestic services.

Italian Airline Plans

(McGraw-Hill World News)

Rome—Definite plans for expansion of international Italian air services have been announced by the Minister of Industry. Italian carriers are to get 14 new four-engine planes and 12 twin-engine craft, which will permit them to step up trans-Atlantic operations, develop new routes to the Middle East and India, and cover the inter-European market.

Here are some of the services being programmed, according to Minister Campilli: five flights weekly to North America, two weekly to Buenos Aires from Rome, one weekly to Caracas, Venezuela, from Rome, one weekly flight Rome-Mogadiscio-Nairobi and six flights weekly to the Middle East and India.

High-Intensity Lights

(McGraw-Hill World News)

London—Australia is adopting the Calvert cross-bar high-intensity approach lighting system for its airline terminal points with expectations that the lights will reduce diversion of flights because of bad weather by approximately 80%.

First of the lighting installations is expected to be completed in about six months at Essendon Airport, Melbourne.

SHORTLINES

► **Canadian Pacific Airlines** this month and next steps up Pacific service in a buildup for jet Comet service anticipated by mid-April. DC-4 service will be once a week this month. In February, DC-6B service will begin. DC-6B and jet service twice weekly is slated for April.

► **Civil Aeronautics Administration** reports that 400 DME ground navigation stations now in process of installation eventually will reduce flying time and costs between cities. The stations will permit use of "curved" airways, short-cutting present point-to-point routing, CAA says.

► **Great Lakes Airlines** was denied by Civil Aeronautics Board order of Dec. 19 the right (requested four months previous) to fly three roundtrips a week in the five holiday-rush weeks from Dec. 14 to Jan. 17 between major U.S. cities, or to limit its service to unofficial military traffic for a shorter period. CAB says the nonscheduled airline has not made a sufficient showing to warrant a finding that present CAB-placed limits on business volume ". . . would be an undue burden on Great Lakes. . . ."

► **Flying Tiger Line** dispensed $250,000 in pay increases at Christmas, subject to RAWB and union approval.

► **International Air Transport Assn.** is expected to revise its European coach fare program next November by setting up the coach rate as "standard," recommending a premium charge for the first-class service now called "standard." This plan was advocated first by KLM at the recent IATA fares conference. IATA expects half of the world's airline transports will be slated for high-density seating by April 1, 1954, meaning the bulk of world's air travel will be by coach.

► **National Airlines** president G. T. Baker, a jet enthusiast, and vice president of sales Walter Sternberg inspected Mark III Comet plans at de Havilland but found the economics still were not attractive enough to warrant pressing an order. American manufacturers plan to enter the market at the Mark IV stage of Comet development, they found.

► **North Star Aircoach** (Airline Reservations Inc.), is under CAB investigation for possible alleged ticket-sales violations of the Civil Aeronautics Act, as amended last June to cover ticket agents.

► **Northwest Airlines** reports November passenger miles increased 18% over a year ago to 56.5 million. Load factor of 59% compares with 1951's 63%. . . . Northwest has appointed W. E. Bertram director of ground safety "in a move to heighten the emphasis on safety in its ground service operations."

► **Pan American World Airways** replaced Constellations with DC-3s on its Mexico City-Tampico-Brownsville route Jan. 1. Official reason: lack of sufficient traffic for the bigger plane. Flight frequency is being increased to four a week, however. Another reason for the change: CAB chastised Pan American for spending too much money by over-equipping and over-scheduling its Latin American division.

► **United Air Lines** estimates 1952 passenger traffic at 2.43 billion passenger-miles, up 30% over 1951. Express up 1% at 9,988,000 ton-miles; mail up 15% to 21,871,000, and airfreight up 21% to 27,464,000 ton-miles but still not quite equal to United's 1950 freight record.

