AVIATION WEEK

A McGRAW-HILL PUBLICATION

NOV. 24, 1952

50 CENTS

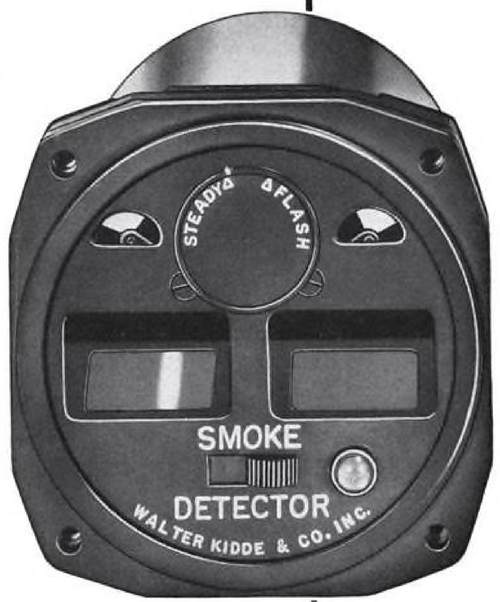
The Aircraft: Grumman F9F-5 Panther
The Engine: Pratt & Whitney Aircraft J-48 Jet
The Fuel System: Holley Turbine Control

HOLLEY Carburetor Co. DETROIT 4, MICHIGAN

FOR HALF A CENTURY—ORIGINAL EQUIPMENT MANUFACTURERS FOR THE AUTOMOTIVE AND AIRCRAFT INDUSTRIES

A-8

NO FALSE ALARMS IN FLIGHT



THE Kidde visual smoke detector offers new advantages in fire protection for aircraft. It is a small, compact, light-weight detector which cannot give false alarms.

Here's how it works: air from cargo compartments is drawn to the detector on the instrument panel. Two viewing windows show a black chamber through which an invisible beam of light passes. The slightest trace of smoke reflects the light beam, showing through one of the windows as a streak of light.

This foolproof detector eliminates false alarms frequently caused by voltage fluctuations and from foreign matter. Write us for full particulars.

Kidde

Walter Kidde & Company, Inc.
1118 Main St., Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

Aviation Week

ABP Member ABC

Volume 57 November 24, 1952 Number 21

43,236 copies of this issue printed

Robert H. Wood
EDITOR

Merlin H. Mickel
MANAGING EDITOR

Robert B. Hotz
EXECUTIVE EDITOR

Alexander McSurely .....Aviation Safety
David A. Anderton .....Engineering
Irving Stone .....Technical
G. L. Christian III ..Equipment & Maintenance
Katherine Johnsen.....Congress
Lee Moore .....Transport
Philip Klass.....Avionics

Scott Reiniger .....New Products
Erwin J. Bulban .....Special Assignments
A. W. Bentz .....NEWS EDITOR
Henry Lefer .....News Desk
Victoria Giaculli.....Editorial Makeup
Leo T. Tarpey.....Printing & Production
Helen Rich .....Editorial Research

Editorial Office: 330 West 42nd St., New York 36, N. Y. Phone Longacre 4-3000, or (night) 4-3035; National Press Bldg., Washington 4, D. C., Phone National 3414. *Domestic News Bureaus:* Atlanta 3, 1321 Rhodes-Haverty Bldg.; Chicago 11, 520 N. Michigan Ave.; Cleveland 15, Hanna Bldg.; Detroit 26, Penobscot Bldg.; Los Angeles 17, 1111 Wilshire Blvd.; San Francisco 4, 68 Post St.; Houston 25, 1303 Prudential Bldg. *Correspondents* in more than 60 major cities.
Foreign News Bureaus: London, Paris, Frankfurt, Tokyo, Manila, Rio de Janeiro, Mexico City. *Correspondents* in more than 59 major cities.
Aviation Week is served by PRESS ASSOCIATION, INC., a subsidiary of Associated Press.

Robert F. Boger
PUBLISHER

R. W. Martin, Jr., *General Manager;* J. G. Johnson, *Business Manager;* Catherine Miner, *Research and Marketing;* Sales Representatives: J. C. Anthony, *New York;* H. P. Johnson, *Cleveland;* L. J. Biel, *Chicago;* W. E. Donnell, *St. Louis;* E. P. Blanchard, Jr., *Boston;* James Cash, *Dallas;* R. C. Maultsby, *Atlanta;* R. F. Dorland, Jr., *San Francisco;* C. F. McReynolds, *Los Angeles;* W. S. Hessey, *Philadelphia.* Other sales offices in *Pittsburgh, Detroit, London.*

November 24, 1952 AVIATION WEEK Vol. 57—No. 21
Member ABC and ABP

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

NEWS DIGEST

Domestic

Charles H. Babb, Los Angeles, aviation pioneer, who was president and chairman of the board of the Babb Co., Inc., aircraft and accessory dealers, died Nov. 15 of a coronary ailment.

The Turbo-Compound Super Constellation is now undergoing an intensive testing program, following its maiden flight lasting just over two hours. The test plane, a Navy version R7V-1, showed greatly improved acceleration and climb over earlier models.

Brig. Gen. Henry Black Clagett, a pioneer of the early days of military aviation, died Nov. 14 in Walter Reed Hospital, Washington, D. C.

The Cleveland National Air Races Corp. has announced that its 1953 classic will be held at Vandalia Municipal Airport, Dayton, and that its new title will be The National Aircraft Show and 50th Anniversary of Powered Flight Honoring the Wright Brothers.

Edward A. Schuch, who was chief engineer for the Aero Service Corp., and a pioneer in the art of aerial mapping, died recently at his home near Philadelphia.

"Wes" Hall, who was a dealer-salesman for Air Associates, Glendale, Calif., was killed recently when the engine of his plane failed after takeoff from Lindbergh Field, San Diego.

The Tennessee Valley Authority has purchased three helicopters, two of which already have been delivered, following successful use of a leased machine in patrolling transmission lines.

Harold E. Mistele, Detroit executive, has been notified that his speed records flying a 145 hp. Continental-powered Cessna "170" equipped with Edo floats have been accepted by Federation Aeronautique Internationale as world marks for Class C-2b seaplanes over a 50-kilometer closed course. Mistele's record speeds, clocked on Aug. 25, were 109.08 mph. for 100 km. and 102.27 mph. for 500 km. Previously, he was credited by FAI with an airline distance record of 946.48 mi. for a Brownsville, Tex.-to-Rosiclare, Ill., flight, June 12.

Civil Aeronautics Administration has organized a 10-man team to evaluate turbojet and turboprop transports with a view toward formulating safety and certification standards for these types.

F-94C ROCKET POD mounted in leading edge of Lockheed F-94C's wings (see picture, p. 15) carries a dozen 2.75-in. missiles to supplement the 24 the plane carries in fuselage nose. Streamlined nose of the pod is made of tangible Fiberglas and disintegrates under impact of rocket gases upon firing. Alternative use of the pod is to carry a machine gun and 265 rounds of ammo. Rocket pods are 9.5 ft. long, gun pods 8 ft.

The team will be headed by George Haldeman, chief of the CAA aircraft engineering division; A. M. Alcorn, engineering chief of Region 6 with headquarters in Los Angeles, will be vice chairman.

Donald A. Duff, executive vice president of Wisconsin Central Airlines, died at Minneapolis Nov. 14. A long-time executive with about ten airlines since the early 1930's, he had been chief executive of Colonial during the Alfons Landa reorganization last winter.

Civil aircraft production schedules for the second quarter 1953 will get full allocation of needed controlled materials if DPA accepts the recommendation of the Air Coordinating Committee. No hitch is anticipated. Total current program stretching to the first half of 1955 includes firm orders for 381 transports (32 added since the previous quarter) and a potential production of 11,542 non-carrier planes for industry, business and agricultural use.

Financial

Eastern Air Lines reported a net profit of $1,773,875 during the first nine months of 1952 out of a gross of $88,143,000.

Air France reports an increase of 26% in profits for the first eight months of this year compared to the same period last year.

British European Airways Corp. reports that although its summer profit amounted to $798,000 its reduced revenue in the winter months is likely to mean a deficit of about $4,920,000 for its fiscal year.

Fairchild Engine and Airplane Corp. lists a net of $1,887,000 for the nine-month period ending Sept. 30. A 20-cent dividend was declared payable Dec. 22 to stockholders of record on Dec. 3.

Cessna Aircraft Co. has declared a dividend of 50 cents a share payable Dec. 22 to stockholders of record Dec. 9. Cessna announced adoption of policy of paying a regular semi-annual dividend of 25 cents per share, to begin in 1953.

Seaboard & Western Airlines, Inc., reports net earnings of $801,335 for the nine-month period ending Sept. 30 from operating revenues of $8,886,559.

Southwest Airways Co. reports net income of $81,600 for nine months ending Sept. 30.

Kaiser-Frazer Corp. and subsidiaries report net income of $344,064 out of total sales of $57,265,337 for the three months ending Sept. 30.

Menasco Manufacturing Co. had a net profit of $523,639 for fiscal 1952. An additional 10-cent dividend per share of stock will be paid Dec. 15 to shareholders of record Dec. 1. Backlog was reported in excess of $35 million.

Temco Aircraft Corp. reports net earnings of $1,359,894 for the nine months ending Sept. 30, a 51% increase over corresponding period in 1951. Unfilled orders amounted to $245,600,000.

Northwest Airlines has paid an installment of $835,000 on its bank loans, reducing the loan to $7,635,363.

International

Qantas Empire Airways now is operating the longest commercial over-water hop in the world on its new route from Sydney to Johannesburg: a 2,677-mi. leg between Mauritius Island and the Cocos Islands, using Lockheed Constellations.

AVIATION CALENDAR

Nov. 24-25—Joint Industry Conference on Preservation Packing, sponsored by General Motors Corp. R. M. Hollingshead Corp. host. Walt Whitman Hotel, Camden, N. J.

Nov. 30-Dec. 5—Annual meeting of ASME, Hotels Statler and McAlpin, New York, N. Y.

Dec. 1—Fourth annual Air Cargo Day, (ASME), Hotel Statler, New York, N. Y.

Dec. 2—Symposium on light metal heavy forgings and extrusions for aircraft, SAE, ASME, IAS and AIME, Hotel Statler, New York.

Dec. 2-5—Aviation Distributors and Manufacturers Assn. tenth annual meeting, The Kenilworth, Miami Beach.

Dec. 3-5—American Rocket Society, Hotel McAlpin, New York, N. Y.

Dec. 3-5—Society for Experimental Stress Analysis, annual meeting, Hotel McAlpin, New York.

Dec. 3-5—American Management Assn., Hotel Statler, Cleveland, Ohio.

Dec. 4-6—Sixth annual Arizona Aviation Conference, Douglas, Ariz.

Dec. 12—Second Convertible Aircraft Congress, The Franklin Institute, Philadelphia.

Dec. 17—Annual Wright Bros. dinner, 7:30 p.m., Statler Hotel, Washington, D. C. Wright Bros. lecture to be presented by IAS 3 p.m., U. S. Chamber of Commerce auditorium.

Jan. 12-16—Annual meeting and engineering display of Society of Automotive Engineers, Sheraton-Cadillac Hotel, Detroit.

Jan. 14-16—AIEE-IRE-NBS conference on High Frequency Measurements, Statler Hotel, Washington, D. C.

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.

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.

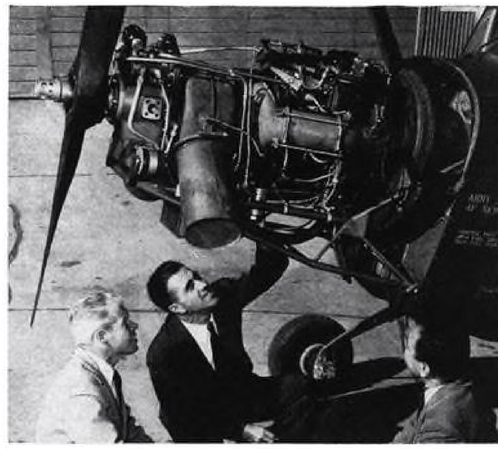
Apr. 4-12—Second annual International Motor Sports Shows, Grand Central Palace, New York, N. Y.

Apr. 20-23—Aeronautic Production Forum, National Aeronautic Meeting and Aircraft Engineering Display (SAE), Hotel Governor Clinton and Hotel Statler, New York, N. Y.

PICTURE CREDITS

7—Lockheed; 9—(top) McGraw-Hill World News; (center) Cessna Aircraft; (bottom) Keystone; 15—Lockheed; 18—USN; 23—David Anderton; 28—Louis McQuaid; 30—de Havilland Aircraft Co. Ltd.; 38—Brooks & Perkins, Inc.; 48—Levy-Shipp; 51—National Bureau of Standards; 89—(top) Convair.

FRENCH TEST BICYCLE GEAR—SNCASO S.O. 30 is testing dual-wheel tandem landing gear developed by the company and made by Hispano-Suiza. A similar-type landing gear is fitted to the new S. O. 4050 Vautour twin-jet fighter (Aviation Week Nov. 3, p. 15).



TURBOPROP CESSNA L-19—Cessna XL-19B, first lightplane to be fitted with Boeing 502-8 turboprop engine, lands after a successful flight trial. The engine (closeup, right) delivers 210 hp. on takeoff and is some 125 lb. lighter than piston engines in other L-19s.

Aviation News In Pictures

HUNTER STUNTER—RAF's supersonic Hawker Hunter jet fighter (Rolls-Royce Avon) is seen on the downward leg of a loop which began at 6,000 ft. and rounded off at approximately 12,000 ft. The photographer took this spectacular shot from a two-seat Gloster Meteor jet trainer which accompanied the Hunter during the maneuver. The sleek new Hawker has been ordered in quantity on a "super priority" schedule.

INDUSTRY OBSERVER

► Present MDAP commitments include delivery of a dozen Sikorsky S-55 ten-passenger helicopters to the ground forces of NATO. Sikorsky has shipped one S-55 to the French SNCASE firm.

► **The new all-jet seaplane to be built for Navy by Glenn L. Martin Co. probably will carry the designation XP6M.**

► Republic Aviation Inc. is developing a new supersonic fighter designated the XF-104. The XF-103 is also a Republic fighter aimed at eventual replacement of the Convair F-102 as the standard USAF supersonic interceptor.

► **Initial order for the Boeing B-52 will be for RB-52A photo-reconaissance versions. No bomber versions of the B-52 have been scheduled for production before the end of 1955. Both the XB-52 and the YB-52, experimental prototypes, are continuing their flight test programs at a good pace with six flights made last week. The YB-52 is now being instrumented for advanced flight test work while the XB-52 is scheduled to do high gross tests at Moses Lake with an Air Research and Development Command crew.**

► Air Force does not expect to get flight test prototypes of the Wright J67 split-compressor turbojet before the end of 1955. The J67 has been considered as powerplant for several supersonic fighter types scheduled for substantial production by the end of 1955.

► **Chase Aircraft will roll out the first production version of the C-123 assault transport at its Trenton, N. J., factory in a few weeks. Main changes in the production model include a squared-off tail fin, larger paratroop jumping doors, and more powerful versions of the Pratt & Whitney R2800 engine developing 2,500 hp. for takeoff.**

► Cessna 180, which is scheduled to replace the radial-engine 190-195 series, is slated to be announced during the company's annual sales meet for distributors at Wichita, Kans., in January. The new 180 powered with an in-line engine, resembles the former 170 models but has a squared-off vertical tail. Also, the horizontal tail is adjustable about three inches trimming.

► **American safety experts question a recent British medical report that more than half the passengers in a Viking transport crash were injured as a result of "flexion of the body over the seat belt." Cornell University Crash Injury Research survey of 800 survivors in plane crashes showed that only 32 had any injuries (usually bruises) in the vicinity of seat belts. Cornell analysis of the British accident data indicated that the fewest injuries occurred in the seat belt area and did not produce positive proof that any injuries were due to the belts. Stronger seat belts and shoulder harnesses have been developed and adopted in this country as a result of the Cornell research.**

► De Havilland is planning a third Comet production line at its Chester plant if additional orders materialize at a sufficiently rapid pace. Some Comet parts already are being made at Chester. De Havilland is extremely sensitive to continued British and foreign criticism that its slow production rate is discouraging many new orders for the jet transport. De Havilland says its current Comet production pace is adequate to handle the volume of orders received to date.

► **Douglas C-124A in service with MATS recently flew for 18 hr. and 30 min. while making a nonstop flight of 3,863 nautical miles from Ramey AFB, Puerto Rico, to McChord AFB in Washington.**

► British Overseas Airways Corp. is thinking of using retractable air inlet screens on its Comet jet transports. The screens would prevent the jet engines from sucking in pebbles, mechanics' rags and other extraneous material during ground runup and taxi maneuvers.

WHO'S WHERE

In the Front Office

Stephen F. Keating, former director of military contracts for Minneapolis-Honeywell Regulator Co., has been named assistant to the vice president in charge of the Aeronautical division. Keating has handled military contracts since he joined M-H in 1948.

L. J. (Larry) Hansen has been designated vice president-sales for Hansen Mfg. Co., Cleveland, Ohio, makers of quick-connect fluid line couplings. Hansen was President-elect Dwight D. Eisenhower's personal pilot 1942-1946. His former post as assistant general manager has been filled by **Bert W. Manning**, also an ex-USAF pilot.

Frederick D. Gearhart, president of Gearhart & Otis, New York investment firm, has been elected chairman of the board of U. S. Airlines, certificated freight carrier. Other new directors include: **Fred A. Miller**, U. S. Airlines' new president; **Col. Paul D. Sheeline, Col. G. Gordon Moore, Jay W. Kaufmann** and **Knox B. Phagan**.

Changes

H. Albers has been designated chief engineer of the USAF heavy press program for Loewey Construction Co., Inc., N. Y.

J. Howard Batchelor has been named general manager of Liberty Mfg. Co., Santa Monica, Calif., subcontractor to aircraft firms. **Edwin A. Kraft, Jr.**, has been appointed sales manager.

Rear Adm. C. R. Todd, USN (Ret.), has been named manager of Continental Can Co.'s Coffeyville, Kans., plant, making Boeing B-47 and Grumman S2F-1 assemblies.

Bruce H. Pauly has been appointed aircraft sales manager at Pesco Products division of Borg-Warner Corp., Cleveland.

Dr. George Gerard, former principal research engineer for Republic Aviation Corp., has joined Bassons Industries Corp., N. Y., as a consultant to advise on government projects. The firm handles plastics molding and fabrication.

R. B. Lerch and **Russell Strongman** have been appointed Middle West and Eastern Seaboard regional managers, respectively, for General Controls Co., Los Angeles.

E. W. Britton has been designated manager of Wright Aeronautical division's spare parts division, Wood-Ridge, N. J. **R. E. Brown** has been named assistant service manager of the firm.

Honors and Elections

Sir Geoffrey de Havilland, founder and director of the de Havilland Aircraft Co., Ltd., has been chosen recipient of the Guggenheim Medal for 1952 in recognition of his "forty years of pioneering in military and commercial aircraft and the development of long-range jet transport." **Phil C. Garratt**, managing director of DH-Canada, has been awarded the McKee Trophy, given annually to the person who has done most toward furthering Canadian aviation during the past year. Garratt received the trophy for his development of the DH Beaver and Otter.

Washington Roundup

Defense Program: Overhaul

First action of incoming President Dwight Eisenhower on defense, it is expected, will be to appoint a commission of civilians to scrutinize all aspects of the military program and come forth with recommendations aimed at getting "adequate" security for minimum cost.

It is likely to touch off the bitterest inter-service row since unification. It also means that the services face an uphill struggle next year against losing authority to the Secretary of Defense's office.

The review commission was first formally proposed by Sen. Robert Taft in his campaign for the nomination.

The proposal was included in the Republican Party platform: "We shall revise our entire preparedness program and we shall strip it clean of waste, lack of coordination, inertia, and conflict between the services."

One probable effect of establishment of the review commission: Any major change in the defense program by the new administration will not be reflected until the 1955 fiscal year budget. This will reach Congress in January 1954, and will be for the year starting July 1954.

Sen. Styles Bridges, key Republican in Congress who can have his choice of the Senate leadership post, chairman of the Armed Services Committee, or chairman of the Appropriations Committee, estimates it will take the commission about six months to complete its work.

Congress: Little Change?

Election changes in the membership of the House and Senate aren't likely to affect the final outcome on key aviation issues.

There will be 20 more Republicans and 20 fewer Democrats in the House and one more Republican and one less Democrat in the Senate next year. There also will be some replacements not reflected in the party lineup, such as replacement of Rep. Lindley Beckworth, who headed House Interstate and Foreign Commerce Committee's Aviation Subcommittee this year, by Rep.-elect Brady Gentry.

But votes this year on vital aviation issues weren't so close that the outcome would be affected by these moderate changes. For example:

- The House vote in favor of clamping a ceiling on defense spending—which would mean a slowdown in plane deliveries—was 220 to 130.
- The Senate vote for lenient mail pay formula for international carriers was 58 to 23.
- The Senate vote against making certificated irregular carriers eligible for subsidies was 53 to 28.
- The Senate vote against cutting back Air Force research and development money was 47 to 30, and, against slashing USAF operational funds, 49 to 25.

Subsidy Legislation

Changes in the makeup of House and Senate Interstate and Foreign Commerce Committees seem to favor the nonskeds in their fight against lenient airmail subsidy separation legislation for the scheduled industry.

▶ In the House Committee:

- Four of the 15 members who went along with the legislation favored by the scheduled industry won't be back next year: Rep. Lindley Beckworth; Rep. John McGuire; Rep. Leonard Hall; Rep. Haarmar Denny.
- All eight of the committee members who bucked the majority and supported legislation establishing a rigid mail pay formula and opening the subsidy field to the cerificated irregulars, will be back—Rep. Charles Wolverton, as chairman; Rep. Arthur Klein; Rep. William Granahan; Rep. Louis Heller; Rep. Morgan Moulder; Rep. John Heselton; Rep. John Williams; Rep. Homer Thornberry.
- Among the re-elected committeemen: Rep. Peter Mack, who piloted a lightplane around the world a year ago.

▶ In the Senate Committee:

- The makeup next year will be greatly changed. There are two Democratic vacancies and three Republican vacancies to be filled by new senators.
- All five of those seats had been filled by members who supported the scheduled airline position on airmail subsidy separation legislation: Sen. Ernest McFarland; Sen. Herbert O'Conor; Sen. Owen Brewster; Sen. James Kem; and the late Sen. Brien McMahon.

Airline Attorneys

Scheduled airlines and nonskeds are financing some legal heavyweights—some with political and some with CAB ties—in the Board's investigation to determine the future of competition in the industry.

Representing the nonskeds will be:

Hardy Maclay, former CAB counsel, representing North American Airlines.

Morris, Kixmiller and Barr, representing American Air Transport, Inc., and Air Coach Transport Assn. Senior member George Morris formerly was president of the American Bar Assn. and junior member Albert Beitel, a former CAB examiner.

Wheeler and Wheeler, representing Coastal Cargo, Inc., is the firm of former Sen. Burton Wheeler, former chairman of the Senate Interstate Commerce Committee.

Davies, Richberg, Tydings, Beebe and Landa, representing Freight Air, Inc., and Seaboard & Western Airlines, includes several top figures of the Roosevelt era: former ambassador to Russia, Joseph Davies; Donald Richberg, former head of the National Recovery Administration and assistant to former Attorney General Homer Cummings; Arthur D. Condon, former attorney for the Bureau of Internal Revenue and Maritime Commission; former Sen. Millard Tydings.

Posner, Berge, Fox, and Arent, representing World Airways, includes Wendell Berge, former Assistant Attorney General, and Albert Arent, former assistant to Attorney General Francis Biddle.

Opposing the nonskeds will be:

Pogue and Neal, representing Western Airlines and Alaska Airlines, includes L. Welch Pogue, former CAB chairman, and George Neal, former CAB counsel.

Chadbourne, Parke, Whiteside, Wolfe and Brophy, representing Trans World Airlines, includes Gerald Brophy, prominent Democrat appointed to represent the government as a director of General Aniline and Film Corp. which former TWA President Jack Frye heads.

Covington and Burling, representing American Airlines and Panagra, is the law firm Secretary of State Dean Acheson was formerly connected with and is expected to rejoin. His son, David, is a junior partner.

Edward Leasure, representing Continental Airlines and Northwest Airlines, former CAB chief examiner.

—Katherine Johnsen

AVIATION WEEK VOL. 57, NO. 21
NOVEMBER 24, 1952

New Cutbacks Hit Aircraft Programs

- **Slashes follow line set by Campbell Report.**
- **Funds to go to newer plane, engine types.**

By Robert Hotz

Drastic cuts in production of obsolescing military aircraft types were made last week by the Air Force and Navy as a result of prodding by Defense Secretary Robert Lovett. Procurement funds recovered from the cuts will be used to increase production of new types.

► **Airplanes**—USAF cut the following programs:

• **Northrop Scorpion (F-89)** twin-jet night fighter. All current models of the Scorpion (A, B and C) have been grounded since September after a series of crashes indicating structural deficiencies. First F89Ds were scheduled to be delivered in November with a production program on this model stretching to the end of 1955. This program has been virtually eliminated by USAF. Previously the development program for the F-89F, successor to the D model, had been cancelled by USAF.

• **Lockheed Starfire (F-94C)** all-weather interceptor. This radar-equipped, rocket-firing fighter is already in production. Size of the production program previously had been reduced by USAF several times since the outbreak of the Korean war.

For the Navy the Bureau of Aeronautics made the following cuts:

• **Grumman Cougar (F9F-6 and -7)** sweptwing carrier-based jet fighter. Navy had originally planned a heavy production program for this fighter involving more than 1,000 planes during the next two years. Slash in this program was heavy.

• **Douglas Skyraider (AD)**, piston-powered attack plane. The Skyraider has been the Navy's standard postwar carrier-based attack plane and gained an excellent reputation in Korean combat. It is scheduled to be replaced by turboprop-powered A2D.

• **North American Savage (AJ-1)** carrier-based attack plane powered by two piston engines and one turbojet. The Savage is the largest U.S. carrier-based bomber and Navy's first plane equipped to carry atomic bombs. Navy recently announced that it planned to convert the Savage for duty as an aerial tanker to refuel carrier-based jet fighters. It is scheduled to be replaced by the A2J using turboprop power.

► **Engines**—Allison and Pratt & Whitney Aircraft are the hardest hit engine manufacturers involved in the cuts. Allison's J35 axial-flow jet powers the Scorpion, and its J33 centrifugal-type powers some versions of the Cougar and is also used in the Savage. P&WA's centrifugal J48 powers the bulk of the Cougars and all of the Starfires. P&WA also makes the afterburner for the Starfire. Cutback in R2800 piston engines for the Savage can easily be absorbed by commercial demand. Wright Aeronautical division will get a cut in R3350 piston engine production for the Skyraider.

Although Secretary Lovett, USAF, and Navy brass dismissed the Campbell Report (AVIATION WEEK July 28, p. 12) as "naive" and "uninformed," all the recently ordered cutbacks were specifically recommended by W. L. Campbell, then acting director of the Defense Production Administration. Campbell has since left DPA and returned to private business.

The services' action came as a direct result of a directive from Secretary Lovett ordering them to conserve aircraft procurement funds for the most modern types available and to phase out obsolescent types as soon as possible. The Defense Department is extremely anxious to present a well-ordered picture of its guided missile and aircraft procurement policies and programs to the 83rd Congress. Even without the impetus of economy-minded Republican control, there was a growing congressional dissatisfaction with the military procurement picture as it developed after the Korean war.

► **Policies Defended**—At the same time the Defense Department was quietly implementing some of the principal recommendations of the Campbell Report, Secretary Lovett was strongly defending defense procurement policies against the sharp criticism of the Senate Armed Forces Subcommittee on Preparedness headed by Sen. Lyndon Johnson. Marshalling statements from the Joint Chiefs of Staff, Munitions Board and the Secretaries of the Army, Navy and Air Force, Lovett made the following points in rebuttal to the most recent report of the Johnson Subcommittee (AVIATION WEEK Sept. 8, p. 16):

• **The stretchout** in military aircraft production was not made entirely for fiscal reasons, but also on the economic consequences that might have followed from an abrupt buildup to a peak followed by a sharp decline.