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66	10078-1AG	Eclipse	Gyro Indicator
62	CQ-9	Eclipse	Clutch Switch (PB10)
57	MF45-3911-90Z	Vickers	Hydraulic Pump (3000PSI)
327	PF4-713-20BCE	Vickers	Hydraulic Pump
75	1416-12E	Eclipse	Starter
142	28008	Airesearch	Jack (Cowl FLAP)
45	AN4103-2	Clifford	Brass (Valve #U4785) Oil Cooler
120	MF9-713-15A	Vickers	Hydraulic Pump
550	TFD 8600	Thompson	Fuel Booster Pump
125	D7818	Adel	Anti-icer Pump
250	AN4014	Erie Meter	Wobble (D-3) Pump
1000	AN5780-2	G.E.	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Wheel & Flap Position Indicator
115	P4CA2A	Parker	Primer
70	AN3213-1	Scintilla	Ignition Switch
450	A-9 (94-32226)	Nasco	Ignition Switch
90	JH950-R	Jack & Heinz	Starter Motor
53	AN6203-3	Bendix	Accumulator 10"-1500 P.S.I.
140	K14949E	Marquette	Windshield Wiper Kit
188	EYLC-2334	Barber-Colman	Control
11	12086-1C	Eclipse	Amplifier
250	558-1A	Eclipse	Oil Separator
100	716-3A	Eclipse	Generator (NEA-3A)
89	318	Edwards	Horn
230	921-B	Stewart-Warner	Heater (200000 BTU)
97	6041H-146A	Cutler Hammer	Relay (B-12)
22	0655-D	Aro	Oxygen Regulator
65	ASDC2	CO2 Mfg. Co.	Fire Detector
384	564-2A	Eclipse	Oil Separator

PRATT AND WHITNEY AIRCRAFT ENGINE PARTS

Quantity	Part No.	Description
166	1045	Bearing
500	3506	Flange
130	8288	Follower Ass'y
814	35814	Blower Ass'y
53	48362	Shaft
75	48363	Shaft
56	48392	Sump
390	48461	Gear
78	76236	Gear
1178	84289	Bearing
113	84487	Housing
77	84591C	Nose Housing
200	48350-D	Crankcase Ass'y
200	84083	Cylinder
100	84084	Cylinder
200	84085	Cylinder

CARBURETORS! MAGNETOS! SPARK PLUGS!

Quantity	Part No.	Description
247	PD12K10	Stromberg Injection Carburetor
19	1375F	Holley carburetor
407	SF9LN-2 (manufacturer's part No. 10-12453-6 Spec. AN9511)	Bendix Scintilla Magneto
42	SF5RN-12 (manufacturer's part No. 10-26170-1)	Bendix Scintilla Magneto
185,000	LS4AD1	Spark Plug (Aero)

SPECIAL GROUP!
Ideal for tear-down for parts

Quantity	Part No.	Description
328	PD12K10	Stromberg injection carburetor
236	PR48-A1	Stromberg carburetor

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LETTERS

'Outstanding Job'

The Dec. 15 AVIATION WEEK was of special interest to us, because it carried the first of our series of H-2 advertisements, and because of George Christian's excellent report on the Vickers Transport Hydraulic Aircraft Conference.

Through some unfortunate experiences with other publications, we have learned that accurate and complete coverage of a subject as controversial as non-flammable hydraulic fluids is not always easily obtained. There was a great deal of discussion relative to our H-2 fluid during this conference, and we feel that Mr. Christian did an outstanding job in presenting the facts without any prejudice or omissions.

On articles of this type, things that are left unsaid can often be more damaging than any reported difficulties or troubles experienced with the product. Without exception, the AVIATION WEEK story touched at least briefly on everything that was discussed during the meeting.

We wanted to bring to your attention the fact that we feel your publication is superior in this field of news coverage, and that Mr. Christian is to be complimented for the consistently high calibre of his reporting.

W. V. SCHOLZ
Technical Representative
R. M. Hollingshead Corp.
Camden, N. J.

Doman's Cost

I would suggest a correction of the item printed in your Industry Observer of Dec. 22. Our established factory price for the LZ-5 and YH-31 is correctly reported as being $120,000. However, this price is based upon a total manufacturing forecast of only 50 units. The report seems to have misled some people into believing that we have set a production goal of 100 to justify the price reduction.

Actually, $120,000 is a moderate price as compared to manufacturing costs in quantities smaller than 50 and we are banking only on that quantity although our expectations are greater. Of course your publication of this has had a generally favorable effect but I would appreciate it if you could clarify the fact that our breakeven minimum is far below 50 units.

GLIDDEN S. DOMAN
Doman Helicopters, Inc.
Danbury, Conn.

Below Sea Level

It has often been said, jokingly, among aircraft designers, that the Structures Dept. should be working on submarines. A recent AVIATION WEEK article seems to indicate that U. S. aerodynamicists also follow the submarine philosophy. "F-86 sets new speed record at 240 ft. below sea level at Salton Sea."