"In revising production schedules and stretching them out over a longer period of time, immediate requirements for critically short production equipment, materials, and manpower were reduced," the Munitions Board stated. "And to that extent military demands have not created serious disruptions in the economy of the nation which might have taken place otherwise. If military production were pushed up to a level where its 'take' of basic materials reduced the operation of many small- and medium-sized business enterprises beyond their break-even point, the damage to our economic structure would have been severe with comparatively little gained in the way of additional weapons."

• **No greater military mistake** could be made than to freeze aircraft design at this time.

• **Appointment** of a defense production czar is neither necessary nor desirable. Lovett noted that he had appointed Hugh Dean, a vice president of General Motors Corp. in charge of manufacturing, as a full-time production expediter.

• **The stretchout** of aircraft production will not delay deliveries of aircraft to foreign allies under the MDAP program because the original production schedules for this program were retained. The stretchout applied only to production for the U. S. military forces.

• **The Joint Chiefs of Staff** have never stated that the years 1953 and 1954 will constitute the period of our greatest peril, as quoted by the Senate report. Lovett said the JCS mentioned the general period of 1954 as the date by which Russian capabilities will become "very dangerous." They do not estimate that Russian intention is to make war in 1954 or imply after that year danger will be less.

Air Force Production Figures

In a detailed report covering all phases of the USAF procurement picture, Secretary Thomas Finletter wrote:

"Aircraft accepted by the Air Force in August totaled 8¼ million lb. airframe weight compared to only 1¼ million airframe lb. accepted during August 1950. Specifically, total fighter production in July 1952 was about five times the amount of two years ago; weight of fighter production was six times higher in 1952 than in 1950. Bomber production in July 1952 was five times higher than in July 1950 and in terms of weight seven times higher. Under production schedules applicable during 1951, 91% of the quantity of aircraft called for were delivered. During the first six months of 1952, 96% of the applicable production schedule was met.

"Two years ago production of the B-47 bomber program had barely started. Today at Boeing-Wichita, one of the three plants dedicated to this program, B-47s are being turned out at rate of better than one per working day. In the fighter category, two years ago the entire month's output of F-84s and F-86s—our two major fighter programs—was 55, or less than one a day. The combined output is now running around 250 a month, or better than 13 per day.

"In the case of engines, Allison and General Electric are currently turning out engines at a combined rate of approximately 60 a day compared to a total of 17 per day two years ago."

LOCKHEED-94C STARFIRE rocket-firing interceptor (note auxiliary missile pods protruding from wings) is one of planes being cut back under new USAF plans.

Aviation Safety Grant

Laurance S. Rockefeller has made a grant of $25,000 to the Flight Safety Foundation to be used in support of a program of safety promotion and education. The foundation is dedicated to the advancement of safety in all branches of commercial and private flying.

British Also Order Cutbacks

Britain's current economy wave in the defense budget already has forced a cutback in the production of obsolescing aircraft types, similar to the recent action by USAF and Navy.

Hardest hit is the twin-jet Canberra bomber program. Originally the program called for production by three other firms in addition to the designer, English Electric. The subcontractor programs have been greatly reduced and there is a strong possibility they may be cancelled completely.

In the night fighter field, where the Gloster Javelin will take over, current orders for the de Havilland Venom and the Armstrong Whitworth NF-11 have been cut back.

Most critical effect of the economy budget may be in the new generation of high-speed bombers on which the Royal Air Force is counting for its offensive power three years hence. Indications are that only token orders rather than quantity production will be authorized for the Vickers Valiant, Avro Vulcan and the Handley Page HP 80, crescent-winged bomber powered by four Sapphire jets.

Odlum Suggests B-60 Jet Airliner

Consolidated Vultee's B-60, sweptwing jet-powered version of the B-36, could be available as a commercial jet transport in 1955, and it could carry 200 passengers coast-to-coast in five hours, according to Convair's chairman of the board, Floyd B. Odlum.

Proviso is that the military release manufacturing space and personnel to allow Convair enough "elbow room" to undertake the task with sufficient facilities and manpower.

Other items of interest noted by Odlum in a speech before the Wings Club this month:

• **Planes capable of speeds** up to Mach 2 are already under construction.

• **No airline should use competition** to force an airframe manufacturer to build at a loss.

• **The 2% fee** now received by airframe manufacturers does not allow enough "fat" unless orders are received in large batches.

• **Cost and production time** of planes must be reduced. They are too complicated, require too many and too high precision parts. We need new techniques to simplify plane construction, especially military aircraft whose life expectancy is low. Possible greater use of plastics might be the answer, Odlum suggested.

Quick Trans-Arctic Route Hearing Urged

State Department is urging Civil Aeronautics Administration to expedite hearing of the Europe-West Coast trans-Arctic route application of Scandinavian Airlines System. State asks CAB consideration by Dec. 31.

U. S. carriers told CAB that if SAS flies the route they want to do the same. Thus, if the Board is not ready for U.S. operation of the route, the airlines ask that SAS not be allowed to operate it. Pan American, TWA, Western and one other airline presented their views to CAB at an informal conference. The Board has not discussed the matter with any SAS spokesmen, but may by Dec. 31 or early next year.

The CAB members have not yet studied the pros and cons. Key problem is that if the Board allows SAS to start scheduled West Coast-Europe service direct, as SAS asks, then U.S. prestige considerations may dictate that a U.S. line operate the route, too. And the subsidy need for that would be high. Present traffic demand for such service is considered low (AVIATION WEEK Oct. 6, p. 14).

The director of State Department's Transport and Communications Office,

J. Paul Barringer, says eventual airline use of this route appears inevitable because of the shorter distance and time. The main question is when.

If CAB considers the SAS application by Dec. 31, as Barringer urges, the Board may have an opinion before spring when SAS hopes to start the scheduled service.

Trans-Canada Buys Turboprop Viscounts

Trans-Canada Air Lines has placed an $11.5-million order for 15 Vickers Viscount turboprop transports. This is the first airline order for turboprop transports on this side of the Atlantic.

TCA President Gordon McGregor said the Viscounts would be used to supplement TCA's current fleet of DS-3s and North Stars on its domestic routes. This means U.S. passengers will get their first introduction to the relatively quiet and vibrationless turboprop travel when TCA introduces the Viscount on its New York-Montreal run sometime during 1955.

▶ **Deliveries**—Vickers has promised TCA delivery of its first Viscount in the fall of 1954 with the entire order scheduled for delivery by the end of 1955. From London, the British Board of Trade reported that the TCA Viscount order was the largest single dollar order received in Britain since the end of World War II.

Vickers recently increased Viscount production facilities at its Weybridge Plant and added an extensive component plant manufacturing operation at Hurn to allow production rates to be increased to six a month. First production models of the Viscount rolled off the Weybridge line this month for delivery to British European Airways.

▶ **Win Over 340s**—The TCA order was placed after an 18-month evaluation of the Viscount and the Convair 340 to meet TCA's future medium-range domestic transport requirements. TCA recently ordered eight Super Constellations for its overseas routes.

TCA currently operates over 16,800 route mi. and has reported a steadily increasing passenger business during the past 18 months.

Vickers now has about 50 Viscounts on order with another 50 still under negotiation.

New Terminal

(McGraw-Hill World News)

Bogota—Construction of a new international airport for Cali is scheduled to begin soon. The field, planned as one of the best terminals in Latin America, is expected to cost $3.2 million.

LEE ADAMS RYAN GURNEY

CAB Shuffles Chairman's Duties

Board assumes power to hire and fire, now controls staff matters of policy and major projects.

Civil Aeronautics Board has curbed the powers of its own chairmanship, as predicted by AVIATION WEEK (Oct. 27, p. 83). The four present members, including new Chairman Oswald Ryan, voted unanimously to put control of the 565-man staff back in the hands of the whole Board.

Former Chairman Donald Nyrop had managed staff affairs himself until resigning Nov. 1. Remaining four members are: Ryan, new Chairman and long-time vice chairman; Republican Chan Gurney, who while senator was chairman of the Senate Armed Services Committee and now is considered leading prospect for CAB chairmanship next year; and Democrats Josh Lee and Joseph Adams. The fifth membership probably will be filled by Eisenhower appointment about Mar. 1.

The procedural changes are exactly those predicted by AVIATION WEEK. And they are in full accord with a specific revision of the President's CAB Reorganization Order of 1950—as also explained in that article, and related in the Board's press release announcing the changes.

▶ **Changes**—Here is what will be involved:

• **Executive hiring and firing,** down to the division chief level, is "subject to the appeal of the Board." The CAB press release, interpreting authorization for this change under the President's old reorganization order, states: "Previously, the Board had defined the term 'heads of major administrative units' as including only the executive director and the heads of offices and bureaus. By its recent action, the Board has redefined the terms as also including . . . the assistant head of each office and bureau; and heads of divisions in each office and bureau."

• **Board controls staff** affairs on policy and major projects. The executive director of the staff, James Verner, reports to the full Board. The CAB press release states:

"The Board has also made a matter of record the fact that the executive director functions under authority delegated by the Board as well as the Chairman and reports not only to the Chairman but to the Board as a whole." The Chairman now handles staff matters mainly from an efficiency and housekeeping standpoint, whereas in the last two years he had largely directed the staff's action on matters of important substance as well. The next procedural change makes this clear.

• **Director reports to the Board** once weekly "to receive instructions and to report concerning overall progress as well as on the more important actions taken by him." Previously, Verner not only reported mainly to the Chairman but was obliged by the Chairman to serve as the latter's executive assistant. Result was that the staff director was constantly tied down to the Chairman's office, and the other Board members felt they had little say in planning the staff work which is considered so vital to members' final decisions on cases and policies.

▶ **Results**—Before effecting the change, the members presented their plan to a special meeting of the staff executives —about 22 of them. Board members report that staff members showed genuine approval.

Executive Director Verner immediately started routine weekly reporting to the full Board on the following Wednesday.

The Board's press release subsequently announced that the Board "saw no need for any major changes either in procedures or personnel" as indicated in AVIATION WEEK (Nov. 17, p. 18). This indicates the Board will not restore the office of "Public Counsel," as recommended unofficially by a number of Washington attorneys. The CAB members apparently believe that the increased efficiency of the specialized "bureau counsel" system outweighs the judicial advantages of a more theoretically independent "public counsel."

This also is borne out in a further acknowledgment by the Board of "the progress which has been made in obtaining more efficient operations" (mainly under the Nyrop chairmanship). Nyrop cracked the whip in speeding up economic cases. And in safety matters he acted as a sort of one-man civil aeronautics authority, especially after the series of crashes last winter.

He also wielded great personal influence with the big airlines on safety matters.

However, the present four Board members say they plan to "continue the progress" insofar as efficiency improvement is concerned.

Nose-High Takeoff Cited in Comet Crash

An unusually nose-high takeoff attitude is believed to have been responsible for the accident involving a BOAC Comet at Ciampino Airport at Rome, according to some unofficial reports.

First contact with the ground apparently was made by the tailskid which dragged down the runway for some distance.

The accident occurred shortly after dusk.

Major damage to the aircraft occurred when it came in contact with airfield boundary lights mounted on concrete posts 2 ft. 6 in. high. The landing gear collapsed. The Comet's crash switches were operated when the aircraft settled to the ground. All emergency equipment functioned. All fire extinguishers operated. Fuel cutoff switches shut down the four engines, all of which were, up to this moment, running at full thrust. Electrical services were curtailed and standby cabin lights were automatically energized.

▶ **No Fire**—Before the aircraft came to rest, one of the concrete posts ripped the bottom skin away from the port outer fuel tank, carrying 1,210 imperial gal. of kerosene fuel. The spilled fuel followed the aircraft in a wave, eventually overtook it and lapped at the jet pipes; but there was no fire. None of the other tanks was punctured nor was there any sign of a leak from any of them.

None of the 42 people aboard was injured.

BOAC concurred in the official statement issued by the British Ministry of Civil Aviation that neither the aircraft nor its engines had malfunctioned.

No official report has been issued on the cause of the crash.

Safety Built In

- **That is feature claimed for all-metal Helioplane.**
- **First of military version to Army next month.**

First delivery of a military version of the radically designed slow-flying four-place Helioplane is due in December. Civil versions will be forthcoming early next year.

Prof. Otto C. Koppen, designer of the all-metal aircraft, told AVIATION WEEK the first custom-built military experimental plane would be delivered to the Army Field Forces at Ft. Bragg, N. C., next month; the first four-place plane off the commercial production line at the Helio Aircraft Co. plant at Norwood, Mass., will be ready early next year. Price is tagged at over $20,000 fully equipped with blind flying instrumentation.

Except for all-metal construction, the commercial Helioplane Courier will be similar in most respects to the four-place prototype Courier which made its debut at the August 1951 Detroit National Air Races and which has been demonstrated about the country since.

▶ **Safety Features**—Designed-in safety features plus slow-flying ability are expected to make the Helioplane perhaps the safest small airplane yet produced. Steel tube structure surrounds the cabin. Seats are designed to take 15G loads fore and aft; shoulder harness is provided. Landing gear is set well forward to prevent noseover. If the pilot uses the slow speed in emergency it is hard to conceive of an accident from which the plane's occupants can't walk away, the designer says.

The airplane was engineered by Prof. Koppen, aeronautics professor at Massachusetts Institute of Technology, to meet specifications derived from a 40-state survey on requirements of the flying public. The survey was conducted by Prof. Lynn Bollinger of Harvard University School of Business Administration.

Designed to take advantage of various highlift devices in order to fly slowly, the Helioplane can maintain level flight at 30 mph. and operate with full load from a 100-yd. air strip, its designers have demonstrated. It is designed to cruise at 150 mph.

▶ **Lycoming Engine**—Powerplant is a 260-hp. Lycoming GO-435 engine turning a Hartzell propeller with reduction gear.