I have seen several articles by British authorities, during the past ten years, which draw attention to the fact that U. S. fighter designers seem to spend most of their effort making planes that will break speed records at sea level, and the trend seems to continue with higher and higher wing loadings, which results in airplanes that cannot maneuver or even fly at high altitudes.

I would like to see the opinions of some of our current combat pilots on the high-altitude performance of our planes. Do they like to fly and fight at altitudes where the "MiGs" can fly circles around them and thousands of feet above them?

Suggestions by pilots that we eliminate the weight of armor plate, self-sealing tanks, etc., seem to indicate that they do not.

How long are we going to design and build below sea-level fighter planes for 50,000 ft combat?

J. MURRAY
139B Route 2
Grand Prairie, Texas

'More Facts per Word'

In your Dec. 1 issue of AVIATION WEEK, Mr. J. W. Lyons wrote about the extent of foreign coverage in AVIATION WEEK. Whilst acknowledging his point of view, we would like to add that it is this spirit of internationalism within the pages of your journal which makes it the best of America's aviation papers.

From our point of view, AVIATION WEEK tells us lots about the American industry and mirrors the British industry with none of the bias which, in spite of all good intentions, creeps into native papers, and of course we hear a great deal about friends in other parts of the world.

Mr. J. W. Lyons should also realize that immediately after the Farnborough display, a great deal of information was bound to require reporting in aircraft papers; the fact that Farnborough is in England is irrelevant, because if a similar display were given in "Bango Bango Land" the impact would be the same in aircraft papers.

So as far as we are concerned in the U.K., we like AVIATION WEEK as it stands; more facts per word than any competitor.

A. C. WOOD
E. C. WHEELER
168 Lewis Buildings,
Walham Green
London S.W.
England

'Cooperation'

The purpose of this letter is to express our appreciation for the cooperation and support you have given us during our formative period while we were not in a position to do any advertising. Your confidence and help was instrumental in helping us to get off to a good start, and I just want you to know that it is appreciated.

CARL WOOTTEN, SALES MANAGER
Aero Design Commander
Aero Design and Engineering Co.
P. O. Box 118
Bethany, Oklahoma

STRICTLY PERSONAL

SINISTER PROPAGANDA

Our holidays were nearly ruined by discovery of a fiendish plot by the railroads to set up a propaganda cell on some of the airlines' most sacred ground—the waiting room at La Guardia air terminal. We were reading a paper, waiting for an American Convair to Washington, when we heard what sounded like repeated long, low moans of a distant locomotive whistle. Unbelieving, we set out to track down the mystery. Gadzooks! There it was before us: There was a full size Model "O" gauge American Flyer train ripping around its track, making every curve safely, its headlight aglow and whistle blowing—the main attraction of the toy counter. And a staring group of air travelers stood transfixed at this sinister demonstration, not realizing they were only tools of the Association of American Railroads. Up to our deadline the Port of New York Authority said they hadn't fully decided whether to cancel the toy shop's lease. The matter probably will come before the next meeting of the Air Transport Assn. board of directors. Insiders expect a shakeup in ATA public relations.

* * *

THE JOINT IS DIFFERENT

Hy Sheridan philosophized the other day while strolling through his Dizzy Six that what the child learns at his mother's knee these days is how to dodge cigaret ashes.

* * *

NOTE TO BUSY EXECUTIVES

The de Havilland Gazette notes philosophically that, "If you get up earlier in the morning than your neighbor and work harder and scheme more and stick closely to your job and stay up later, planning how to get ahead of him while he is snoozing, not only will you leave more money when you die . . . but you'll leave it a lot sooner."

* * *

PUBLICITY BACKFIRES

Trans-Canada Air Lines says it got this letter from a customer: "I note that these ships have an advertised cruising speed of 306 mph. Tonight we left Montreal 20 min. late and the captain's report shows our speed of 225 mph. and an anticipated arrival 25 min. late. . . . If such speed is possible, why is no effort made to make up time?"

* * *

ALPA WILL STOP THIS SORT OF THING

Wing Commander R. P. Beamont, who has established quite a reputation for his trans-Atlantic commuting in a Canberra and the hairy performances he puts on with the twin-jet bomber at the Farnborough shows, reported to our **Bob Hotz** that during his recent roundtrip of 7 hr., 56 min. between North Ireland and Gander, he contacted a TCA transport pilot doing his regular stint.

Beamont informed the TCA pilot he was en route from Aldergrove to Gander.

"What are you going to do when you get to Gander?" the TCA man asked.

"Turn around and fly back to Aldergrove this afternoon," Beamont answered.

"Now isn't that a helluva way to spend a day!" sighed the TCA lad.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—JANUARY 5, 1953

EDITORIAL

The Collision Menace

Increasing traffic of all kinds on and across the nation's airways is a matter of growing concern in commercial aviation circles.

Never has the aerial collision menace loomed so large as it does today.

These are gloomy words for an aviation publication to disseminate. But publicity of such words will not cost lives. Failure to heed them will take many. Why do we fail to take united action against the collision menace?

Crash Causes & Secrecy

The crash of an Air Force Globemaster Dec. 20, costing at least 86 lives, was the worst aviation accident in history.

Although various aspects of the catastrophe have been widely discussed, one has received little attention: The Air Force revealed publicly its findings of the probable cause—the failure to release the gust lock.

As we have pointed out on this page repeatedly through the years, the Air Force has always kept its accident investigation findings from reaching the press. Usually, this censorship has been maintained in the guise of protecting military security. Time after time we and other inquiring editors and reporters have drawn adamant refusals from Air Force authorities when we have asked for officially ascertained probable causes of accidents which appeared to have a public interest.

As always develops when secrecy and censorship prevail, rumors have arisen, and distrust of Air Force training, operations and regulations generally have developed, sometimes unnecessarily.

Public opinion is a powerful force. The Air Force admits this in breaking its long secrecy rule in this latest catastrophe. The public and Congress have reason to wonder how many other accidents the Air Force has suffered from preventible causes. In the three weeks to Nov. 29, the Associated Press counted 198 persons dead or presumed dead in various USAF air crashes. The Globemaster fell less than a month later.

In pursuing its hush-hush policy on accidents, the Air Force does itself no good with the public.

The new administration should divulge the probable causes of all military accidents which do not directly relate to highly confidential aircraft. Otherwise the implication is strong that the truth could not stand up under the spotlight of publicity.

Give the Helicopter Its Chance

The best concise evaluation we have seen of the present state of the helicopter, and its commercial outlook, comes from the assiduous research of L. Welch Pogue, the well-known and respected counsel for the Helicopter Council of the Aircraft Industries Assn.

A 32-page, annotated report, delivered by Mr. Pogue as an address before the National Association of State Aviation Officials, should be distributed widely to help answer the thousands of questions being asked about the helicopter by the public, and by municipal, state and national government officials everywhere.

The helicopter, Mr. Pogue believes, is the "greatest advance in short-haul transportation since steam superseded sail." Therefore, he advises, we will all be forehanded if we review the laws and regulations in their respective jurisdictions and, in the light of that review, sponsor and support changes that may be necessary to build for the future of this versatile servant.

"In order that this be done well, it is submitted that certain concepts are essential for a proper approach to helicopter regulation and certain propositions should be followed in the blueprint if sound building is to result," Mr. Pogue told the NASAO.

His concepts are:

1. The helicopter is not an airplane—it is in a class by itself.

2. The helicopter has plenty of speed now to solve our most pressing short-haul problems.

3. No particular new regulation should be imposed unless required; and existing regulations, though required for airplanes, should be re-examined for non-applicability to the helicopter.

Mr. Pogue's propositions are:

1. Except the helicopter from all regulations not required, after study, to be made applicable to it.

2. Re-examine the airport program for your state and be sure that the heliport is accorded its proper place in this field of planning.

3. Let the helicopter have its natural chance to serve your people by permitting the establishment of heliports throughout metropolitan areas, including the city center location where people come from and go to. Do not regulate private helicopter landing areas except from the safety standpoint.

4. Study the matter of federal-state cooperation in the field of helicopter regulation to the end that all regulation of this locally operating transportation servant will meet the local necessities and at the same time not make uniformity impossible.

In his report, Mr. Pogue makes these broad assertions, supported by statistical data:

The helicopter is the answer in local and short-haul traffic.

Speeds already are adequate for short-haul needs.

Both large and small vehicles are becoming available.