Wing is fitted with very large full span flaps, plus leading edge automatic slats, and is designed to be spinproof. Prof. Koppen before World War II had designed the spinproof General Aircraft Skyfarer two-place airplane, with two-control system. The four-place design is the second Helioplane. The design principles were flight tested previously in a smaller Cub-size two-placer first flown in 1949.

Helio Aircraft Co. has been struggling to get into production on the military and commercial versions for more than a year, and at one time had a materials schedule with DPA for 12 planes a month. Current plans are to build the commercial planes on order, with down payments in advance.

AF Officer Sees Need for Complexity

"Give us reliability and don't worry about complexity," said Col. H. J. Sands, USAF, to the recent Metropolitan Section meeting of the Society of Automotive Engineers.

Sands, who spoke on complexity in present-day aircraft, is special assistant to the Deputy for Development, Air Research and Development Command. He had been a member of a group recently returned from a study of battle conditions in Korea and drew on that experience for his talk.

Sands' general thesis was that the pilot should not have to do anything but fight, and that if additional gadgets were necessary to accomplish that job then they should be provided. He cited as one example the problem of starting a turbojet where temperature of the starter-generator is a limiting factor. Pilots exceed permissible limits too easily with manual starting, and so the Air Force is considering the use of a completely automatic engine starting system.

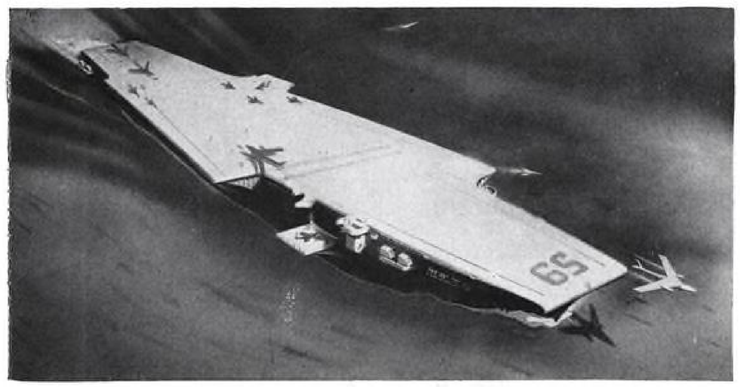
Sands said that much of the current outcry against complexity could be traced to quotes from experienced pilots with long strings of combat missions in World War II and Korea. These men could probably use a simple airplane, he said, but the new pilots couldn't. It is this latter group that will be doing most of the fighting in event of war, he added.

Lack of Capital Hits Aerocar Plans

Lack of capital has forced Aerocar, Inc., Longview, Wash., to drop out of the Civil Aeronautics Administration's program to run full-scale tests on dual-purpose aircraft convertible to autos.

CAA had asked the firm to supply 10 of its Aerocars on a rental basis, but the company's president and designer, Moulton Taylor, says he has been unable to raise the $90,000 necessary.

Aerocar is building four of its models.



ANGLED DECK on USS Forrestal will permit emergency takeoffs after bad landings.

New Angle for Carrier Landings

A new type of flight deck and operational technique has been developed jointly by the U.S. and British navies to increase efficiency and safety of jet aircraft operations aboard aircraft carriers.

The new deck has an additional area extending outboard from the normal flight deck to allow the aircraft landing area to be angled ten degrees off the ship's centerline.

► **Operation**—Here is how it works:

In current carrier operations the pilot approaches for a landing at from 5 to 15 knots above stalling speed. When he is directly over the landing area he gets a signal from the landing signal officer to "cut." The pilot chops his throttle and stalls down onto the deck where his tailhook engages one of the arresting wires. When the pilot chops his throttle he is irrevocably committed to land. If his tailhook misses the arresting gear he rolls on into a crash barrier designed to keep his plane from crashing into the deckload of gassed and armed planes parked on the forward deck.

For a piston-powered plane, the crash barrier has wires that catch the propeller. For a jet, a 12½-ft. nylon web tries to catch and hold the landing gear and wing. If the barrier fails to hold a plane, or it bounces over, a costly crash into the planes parked forward is inevitable.

In the new technique the jet pilot approaches at an angle with his air brakes extended and pulling about 75% power. He comes in at a relatively high speed with the nose high to make the aircraft sink at a controlled rate of descent. Instead of stalling down onto the arresting gear, he "sinks" into it and doesn't cut power until he feels his tailhook engage. If the hook fails to engage he retracts his air brakes, jams the throttle forward and, since he already has considerable power, the jet can accelerate fast enough to take off again and come around for another approach.

The combination of the angled deck and new approach technique offers the following main advantages, according to Rear Adm. T. S. Combs, chief of the Navy's Bureau of Aeronautics:

• **Safety.** It removes the costly hazard of a crash into the forward deckload of gassed and armed planes. A recent crash of this type where a Banshee jumped the nylon crash barrier on the Essex off Korea killed ten men, injured a score and destroyed about $3 million in aircraft. If a crash does occur on the angled deck, it is pointed away from the deck load and "island" superstructure; it will involve only a single plane.

Additional hazard from charged wing guns, loose rockets and "hung" bombs that fire or explode along the line of landing will also be directed away from flight deck personnel and vulnerable targets. The jet pilot also has a much better chance of making a recovery from a bad approach or malfunctioning tailhook than formerly.

• **Economy.** The angled deck landing gear requires only half the arresting gear used for normal operations and eliminates the crash barrier. Observers estimate that about $300,000 will be saved on arresting gear engines alone. Considerable weight is saved in the critical area high above the plane's center of gravity. Indications are that enough weight can be saved to allow installation of an additional catapult for jet launchings on the angled deck.

► **Developed by British**—The angled deck concept was developed by the British at the end of World War II when they began operating twin-engine attack planes of wooden construction. The normal crash barrier tore up these planes beyond repair. First flight tests were made in 1951 by U. S. Navy pilots off Norfolk using jet aircraft on a specially marked portion of the carrier FDR's flight deck.

Initial construction of an angled deck on a carrier is now being completed on the 27,000-ton Essex-class carrier Antietam. A full-scale fleet evaluation of the angled deck and its flight techniques is scheduled for early in 1953, with both British and American jet types participating. Cost of the Antietam modification is about $1 million. If the Antietam tests are as successful as anticipated, all of the Essex-class carriers will be modified with an angled deck. On carriers with an island superstructure, the angled deck will extend off the port side. On the new flush deck 60,000-ton Forrestal-class carriers the landing and catapult areas can be angled in both directions.

Transistor 'Aging' Troubles Producers

Reports of "shelf-life aging" in certain types of point-contact transistors are attributed by one leading manufacturer to inadequate sealing against moisture. The manufacturer says he already has taken corrective steps. Reduction in transistor gain, or amplification, are the symptoms of the reported troubles.

Avionics industry interest in the transistor as a possible substitute for the vacuum tube has been high because of the transistor's extremely long life, small size, light weight and low power consumption. Although it is only recently out of the "laboratory curiosity" stage, many companies already have put their engineers to work to learn more about the transistor's characteristics and potential uses.

► **Point Contact Type Susceptible**—The aging problem has shown up only recently in the point-contact type transistor, the earliest type and the one which is in widest production today. This point contact transistor consists of a small piece of germanium against which are pressed two tiny wire "cat's whiskers," called the emitter and the collector. (Functionally, the emitter corresponds to a vacuum tube's grid; the collector corresponds to the plate.)

It has been known for some time that moisture causes a chemical reaction at the point of whisker-germanium contact which increases collector impedance and reduces current gain. Extended storage periods have now shown that the plastic used to seal some types of transistors permits moisture seepage. Hermetic sealing and possibly the use of an inert filling gas appear to be the logical solutions to the problem.

► **GE Statement**—In answer to an AVIATION WEEK query, a General Electric spokesman said: "Along with other companies, GE has experienced a phenomenon similar to shelf-life aging which has been traced to a lack of adequate protection against moisture at the contact between the whiskers and the germanium. Laboratory hermetically sealed transistors do not indicate (these) . . . effects.

"New commercial designs having adequate moisture protection are under way at the present time."

A source at Western Electric said that approximately 15% of its type 1698 transistors have shown significant gain changes in storage. (Western Electric is possibly the largest transistor manufacturer at present and an affiliate of Bell Telephone Labs, which invented the transistor.)

The company has as yet declined to talk officially about the problem or corrective measures which might be undertaken.

► **Future Still Bright**—Present manufacturing problems are typical of those involved in moving any new device from the laboratory into production and are not expected to dampen industry enthusiasm for the transistor. New Jersey Bell Telephone Co. showed its confidence last month by inaugurating full-time use of transistors in its automatic, customer long-distance dialing service at Englewood, N. J. to cite one special example.

Turboprops

- **NACA and services seek better plane designs.**
- **Mach 1.5 speeds possible with present know-how.**

U.S. high-speed turboprop developments, which have been lagging far behind jet aircraft engine developments the last two years, are due for a shot in the arm shortly.

Although the aerodynamic know-how has been available for some time to make propellers that will carry aircraft up to speeds of Mach 1.5, nothing much has been done until recently about developing the high-thrust turboprop powerplants or airplanes specially designed to fly them.

Two new steps toward pulling the turboprop out of the doldrums are now in progress:

• National Advisory Committee for Aeronautics has been asked by U.S. propeller manufacturers to make a detailed study of design parameters for an ideal configuration for a high-speed propeller-driven plane.

• Air Force and Navy recently settled their argument about the size of turboprop engine development in favor of more powerful engines which will produce 15,000 hp., have authorized development of such a powerplant.

► **Accept Penalties**—Delay in developing more powerful turboprops that would be competitive in power with current turbojet engines has been responsible for the slow start for fast propeller-driven planes. U.S. military development has been so concentrated on turbojets that little attention has been given to turboprop engines since the three Navy development contracts for the Allison T38 and T40 and the Pratt & Whitney T34 about five years ago.

As a result, aircraft manufacturers are not designing high-speed propeller planes and are accepting penalties in the relatively low power (about 5,500 hp.) of the two U.S. turboprops now in advanced development or limited production—the Allison T40 and Pratt & Whitney T34.

U.S. propeller engineers feel that data is available today to design props capable of propelling planes at speeds as high as Mach 1.5. This would be competitive in speed with the fastest jet planes now flying, while providing additional fuel economy, better takeoff and climb performance and reverse thrust braking for shorter runway landings.

► **Conversions Planned**—The fast pace

NEW SWEDISH ATTACK PLANE TESTED

Flight trials were started Nov. 3 of the new Saab-32 Lance, a 700-mph. two-seat all-weather plane designed primarily to attack ground and sea targets. Flush air intakes feed the powerful Rolls-Royce Avon engine. The Lance's clean lines are further accentuated by its sharply swept wings and tail and the large fairing at the horizontal tailplane for smoothing air flow at the root of the movable stabilizer. The thin wing is fitted with large Fowler-type flaps and leading edge slats and ailerons and elevators use hydraulic boost. Crew members have ejector seats. Primary armament of the plane consists of cannon, but rockets and bombs also can be carried if the need arises. Nose wheel folds forward and up, main wheels inward.

at which jet engines have stepped up their power and the military emphasis on speed, probably are primary reasons why scant attention has been paid to further turboprop developments in the last two years.

Two high-speed jet planes have been planned for conversion to turboprops to test the propeller drive at speeds in the subsonic and transonic ranges. One of these projects, for modification of the McDonnell XF-88 for propeller drive in addition to its jet powerplants, has since been dropped. The other still has joint Air Force and Navy support for the installation of a turboprop in a special sweptwing version of the Republic F-84.

Turbulence created in the nose of either of these fighters by the wake of a high-speed propeller would subject the plane to unfavorable rough air conditions it would not fly in as a pure jet.

A third proposed turboprop development at relatively high subsonic speeds calls for installation of turboprop engines in a long-range version of the Boeing six-jet B-47 sweptwing medium bomber.

▶ **Return to Mixmaster**—Propeller engineers point out that installation of turboprop engines in pods under the wings, as would be indicated here, is far from an ideal arrangement. It involves either a severe limiting factor on propeller diameters for ground clearance or a ridiculously long-legged and impractical landing gear.

Return to something like the Douglas XB-42 Mixmaster configuration, with the propeller at the tail so the plane will not have to fly through propeller turbulence, probably is indicated as at least one preferred configuration.

While several other turboprop-driven planes are now flying, none is in the high-speed category which today's propeller design capabilities make possible.

Design trends for very thin straight blades, whirled at high speeds, continue to be favored as the best solution, according to leading propeller engineers. Additional tests have indicated that the props do not need to be so thin in the critical area near the shank and hub as was earlier believed.

Bell Copters Abroad

Foreign governments now using or planning to use the Bell 47D-1 helicopter in military as well as in some civilian roles include Norway, Sweden, Denmark, Italy, Chile, Belgium, France, Chinese Nationalists, Philippines, Iraq, Argentina and Canada. In addition to military assignments, the copters are used on postal routes, ambulance duty, pest control, power line patrol, map survey and exploration.

Fifty Years of Powered Flight

Plans for a year-long observance of the 50th anniversary of the Wright Brothers' first flight were revealed in Washington last week by James Harold (Jimmy) Doolittle, who will head the program. The 50th anniversary of flight observance will begin Dec. 17 at the Wright Memorial dinner in Washington and continue until the same event in 1953.

Doolittle, who will receive the 1952 Wright Brothers Memorial Trophy for his contributions to civil aviation (AVIATION WEEK Nov. 17 p. 12), will head a committee of approximately 100 leaders in all phases of aviation to spark the program. Committee headquarters will be in Room 653, Shoreham Bldg., Washington, D. C.

Goal of the committee is to organize a national tribute to the pioneering achievements of the Wright Brothers, Orville and Wilbur, who made the world's first flight in a powered aircraft at Kitty Hawk, N. C., on Dec. 17, 1903. The program also will recognize contributions of other aviation pioneers and attempt to stir public appreciation of aviation's contributions to America during the past half century.

The 1953 National Air Races scheduled to be held at Dayton, Ohio, home of the Wright Brothers, and other outstanding national aviation events are expected to be co-ordinated with the 50th anniversary program. Doolittle appealed to all American citizens to furnish additional ideas for the celebration to him and his committee. These suggestions should be addressed to Doolittle either at the Shoreham Building or at his Air Force office in the Pentagon.

Sen. Bridges Calls For K-F C-119 Probe

A Senate airing of Air Force's contract with Kaiser-Frazer Corp. for production of C-119s early next year is likely.

Charging that the unit cost being paid to K-F of $1,200,000 compares with $260,000 being paid to Fairchild Engine and Airplane Corp. which originally developed the aircraft, Sen. Styles Bridges has called for a thorough investigation by the Preparedness Subcommittee of the Senate Armed Services Committee. He also urged the Senate Appropriations Committee to review the contract in passing on 1954 fiscal year funds for the Air Force.

Bridges, who is the top-ranking Republican on all three groups, probably will take the chairmanship of the Appropriations Committee in the new Republican-controlled Congress convening Jan. 3 in preference to heading either of the other two groups. Bridges said that the $189,952,519 contract with K-F for 159 C-119s is costing the government almost $150 million more than if the same contract had been awarded to Fairchild.

▶ **Committee Cool**—House Armed Services Committee, which already has made a thorough investigation of the contract, is inclined to drop the matter. Members feel that it boils down to a question of the policy of whether the military should open up second and third sources of supply. The policy is generally favored by the military services and members of congressional committees concerned with military affairs.

"The gist of the Air Force statement appears to be that K-F has had no experience in the aircraft industry and must necessarily undergo large initial costs," Bridges declared. "This explanation can be considered a strong argument against the contract rather than any justification for continuing it. I believe most people would agree with me that it is the duty of the Air Force procurement officials to see that contracts are let to firms with know-how to fulfill them properly and at the best price to the government."

Bridges said that the K-F contract for production of C-123s also should be investigated "to see if it entailed the same excessive costs. I see no need of subsidizing any company while established plane builders have unused capacity."

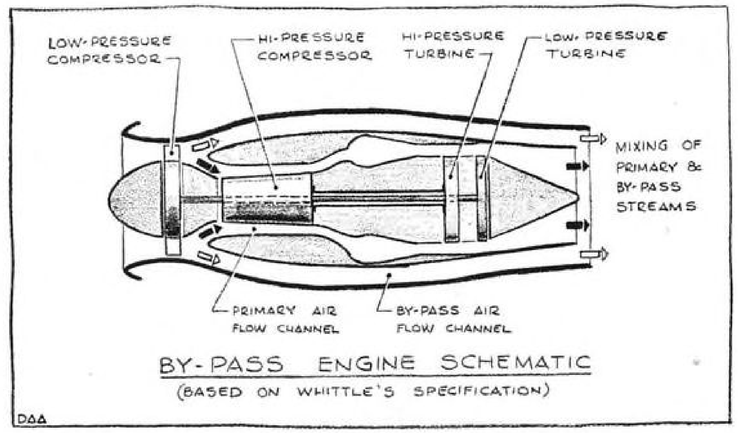
▶ **Probe Outlined**—Points Senate investigators should go into, Bridges stated, are: Whether the Fairchild plant at Hagerstown, Md., can produce the balance of the K-F contract; the K-F record on meeting production quotas; whether it is possible for unit costs to be increased under the K-F contract; whether Air Force has incurred excessive costs on other second sources of supply for aircraft production; whether USAF's military command concurred with the civilian secretariat in letting the K-F contract.

Jet Overhaul Base

A jet aircraft overhaul base has been dedicated at Ontario International Airport, Ontario, Calif., by Lockheed Aircraft Service.

By-Pass Engine Promises Fuel Economy

- **This powerplant looks good for transport types.**
- **It offers low-cost high thrust for climb, cruise.**



BY-PASS ENGINE SCHEMATIC
(BASED ON WHITTLE'S SPECIFICATION)

The by-pass, or dilution, jet is first and foremost a design for fuel economy.

It is a way of obtaining high cruising thrust with low fuel consumption, and as a secondary advantage, a high thrust for takeoff and climb.

It is not of concern to aircraft designers who are after high speed alone.

▶ **History**—Technically the by-pass engine is a turbojet which incorporates a ducted fan or low-pressure compressor. As defined in Sir Frank Whittle's basic patent, airflow from the fan or low-pressure compressor is divided between the main compressor-burner-turbine cycle, and a by-pass duct around the engine to an exhaust outlet concentric with that of the turbojet.

In its original form, Whittle's patent (British, No. 471,368) embraced the compounded engine, such as the Napier Nomad, and the use of afterburning. The patent, filed in 1936, was recently renewed for the maximum extension period of 10 years after a legal battle by Power Jets (Research and Development) Ltd. on behalf of Sir Frank.

Whittle also filed U.S. Patent 2,168,726 in similar terms before World War II, but the clauses describing the compounded engine were omitted from this application.

▶ **Early Engines**—Whittle was first to propound the by-pass method of increasing jet-engine air-mass flow. But the first to put the principle into practice may have been the German Daimler Benz company, which had the D.B. 007 engine running in the autumn of 1943. This design was, however, considered too complicated by German authorities and was dropped.

Independently the French Societe Rateau, under the guidance of M. Anxionnaz, veteran supercharger designer, started work in 1940 on a by-pass jet. Development continued in secret during the German occupation and Rateau had an engine running in 1946. This S.65 (or S.R.A.1) unit had a static thrust of around 2,800 lb. and a specific fuel consumption of 1 lb./lb./hr., which was good for a development engine of those days.

Power Jets Ltd., the government-owned company established to supervise British jet development and the application of Whittle and other patents, started work in 1943 on the LR-1, an adaptable by-pass unit. This engine, well under construction in 1944, was dropped when, under pressure from the British engine industry, Power Jets stopped active design work in favor of advisory duties.

Recently, the French Societe Turbomeca has test-flown its small by-pass engine, the Aspin, with considerable success and with remarkably low fuel consumption.

It has been said that the British Metro-Vick F-4 engine with ducted-fan thrust-augmenter—a shrouded propeller at the rear of the engine driven by an entirely independent turbine mounted downstream of the main turbine—was a by-pass design, but British purists maintain it was not. The point at issue is that in this case the air mass accelerated by the fan is independent of that consumed by the compressor, and that to qualify for the title by-pass there must be a splitting of a common air supply.

▶ **Behind the Theory**—The by-pass principle is simple enough and depends upon the fundamental fact that the nearer the jet stream velocity is to the speed of the aircraft, the greater is the propulsive efficiency. Until it is traveling very fast, the straight turbojet is not efficient because of this "slip."

In order to give high takeoff thrust—that is to get a large mass of air moving—the turbojet has to accelerate it to a very high speed. This means burning a great deal of fuel—over a pound for each hundred pounds of thrust, in fact. (By comparison, the propeller of a piston engine can deal with something like one hundred times as much air for each pound of fuel burned.) Already, fuel consumptions of around 0.5 lb./lb./hr. are contemplated for the by-pass engine, which means very high air-miles per gallon in the stratosphere.

The turboprop engine is one way of improving the air mass-flow, but it adds all the complications and weight of a high-reduction gear-box and a propeller. There are also the attendant difficulties of starting, and the provision of special low-pitch positions and automatic feathering in the propeller controls. The airplane itself is affected because of nacelle "dirtiness" and slipstream drag and, of course, there is the longer (and heavier) undercarriage needed for propeller ground clearance.

▶ **Better Compromise**—The by-pass engine, and the ducted fan, are attempts to get the best from both systems. British authorities who believe in the by-pass principle claim that it is mechanically simpler than the large turboprop and is therefore lighter and more reliable. It is possible to achieve five or six times the air mass-flow of a straight jet for the same fuel consumption.

The reason for this is that the first three or four low-pressure compressor stages may give a pressure ratio of 1.5:1; the flow from this is then split. The main quantity, probably 60%, continues through the high-pressure stages, with a ratio of, say, 4:1 giving an overall pressure ratio of 6:1 (4 x 1.5). Meanwhile, the by-pass air removes waste heat

from the engine body and in the process absorbs heat energy, before being discharged at the rear of the engine.

Furthermore, the by-pass jet is moving much more slowly than a normal jet and, mixed with the exhaust-gas jet, has much better propulsive powers at low speed because of the reduction of "slip." Above all, the by-pass is a natural for afterburning—a device foreseen in Whittle's original patent—because of the large quantity of unburnt air remaining.

▶ **Application**—British opinion, naturally exemplified by Rolls-Royce because of their work on the Conway, is that the by-pass engine is ideal for bomber and transport operation in aircraft such as the Valiant or the Comet IV. High thrust for takeoff and climb are available, with or without afterburning, and the improvement in mass-flow is particularly valuable for cruise economy at 50,000 feet and above.

Installation cleanness of the by-pass engine is in its favor for highspeed cruising, and there is no reason why over-all diameter should necessarily be any larger than for an equivalent straight jet. The cooling sheath of air may well reduce structural problems now troubling designers because of heat transfer from high-thrust jets.

The first low-pressure compressor stages can be driven either by gears or by using a two-spool layout, the latter probably being the simpler. In the Turbomeca Aspin, variable-incidence entry guide vanes are used to insure the most economic airflow for given speeds. This feature is presented as a virtue by designer Joseph Szydlowski, but is more probably a necessity.

Although small, the Aspin is an excellent example of a by-pass engine and deserves full credit as being the first to achieve flight. Tests were made in a Fouga Gemeaux light aircraft.

▶ **Objections**—Opinions against the by-pass engine expressed by technicians of rival engine British companies may be summarized as follows:

- **Operating brackets are restricted.** The by-pass engine is a more refined design problem, depends more on ambient conditions, than does the straight turbojet. New conditions, or changes in specifications, demand a complete redesign.
- **Drive mechanism is complex.** The two-spool turbojet layout is already bad enough to work with, say the British design teams.
- **Ducting installation is complicated.** It involves splitting an air supply through areas already alive with lines, pipes and other plumbing.
- **Mixing of jet streams is tricky.** Interference and noise problems of such installations are not completely known, let alone studied.

▶ **Rebuttal**—Proponents of the system

counter that technologically there is the knowledge to overcome all difficulties, it is merely a matter of experimenting to evolve the best methods. They accuse their antagonists of searching for objections.

Finally, there is the question of operating speed. The by-pass is **not** a pure speed engine and is essentially wasted in a fighter—save where long range or endurance is required—even though its acceleration potential is greater than a pure jet.

On the other hand, there seems to be no reason why particular by-pass engines could not be designed for sonic or low supersonic speed ranges. For years past, propeller designers have been threatening to develop cropped multi-blade supersonic fans—and if these can be made to work their duct-mounted relatives should be more efficient still.

—James Hay Stevens

How XH-16 Copter Blades Are Formed

Rotor blades of Piasecki's 42-place XH-16 copter, scheduled to fly late this year, are being built around compression-formed spar tubes.

Basic extruded tubes are processed by Tube Reducing Corp., Wallington, N. J., by its Rockrite procedure. This involves cold-forming by rocking semicircular dies back and forth over the tubing, forcing the metal against a polished mandrel which controls the inside diameter.

Better grain for improved structural strength, and closer control of dimensional tolerances, wall thickness and concentricity for minimum final machining are reported possible with the process.

Piasecki covers the spar tubes with honeycomb structure and milled aluminum skin.

This type of spar tube also is used on Piasecki's HUP and 16-place YH-21 Air Force rescue copter.

Homemade Climate For Equipment Tests

Two custom-built units for environmental testing of aircraft components have recently been delivered by Bowser Technical Refrigeration division of Bowser, Inc., Terryville, Conn.

The first, a walk-in chamber built for the Dalmo Victor Co., San Carlos, Calif., is to simulate altitudes up to 80,000 ft. or temperatures from −85F to 167F. Freon 12 and Freon 22 in the refrigeration system drop the ambient test temperature from 140F to −76F in about two hours. Pumps evacuate the chamber at a climbing rate of about one mile per minute. Reflective foil insulation helps to maintain a 5-kw. load at 50,000 ft. and a temperature of −76F.

The second unit was tailored to the requirements of desert atmosphere testing for Wright-Patterson AFB, Ohio. The test chamber is made of stainless steel, so that dust will not adhere to the surface.

Temperatures of 80F to 160F combine with wind velocities from 100 to 2,300 fpm. to simulate desert atmospheres. Pre-measured quantities of dust are added through a Bowser-designed sand injector to subject the test piece to abrasion and clogging.

Unit Aids Accuracy Of Optical Tooling

An optical tooling refinement—built-in auto-reflection—is a new feature of the British Taylor-Hobson Micro Alignment Telescope. This instrument, marketed in the U. S. by Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill., adds the technique of determining target squareness (normal to line of sight) to the scope's function of checking point alignment to .001-in. accuracy

over distances from 18 in. to more than 150 ft.

With auto-reflection, an image of the scope's objective end is returned from the mirror target and if the target is out of square the image will be out of center. A built-in illuminator and calibrated graticule (reticle) enable the operator to determine target squareness exactly.

Scope's barrel diameter is 2¼ in., magnification is 30X and 45X. When micrometer reading of displacement is not required, the scope is available without built-in optical micrometers.

Another T-H unit offered by Engis is an aligning tube for precise point and tilt alignment. This has the same diameter as the scope and incorporates two illuminated targets at 10-in. distance. Tube-scope alignment is established when both targets are aligned in the scope.

New T-H targets available are 1½- and 2½-in. hard glass units, made to Aircraft Industries Assn. standards. Other accessories include collimators mounting spheres, target rotators, optical squares, and scope stride level, according to the distributor.

Shipping Unit Saves Missile From Shock

New spring-loaded mount has been designed to protect guided missiles against shock and vibration in shipping.

The basic design would be tailored to fit a specific missile, such as the dummy body shown. Springs on the fore and aft rings carry the load and are compressed from a normal length of 8 in. to 6 in. for a preload condition to break their natural frequency. Radial positioning of the springs—six placed at 60 deg. apart—causes each to act against its opposing member. Rings contacting the missile are located at body's bulkheads.