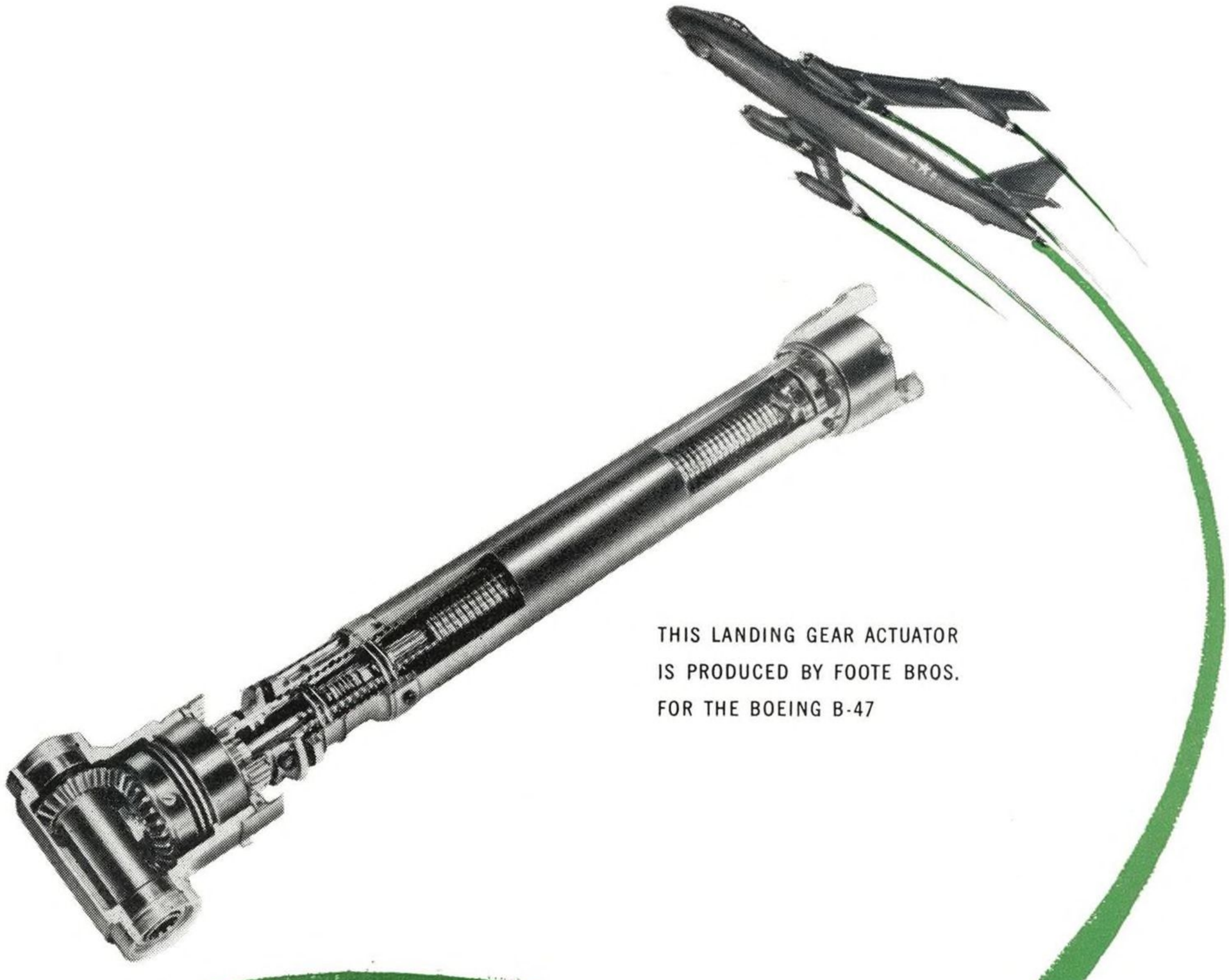
The short-haul inter-city traffic market is huge, and the large transport helicopter will be able to compete effectively for short-haul business.

Ultimately, Mr. Pogue says, small copters will be the answer for "most" private flying. The helicopter already can be operated safely to and from centrally operated heliports.

* * *

If the advent of the jet engine is really bringing a revolution in aviation, it is difficult to find a word of sufficient force to describe the changes that the helicopter will bring about.

—Robert H. Wood



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