Shock cords from rings to the frame act as snubbers. Crank serves to open ring turnbuckles for insertion and removal of missile body. Dolly wheels are quickly removable and entire assembly, missile and mount, could be shipped in a container—mount being inserted in container first, the missile slid in, and turnbuckles closed. Patent on the design is held by Mechanical Suspension Mount Co. Ltd., Westbury, L. I., N. Y., which acts as the licensing organization. The company will also supply prototype or production models, if requested. In addition to the continuous ring carrier shown, a split-ring type mounting also has been designed by the company, as well as spring-loaded carriers for various electronic-type controls.

Firms now licensed for manufacture of the missile mount are Molla, Inc., Westbury; and Hammond Mfg. Co., Pasadena, Calif.

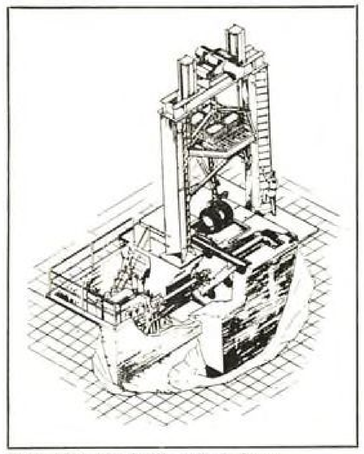
Armour Announces Plane Foam Plastic

A new low-density material, reportedly being used to fill cavities in aircraft fuselages, is announced by Armour and Co.'s Adhesive division, 1355 W. 31st., Chicago, Ill.

Known as Armofoam, the substance is a foamed-in-place, self-curing expanded plastic furnished as a two-part liquid formulation. A similar substance, Lockfoam, was described in Aviation Week Oct. 27, p. 35.

Characteristics include ability to stiffen and vibration-dampen, together with affording a tight bond on metal, wood, glass, plastic, fiber, cloth and porcelain, as well as good thermal, sound and electrical insulation properties.

The material is reported to have marked stability to heat, and is insoluble in water. Density can be varied from 3 to more than 20 lb. per cu. ft., as desired.



230-TON treadmill unit is how . . .

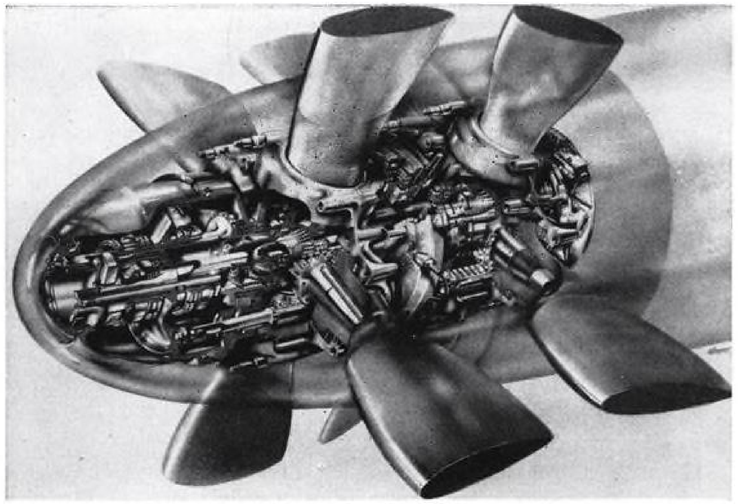
Landing Shimmy Is Studied at Lockheed

A huge treadmill is being erected at Lockheed Aircraft Corp. to help engineers unravel the complexities of landing gear shimmy. Instead of beefing up gears to withstand vibration, Lockheed wants to eliminate possibility of shimmy in advance on its future experimental planes.

With the new research unit illustrated, in effect a mechanical runway, Lockheed is aiming to achieve faster integration of landing mechanisms into new designs. Takeoffs and landings will be simulated for planes as large as the Super Constellation, with speeds of future jet transports.

Landing mechanisms for two experimental planes already are scheduled for tryout on the device some time this month.

Key part in the test equipment is a 10-ft.-diameter rotating drum operated to simulate speeds of the landing or takeoff conditions desired. The drum can be provided with built-in bumps to simulate taxi characteristics on rough airstrips. Maximum surface speed of the drum is 150 mph. Loads applied to nose gears under test may run as high as 150 tons.



CUTAWAY of DH prop for Saunders-Roe Princess shows internal mechanism which achieves propeller pitch changes as high as 32½ degrees per second.

Proteus Prop Changes Pitch Fast

New de Havilland blades, now flying on Britannia and Princess, can reach rate of more than 32 deg./sec.

A system which produces pitch changes greater than 30 deg. per second is the outstanding design feature of de Havilland propellers built for the Bristol Proteus turboprop engine installations.

Now flying in both the Bristol Britannia four-engine transport and the Saunders-Roe Princess 10-engine flying boat, the new props represent a high point of DH technical effort in propeller design.

Hollow steel blades (for this development DH owes much to Hamilton Standard div. of United Aircraft Corp.) are used on the Britannia. Dural blades are used on the Princess, but will be replaced with steel units when higher-powered Proteus engines are installed on the plane.

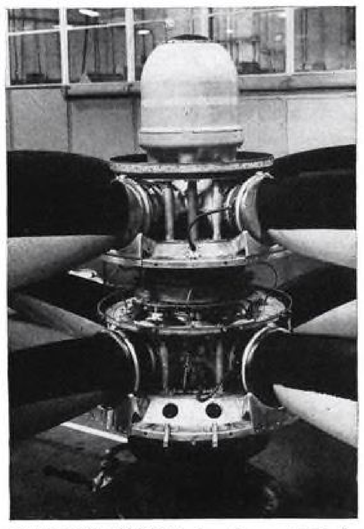
► **Design Problems**—The free turbine of the Proteus makes for fewer problems for the propeller designer than does the shaft-coupled turbine type.

One big exception has to do with the response rate of a free-turbine engine. These engines give a sudden surge of power when the throttle is opened, forcing the prop's constant-speed unit to act very quickly and accurately to handle this rapid increase of power.

DH's first attempt produced a governing unit with a fluid capacity of 1,400 gph. supply to the pitch-change mechanism at maximum engine rpm. (Largest unit in use at the time of this development had a capacity of 400 gph.)

This rate of delivery was inadequate so DH turned to a different approach.

Final form of the speed control was a high-capacity governor with an avionic acceleration-conscious device to handle high accelerations. Signal to this unit comes from the 3-phase engine-driven tachometer-generator on the Proteus. Engine acceleration is measured and compared to a preset value; if the acceleration exceeds the control value, full delivery of fluid is switched to the pitch-change unit.



PRINCESS PROP is bench-assembled for functional and hydraulic checking. Unit between propellers carries slip-ring for transfer of electric current for de-icing forward propeller blades. Separate ring supplies current for rear blades.

Pitch-change rates as high as 32½ degrees per second can be obtained, which de Havilland says is nearly twice the rate of pitch change of conventional systems.

► **Feathering**—Push-pull buttons feather the Britannia and Princess props. Feathering takes about two seconds.

On the Princess, the counter-rotating propellers are not arranged to feather independently, because a power failure of one of the coupled engines simply changes the gearing so that the propeller still can be driven by the good engine.

There is enough capacity in the constant-speed units to eliminate the separate reversing pumps. For reversing, throttles are pulled back and up over a gate; this energizes three solenoids to deliver full output of the constant-speed unit to the prop. The rate of pitch change is such that reversing can be accomplished from cruise power without danger of overspeed as the blades pass through zero pitch angle.

Automatic synchronization has been tested by DH on a Handley-Page Hastings, equipped with piston engines, and on a Proteus Lincoln testbed. Right now such synchronization is not a feature of the Princess and Britannia.

If the hydraulic supply to the propeller fails, there is a device which locks the blades immediately in the angle at which they are operating. This keeps them from returning to the low-pitch stop and developing the very high windmilling speed and drag to which the free turbine is particularly susceptible.

Dodge Plant to Produce Propellers

Propellers are scheduled for production early next year in Chrysler Corp.'s Dodge plant, San Leandro, Calif. Company will make 16½-ft.-diameter, four-bladed, rubber-filled Hamilton Standard props under license for Air Force and Navy, in a new plant addition. The facility will have a production control laboratory for check on material from raw stock to finished product. The lab will be devoted primarily to metallurgical work, but will also cover rubber and other materials.

Japs Study Jets

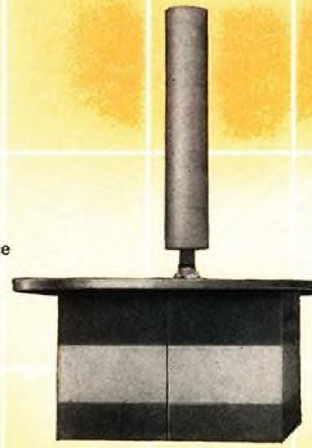
A Japanese firm reportedly is drawing up plans for a new lightweight but powerful jet engine which is scheduled for completion in two years. The manufacturer, Omiya Fuji Industrial Co., is collaborating with Sumitomo Metal Co. on production of heat-resistant steel to be used in the powerplant.

Type 396A
Transmitter Station
Single channel 250 watts 118-132 mc/s
Maximum dependability for unattended service

Type 440A
VHF Airborne Communications System
Receiver • Power Supply • Transmitter
180 Channel 118-136 mc/s, 50 watt output

Type 429A
Glideslope Receiver
A dual conversion superheterodyne receiver providing highly reliable I.L.S. aircraft navigation

Type 99A
Multi-Frequency Transmitter
Provides any combination up to four R. F. channels for operation 125-525 kc/s, 2-18 mc/s, 400 watt; and 118-132 mc/s, 250 watt



Type 482A
Terminal VHF Omni-Range Unit
Low cost packaged let down facility for airline stops
Operates with present VOR airborne equipment

wilcox
ELECTRIC COMPANY, INC.

Fourteenth and Chestnut
Kansas City 1, Missouri, U.S.A.

means dependable communications

Type 96 Series
Transmitting Station
96D Transmitter 2500 watts, 2-26 mc/s
96-200C Transmitter 2400 watts, 125-525 kc/s
50H Modulator • 36D Rectifier

Type 428
Packaged Complete VHF Station
Receiver: Type 305A
Transmitter: Type 406A, 50 watt output
Nothing else to buy

Dependable communication and navigation . . . night or day . . . in fog or ceiling unlimited . . . that's what the name Wilcox means to aircraft operators all over the world. For, wherever men fly, Wilcox equipment has proved itself in years of steady service.

For complete specifications of equipment write us today.

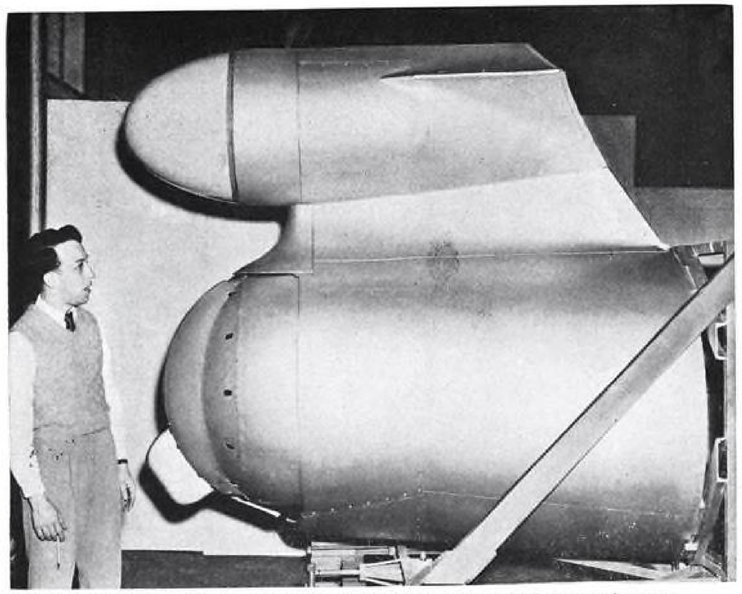
Fast Writeoffs

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

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

- **Marion Screw Products Co.,** Marion, Ind., aircraft parts, $14,925, 70%. (This figure to be reduced by the Bureau of Internal Revenue at a later date upon determination of the cost of certain facilities.)
- **Model Engineering & Mfg. Inc.,** Huntington, Ind., aircraft parts, $18,503, 65%.
- **Mack Engineering Co.,** Minneapolis, aircraft parts, $17,276, 45%.
- **Armstrong Furnace Co.,** Des Moines, aircraft parts, $66,390, 65%.
- **Aeroaffiliates,** Ft. Worth, aircraft parts, $75,805, 65%.
- **American Tool & Die Co.,** Los Angeles, aircraft parts, $6,111, 70%.
- **Mendelson-McCarthy Co.,** Long Beach, aircraft parts, $50,000, 70%.
- **Douglas Aircraft Co., Inc.,** Santa Monica, aircraft parts, $442,957, 60%.
- **Heppenstall Co.,** Bridgeport, Conn., aircraft parts, $144,402, 60%.
- **United Aircraft Corp.,** Windsor Locks, Conn., aircraft parts, $808,408, 65%.
- **General Electric Co.,** Worcester, Mass., aircraft parts, $76,295, 65%.
- **Lee Co.,** Hartford, Conn., aircraft parts, $3,723, 70%.
- **General Motors Corp.,** Rochester, N. Y., aircraft parts, $145,808, 65%.
- **Edward A. Heiner Labs.,** Farmingdale, N. Y., aircraft and electronic products, $11,643, 70%.
- **Fairchild Engine & Airplane Corp.,** Hagerstown, Md., airplanes and airplane parts, $29,205, 65%.
- **General Motors Corp.,** Vandalia, Ohio, aircraft parts, $66,884, 60%.
- **Universal Electric Corp.,** Owosso, Mich., miniature electric motors for aircraft, $128,329, 45%.
- **Jack & Heintz, Inc.,** Maple Heights, Ohio, aircraft parts, $27,000, 45%.
- **Steel Improvement & Forge Co.,** Cleveland, aircraft parts, $24,961, 65%.
- **Elbesco, Inc.,** Jackson, Mich., aircraft parts, $32,350, 70%.
- **General Fireproofing Co.,** Youngstown, aircraft parts, $325,000, 40%.
- **Peerless Tool & Engineering Co.,** Chicago, aircraft parts, $181,594, 60%.
- **General Motors Corp.,** Indianapolis, aircraft parts, $79,017, 65%.
- **Kropp Forge Co.,** Chicago, forgings for aircraft, $165,999, 65%.
- **Neo Ray Products, Inc.,** Des Moines, aircraft parts, $36,018, 70%.
- **Beech Aircraft Corp.,** Sedgwick County, Kansas, aircraft parts, $20,521, 65%.
- **J. C. Peacock Machine Co.,** Los Angeles, aircraft parts, $299,434, 70%.
- **Arcturus Manufacturing Corp.,** Venice, Calif., aircraft forgings, $296,525, 55%.
- **Cannon Electric Co.,** Los Angeles, electrical connectors for aircraft, $192,084, 65%.
- **Transco Products, Inc.,** Los Angeles, aircraft equipment, $43,115, 70%.
- **Vard, Inc.,** Pasadena, aircraft components, $128,336, 55%.
- **Earle M. Jorgensen Co.,** Los Angeles County, aircraft forgings, $277,236, 60%.
- **Solar Aircraft,** San Diego, components for military aircraft, $88,515, 60%.
- **Nevada Air Products,** Reno, aircraft parts, $16,545, 70%.
- **Fricano Custom Products Co.,** Inglewood City, Calif., aircraft parts, $64,007, 50%.
- **Neuschotz Engineering Co.,** Los Angeles, aircraft parts, $11,305, 70%.
- **Wemac Co.,** Inglewood, Calif., aircraft parts, $6,127, 65%.

PRODUCTION



MAGNESIUM assembly is made by Brooks & Perkins for B-47 fire control system.

Stratojet Has New Tailcone Unit

Photo of new tailcone for the Boeing B-47 bomber indicates that the tail turret is radar-directed. The turret is topped by what looks like a radome; this coupled with the fact that General Electric is producing the system as a modification of its B-36 installation (reported by USAF as a gun-laying radar type), lead to the conclusion that the turret is radar-positioned.

The new tailcone assembly is made almost entirely of magnesium by Brooks & Perkins, Inc., Detroit, which ships it to GE's Aeronautic and Ordnance Systems division in Schenectady for installation of the fire control system. GE assembles, aligns and tests the fire control system in this tailcone assembly before shipping it to the airframe manufacturer. This is believed the first time an armament manufacturer has provided that portion of the airframe which houses his avionics equipment.

The technique may save system test, installation and "de-bugging" time at the B-47 plants in Wichita (Boeing), Tulsa (Douglas), Marietta (Lockheed).

In addition to Stratojet tailcone assembly work, Brooks & Perkins are tooling up for a magnesium subassembly program for the B-47 made at Marietta and Tulsa.

Willys Gets New Big Forge Hammers

Two giant forge hammers of the nine additional units scheduled for operation under the expansion program of Willys-Overland Motors, Inc., Toledo, Ohio, have gone into operation. The two new hammers will be used to produce airframe and engine components for jet planes.

When the expansion program is completed next spring, the nine additional hammers will add more than 100 million lb. to the yearly production potential. Program is expected to boost employment to about 1,000 from half that figure now.

Sealant Saves Porous Castings

A new service for filling and sealing microporous voids in foundry products promises to lower the cost of aircraft castings. The service, available from licensees of Polyplastex International, Inc., New York, uses a new penetrating resin, Polyplastic MC, and special equipment to save the porous castings from the scrap heap.

Salvage to redeem rejected castings can be carried out on a production-line basis with greater certainty that all parts produced will be usable, Polyplastex says, resulting in lower cost quotes on casting jobs.

Greatest use of the plastic is expected in aluminum and magnesium castings, since microporous flaws are most prevalent in low-density metals. Castings sealed up this way can be used for a variety of aircraft and high pressure applications, the company says, such as fuel pumps, valves, carburetors, hydraulic components, motor parts, radar and range finding units and other components.

Among production items which have received the treatment are a complex magnesium aircraft engine control casting, magnesium units for fire control systems, avionic components and a small aluminum-alloy casting which is used for carrying carbon dioxide for inflatable life jackets.

The Polyplastex process uses a chemical which polymerizes under pressure into a solid. Previous methods have used inorganic chemicals, such as silicates, from which the water (solvent) evaporated, leaving voids where the sealant should be, the company says. The new method permits, for the first time, a virtually 100% filling job, Polyplastex claims.

The cured resin, a thermosetting type, can withstand temperatures of 350F. While it is hard, it retains enough resiliency to allow for expansion and contraction of the metal.

Among advantages listed for Polyplastex MC: insoluble in gasoline; low viscosity in the monomeric state; chemical inertness to magnesium; toughness of polymer; low toxicity; good penetrating qualities; low cost.

Most common method of applying the sealant is in a vacuum-pressure tank. With vacuum established, sealant is introduced under a pressure head of 100 psi. with the result the resin is both sucked up and forced into pores.

The process is handled by licensees, with service now available in key industrial areas. Where a plant is a large user of castings, it may get its own license for the process. System is the property of Polyplastex International, Inc., 441 Madison Ave., New York.

PRODUCTION BRIEFING

▶ **The Lee Co.**, Hartford, Conn., maker of aircraft and rocket control components, has purchased a two-story building in Westbrook, Conn., increasing production capacity by 45%.

▶ **Studebaker Corp.**, South Bend, Ind., has delivered its first J47 jet engine to

the Air Force for B-47 installation. Designated J47-ST-25, the powerplants are being built under GE license.

► **Mallory-Sharon Titanium Corp.,** Niles, Ohio, has opened a West Coast office at 1338 So. Lorena St., Los Angeles., with George H. Denny in charge.

► **Ronson Art Metal Works, Inc.,** Newark, N. J., has acquired a 32,000-sq. ft. plant to aid in defense work production expansion.

► **Skil Corp.,** is the new name of Skilsaw, Inc., Chicago, maker of portable and pneumatic tools.

► **Talchem,** San Lorenzo, Calif., Transocean Air Lines subsidiary, has been named U. S. distributor for Wyandotte Chemicals Corp. Rights in several foreign countries are included.

► **Westinghouse Electric Corp.'s** Elevator division, has received a $3 million Navy contract for installation of deck-edge aircraft elevators on the supercarrier USS Forrestal. The elevators will be 60x60 ft.

USAF CONTRACTS

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

Donovan, Frank, Associates, 1775 Broadway, New York, production of a motion picture, 1 ea., $27,500.

Douglas Aircraft Co., Long Beach, Calif., special tools, $61,356.

Douglas Aircraft Co., 3000 Ocean Park Blvd., Santa Monica, Calif., services & material to fabricate AN/APS-42 radar set installation kits for C-47 aircraft, $70,000.

Drayer-Hanson, Inc., Los Angeles, tank assembly, 25,000 ea., $4,173,750.

Dumont Labs., Inc., Allen B., 1500 Main Ave., Clifton, N. J., oscillograph-cathode ray, Dumont type 304 H and commercial data at N/C, 242 ea., $70,301.

Dynamic Electronics New York, Inc., 73-39 Woodhaven Blvd., Glendale, L. I., N. Y., radar test set, AN/UPM-18, 146 ea., $25,654; radio test set, spare parts, data, $60,824; radio receivers, 350 ea., $30,901.

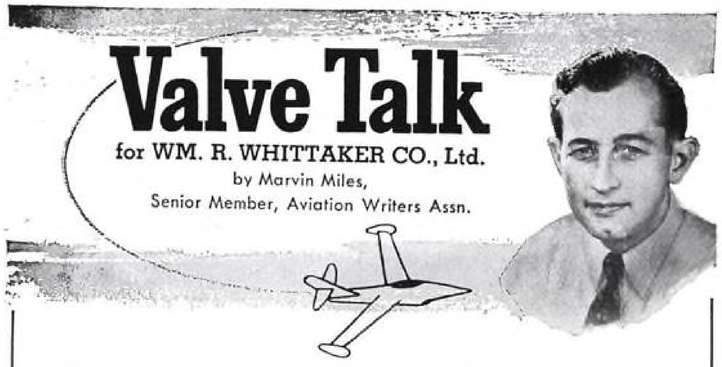
Eastman Kodak Co., 343 State St., Rochester, N. Y., misc. photo equipment, $110,168.

Eclipse-Pioneer div., Bendix Aviation Corp., Teterboro, N. J., spare parts, $35,832; indicator, pressure torque, 1,764 ea., $292,-097; indicator fuel pressure, 2,667 ea., $142,-352; indicator, pressure manifold, 2,073 ea., $316,576; amplifiers; indicators, $54,345; accelerometer, aircraft, 5,818 ea., $670,815; 400-amp. generators, 3,082 ea., $2,293,881; accelerometer, aircraft, 1,300 ea., $131,954; generators, type M-3, $76,091; spare parts (misc.), $338,754; 8-kva. generators, 261 ea., L-4 regulators, 228 ea., $180,518; indicator, manifold pressure, 220 ea., $33,917; voltage regulators, 951 ea., $35,716; type J-8 attitude gyro indicators, spare parts, data & special tools, 334 ea., $230,902; indicators, type J-8, spare parts, data & special tooling, 9,120 ea., $5,970,876; indicator fuel pressure, P/N MS 28010-4, 1,975 ea., $93,457; transmitter fuel flow, 2,000 ea., $231,864; fuel indicators, 1,764 ea., $810,-520; indicator, 941 ea., $140,763; spare

Valve Talk

for WM. R. WHITTAKER CO., Ltd.

by Marvin Miles,
Senior Member, Aviation Writers Assn.



I've been writing about aircraft valves for some time now, about their design and engineering, about their assembly and test. I thought I knew them quite intimately.

But then I saw the Whittaker units installed in the planes at North American Aviation. Somehow they looked different. They had a new and grimly impressive appearance of responsibility as integral parts of the company's famed fighting ships.

Nestled in a maze of wires and plumbing, they blended perfectly into the orderly jigsaw that energizes nerve and sinew of such hard-hitting power packages as the F-86 Sabre and the AJ-1 Savage.

F-86 Sabre

North American fuel system engineers have a definite philosophy of design, I learned from P. H. (Phil) Jones, head of the fuel system group of three score engineers, and George Foster, production design expert. It might be described as "utmost reliability with greatest possible simplicity."

Their problems are increasing with constant step-ups in jet engine power and plane performance throughout an ever-widening range of combat and climatic conditions.

And the success of their work was proved recently in a two-word accolade that came from Korea as a report on the operation and maintenance of F-86 fuel systems under the rigors of day-to-day missions ... with a fifteen-to-one kill ratio over the MIG-15.

It said simply: "No trouble."

Jones and Foster told me of Whittaker valves on various North American aircraft (seventeen on the four-jet B-45C fuel system, for example) and spoke of the role electrically-operated units have played in reducing the engineer's problems.

"If it weren't for motor actuated valves," they explained, "we'd have to depend on cumbersome rod and cable systems. Positive control of valves in remote positions would be virtually impossible."

The fuel system engineers work as a group on all North American planes rather than divide the problems of various aircraft systems among elements of the staff.

Work starts with a study of configuration, target weight, fuel supply and engine demand. Once the ship's tankage is laid out, the group starts wrestling toward a fuel system that can be coordinated with the development work of such other groups as armament, power plant, electrical, and controls.

"You might call it an evolutionary process," Jones said. "Endlessly we keep in mind that efficiency goes up as complexity goes down.

"Pressures and flow patterns must be correct. The effects of extreme altitude, temperature changes, violent maneuvers, center-of-gravity shifts and combat damage must be considered. Alternate emergency systems must be available, valves and vents and bypass lines properly placed.

"Always the boys come up with several possible ways of doing something ... and then there's the job of picking the best way."

Perhaps a top measure of the task confronting the fuel men is the number of engineering man-hours required to complete a system design for a new jet airplane ... 15,000 to 25,000, depending on complexity.

So far as valves are concerned, the fuel experts concentrate on various manufacturers in specialized fields.

"As I said," Jones concluded, "we absolutely will not compromise with reliability. A faulty valve can foul up the works, but good. Therefore, we demand our own standards of reliability from our suppliers."

parts, $27,196; indicators, 591 ea., $31,618.

Eicor, Inc., 1501 W. Congress St., Chicago, 100-va. inverters, 3,115 ea., $317,574; B-1 alternators, 569 ea., $183,382.

Electrical Connector div., Joy Mfg. Co., 4235 Clayton Ave., St. Louis, connector-receptacle, 4,234 ea., $26,886.

Electric Auto-Lite Co., Toledo, spare parts for powerplants, $109,826.

Electro Impulse Lab., 62 White St., Red Bank, N. J., dummy lead, maintenance spare parts, 1,215 ea., $50,821.

Electrolux Corp., 51 Forest Ave., Old Greenwich, Conn., dynamotor unit, 1,408 ea. and 1,532 ea., $151,661.

Emerson Radio & Phonograph Corp., 111 Eighth Ave., New York, simulator group, 50 ea., interconnecting group, 49 ea., $2,503,000; glide slope receivers, 1,375 ea., $727,228, radar beacon, 87 ea., $919,800.

Espey Mfg. Co., Inc., 528 E. 72 St., New York, radio sets AN/TRC-7B, 566 ea., $1,204,065.

Fairchild Camera & Instrument Corp., 88-06 Van Wyck Blvd., Jamaica, L. I., N. Y., bubble chamber, 1,650 ea., $89,290; T-11 camera, 125 ea., K-47 camera, 110 ea., K-48 camera, 87 ea., $1,565,812; type CAX-12 camera, 206 ea., $2,983,451; lens assembly, 560 ea., $57,299; cameras, 107 ea., $1,735,612; spare parts, $22,156; camera bodies, 485 ea., $2,410,051.

Fairchild Engine div., Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y., spare parts, 156 ea., $1,450,218; powerplants, relief valve assembly, 12 ea., 6,500 ea., $199,566; magneto lead & gear assemblies, 1,800 ea., $125,315.

Federal Mfg. Engr. Corp., 211 Steuben St., Brooklyn, N. Y., spare parts, $163,156; projector set AN/PFP-3 and accessories, 1,500 ea., $1,374,375; projectors, $688,075; projector sets AN/PFP-1, 207 ea., $181,083; maintenance parts for projector sets, AN/PFP-1, $459,532; AN/GRC-32, 2,010 ea., $5,567,893.

Federal Television Corp., 139 Duane St., New York, modulator, 796 ea., mounting—spare parts, data, 707 ea., $55,640.

Fletcher Aviation Corp., Pasadena, Calif., fuel tank, 41,514 ea., $21,183,110; tank assembly, 500-gal. capacity, 328 ea., $491,924; tank assembly, 200-gal. capacity, 20,000 ea., $3,402,000; tank assembly, 250-gal. cap., aux. fuel, jettisonable, aluminum alloy, type III, 6,592 ea., $5,553,403.

Gabriel Co., Workshop Associates div., 135 Crescent Rd., Needham Heights 94, Mass., antenna AT-246/U, 9,185 ea., $84,502.

Gadgets, Inc., 3629 N. Dixie Drive, Dayton, magnesyn instr. tester, 1,055 ea., $158,637.

General American Transportation Corp., 138 S. LaSalle St., Chicago, fiber glass seat pans, for survival kits, 28,000 ea., $130,872.

General Electric Co., 1 River Rd., Schenectady, N. Y., starter-generator, 300 ea., transformer, 500 ea., $176,425; magnetos & misc. overhaul spare parts, $364,050; spare parts, $740,006; spare parts for B-31 turbosuperchargers, $2,090,108; portable arc welder, 52 ea., $28,080; tachometer indicators, $431,669.

General Electric Co., Electronics Park, Syracuse, N. Y., AN/APG-32A, radar set, 7 ea., $1,426,747; training parts & spares to support radar set, AN/CPS-6B training program, $300,000; training parts & spares to support AN/FPS-6 training program, $75,000; radar set, 1,400 ea., $15,508,415.

German-Rupp Co., Mansfield, Ohio, refueler trailers-type B-1 264 ea., $385,917.

Gibbs Mfg. & Research Corp., 450 N. Main St., Janesville, Wis., switch, SA-3A/A, 10,332 ea., $160,900.

Globe-Wernicke Co., 802 Rhode Island Ave., NE, Washington, D. C., filing cabinets, 292 ea., $30,743.

Goodrich Co., B. F., 803-4 Winters Bank Bldg., Dayton, wheel assembly, 333 ea., $84,794; nose wheel assembly, spare parts & technical data, 1,688 ea., $83,603; rubber track blocks, 150,000 ea., $390,030; wheels, brakes, spare parts, data & bills, $1,051,463.

Goodyear Aircraft Corp., 1210 Massillon Rd., Akron, spare parts, $85,833.

Goodyear Tire & Rubber Co., Inc., 1144 E. Market St., Akron 16, nose wheel assembly, 1,500 ea., $173,370; shelter, air stiffened,

6 ea., $80,251; main wheel & brake assemblies, spare parts & data, 913 ea., $318,040; wheels, 17.00"-20", 230 ea., brakes 17.00"-20", 244 ea., spare parts & data, $123,563; wheel assembly 6.50-10, 506 ea., brake assembly P/N 5920926, 422 ea., nose wheel assembly, 7.50-10, 132 ea., spare parts—hub caps, grease seals, $106,224; wheel assembly maintenance landing, 1,850 ea., brake assembly, 1,850 ea., spare parts and data, $471,246; wheel assemblies (F-86D, F-86F & T-33A aircraft), 1,510 ea., wheel assemblies (T-33 MDAP aircraft), 277 ea., $82,376.

Gould National Batteries, Inc., Depew, N. Y., batteries, aircraft storage, 7,828 ea., $363,477.

Graflex, Inc., 154 Clarissa St., Rochester, N. Y., adapter, finder, glass, 6,556 ea., $64,997; photo—spare parts, $26,342; camera PH 120, 24 ea., $26,361; C-6 ground camera, 429 ea., spare parts & maintenance data, lens assembly for C-1, 33 ea., lens assembly f.12.5, 33 ea., tripod assembly graflex, 33 ea., back assembly, 125 ea., shutter assembly #2 Graflex, 20 ea., $151,734; spare parts & misc. photo items, $27,043; photo equipment, $63,965.

Great Lakes Mfg. Corp., 1046 E. 134th St., Cleveland, switches, 5909 SA-198A/U, $101,383.

Guardite Corp., 9535 S. Cottage Grove Ave., Chicago, fabrication & installation of gyroscopic propeller test stands, 1 job, $235,293.

Gundach Mfg. Corp., Fairport, N. Y., lens, 335 ea., $28,810.

Hallicrafters Co., 5th & Kostner Ave., Chicago, radio sets, 85 ea., $89,219.

Hamer Oil Tool Co., 2919 Gardenia Ave., Long Beach, Calif., blind, 3 bolt 8", 255 ea., blind, 3 bolt 6", 5 ea., $42,043.

Harrison Sheet Steel Co., 4718 W. 5th Ave., Chicago, office tables, steel, 1,200 ea., $34,147; table—office, 1,690 ea., $46,018; desks, 5,096 ea., desks, 1,248 ea., $430,278.

Hartman Electrical Mfg. Co., 175 Diamond St., Mansfield, Ohio, 600-amp. cutouts & spare parts, 4,131 ea., $130,964.

Hartzell Propeller Co., div. of Hartzell Industries, Piqua, Ohio, propeller assembly, 100 ea., $36,000.

Hatfield Wire & Cable div., Continental Copper Steel Inc., 487 Hillside Ave., Hillside, N. J., copper cable, various ft., $179,-227.

Heil Co., 3000 W. Montana St., Milwaukee, spare parts, $42,882; semi-trailer, 120 ea., $1,576,182; cover assembly, 800 ea., $47,776; spare parts for F2, F2A, A3, A-1 fuel servicing trailers, $511,188.

Hendy Machine Co., Torrington, Conn., lathes, 97 ea., $930,846.

Hercules Motors Corp., Canton, Ohio, spare parts B-10, A-3 powerplant, C-21, C-22, $36,923.

Hewitt Rubber div., Hewitt-Robins Inc., 240 Kensington Ave., Buffalo, N. Y., hose 2" x 50', $77,079.

Heyer Products Co., Inc., 471 Cortlandt St., Belleville 9, N. J., rectifier, portable, 1,022 ea., $396,025.

Hycon Mfg. Co., 2961 East Colorado St., Pasadena, Calif., magazine, aircraft camera, spare parts & data, 1,305 ea., $314,149; brake assembly, 3 ea., brake assembly, 3 ea., curtain assembly, 2 ea., shutter assembly, 2 ea., $42,500; K-36 camera, 100 ea., K-46 camera, 510 ea., $1,445,000.

Hydro-Aire, 300 Winona Ave., Burbank, Calif., switches, actuators & data, 485 ea., $55,458.

Industrial Instruments, Inc., 17 Pollock Ave., Jersey City, N. J., power meter TS-305A/UP, 433 ea., maintenance spare parts, 24% bulk, engineering data table XX, 2 set, engineering data table, XL, 2 sets, maintenance handbook data, 1 set, $86,678.

Infra Electronics Corp., Roseland, N. J., remote controlling unit RM-6-J, 50 ea., $43,863; remote controlling unit RM-6-J, 50 ea., $43,863.

Ingersoll Products div., Borg-Warner Corp., Chicago, tank assembly, auxiliary fuel, jettisonable, 120-gal. cap., steel, type IV, 9,394 ea., $1,995,849.

Jack & Heintz, Inc., Cleveland 1, 1,500-va. inverters, 90 ea., $41,738; 1,500-va. inverters, 1,268 ea., $586,402; 2,500-va. inverters, 270 ea., $138,906.

Jack Scientific Instrument Co., Bill, Solana Beach, Calif., camera control system, 122 ea., $1,004,400; camera control system, 26 ea., $2,448,000.

Kellog div., American Brake Shoe Co., 97 Humboldt, Rochester, N. Y., compressor, 370 ea., spare parts, data, 741 sets, $125,042.

Ken Tool Mfg. Co., 768 E. North St., Akron, tire removing kits, 750 ea., $54,300.

Keystone Watch Case div., Riverside Metal Co., Riverside, N .J., indicator, position, landing gear, AN5839-1, $268,435.

Kingstone Products Corp., Kokomo, Ind., radio sets, 5,724 ea., $1,878,644.

Kollsman Instrument Corp., 80-08 45th Ave., Elmhurst, N. Y., airspeed, indicators, 925 ea., $140,783; true airspeed indicators, 349 ea., true airspeed indicators, 229 ea., $185,278; airspeed indicators, 1,108 ea., $219,806; indicators oil pressure CF-100, 2,283 ea., $125,325; machmeter, pitot static operated, 6,330 ea., $2,489,492; Indicator oil pressure type MS28010-2, F84F-F86D-F86H-T33A-YF100-F100, 3,039 ea., $170,545; indicator, airspeed type D-9 Aerno 60-4956, 937 ea., $188,649.

Lackner Co., Inc., 1115 York St., Cincinnati, photographic timer, style A, 299 ea., photographic timer, style B, 271 ea., photographic timer, PH-109, 1,000 ea., $27,496; timer-mechanical PA-29, 1,700 ea., $34,300.

Lakeland Steel Corp., 628 East Forest Ave., Detroit, Carlson steel sheet, 7,288,000 lb., $511,965.

Lamb Electric Co., Kent, Ohio, spare parts, 61 items, $43,185.

Lanagan & Hoke, Inc., Easton Rd., Warrington, Pa., case tester, 235 ea., $136,300.

Lauson div., Hart-Carter, New Holstein, Wis., spare parts for Lauson motors, $102,-826.

LeBlond Machine Tool Co., R. K., Cincinnati, lathes, 99 ea., $532,993.

Leece-Neville Co., 5363 Hamilton Ave., Cleveland, generators, engine-driven, 494 ea., $71,457.

Leland Electric Co., 1501 Webster St., Dayton, inverters, 60 cycle, 42 ea., $43,650.

Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo, lam. glass spare parts, $27,128; glass spare parts (windows), $381,673.

Link Aviation, Inc., Binghamton, N. Y., trainers, jet-propelled air-craft, 174 ea., $2,000,000; trainers, instrument converters & spare parts, 76 ea., $6,814,025; miscellaneous spare parts for AN-TT-1S C-8 & AN-T-34 trainers, $49,987.

Lion Manufacturing Corp., 2640 Belmont Ave., Chicago 18, 2,500-va. single phase inverters, 1,586 ea., $915,616.

Lite Manufacturing Co., Inc., 101 W. 21 St., New York 11, tow target, 30,000 ea., sleeve assembly, 80,800 ea., $1,566,638; belt, lap safety type C-3, 4,667 ea., $33,602.

Lockheed Aircraft Corp., Burbank, kits, 158 ea., $96,286; T-33A mobile training unit, 1 ea., $150,000.

Lord Mfg. Co., 1635 W. 12 St., Erie, Pa., material, $327,144.

Lowrey Organ div., Central Commercial Industries, Inc., 332 S. Michigan Ave., Chicago, components, 1,374 ea., $477,826.

Lycoming-Spencer div., Avco Mfg. Corp., Williamsport, Pa., spare parts for V-1650 engines, $308,259.

Magnaflux Corp., 5900 N. W. Highway, Chicago, developer, 1,700 lb., oil, 12,770 gal., $53,743; Magnaflux inspection equipment, 18 ea., $156,479.

Magnavox Co., Ft. Wayne, Ind., components of radio compass, 1,436 ea., $2,260,999.

Mallory & Co., Inc., P. R., 3029 E. Washington St., Indianapolis, charger, battery, 530 ea., charger, battery, 18 ea., power supply, metallic rectifier, 139 ea., rectifier, portable, 292 ea., $486,598.

Massillon-Cleveland-Akron Sign Co., 681 1st St., S.W., Massillon, Ohio, weight-flag, 27,000 ea., $30,348.

Master Electric Co., 126 Davis Ave., Dayton, motor generator set, 214 ea., $215,743.

Master Vibrator Co., 200 Davis Ave., Dayton, engines for powerplants, $38,253.

Medico-Electric Motor Co., 11 Tomkin St., Pittston, Pa., type B-6 hydraulic jacks, data & spare parts, 1,232 ea., $585,195.

Michigan Brass Co., Grand Haven, Mich., antenna, AT-190 A/AP, 2,620 ea., antenna, AT-191 A/AP, 1,986 ea., $74,060.

Minneapolis-Honeywell Regulator Co., Minneapolis, components of type E-6, automatic pilot, spare parts, special tools & data B-36 aircraft, $3,551,515; spare parts for B-3 & B-4 turbo regulators, $1,126,259; components of type E-12 automatic pilot, spare parts, special tools, data, $4,476,795.

Mitchell Camera Corp., 666 W. Harvard St., Glendale, Calif., cameras & spare parts, $207,740; spare parts for cameras, $55,528; spare parts for cameras, $35,593.

Molded Products Corp., Chicago, 225-gal. plastic fuel tank, 10,000 ea., $1,229,460.

Monroe Aire, Inc., 24 E. Front St., Monroe, Mich., discharger, $39,516.

Morse Instrument Co., 21 Clinton St., Hudson, Ohio, processing unit, spare parts, data, 529 ea., $177,739; projection printers, spare parts, data, 78 ea., $979,245.

Motch & Merryweather Machine Co., Cleveland, engraving machines, 28 ea., $83,541.

Murdock Co., Wm. J., 158 Carter St., Chelsea, Mass., headband HB-7, 77,431 ea., $153,313.

Neal Machine & Tool Co., 1400 Kibley St., Lima, Ohio, maintenance parts, 3 items, $53,133.

Neumade Products Corp., 330 W. 42 St., New York 36, N. Y., synchronizers, rewinders, film cleaner PH-315 tables, PH-214 racks, HM-6 splicers, $33,305.

Nobles Engineering & Mfg. Co., 645 E. Seventh St., St. Paul, ammunition chute sets & spare parts, 119 sets, $164,782.

Norris-Thermador Corp., 5215 S. Boyle Ave., Los Angeles, acetylene cylinder, 8,000 ea., $77,400.

North American Aviation, Inc., Los Angeles process of training parts, tools and equipment, $200,000.

Northern Radio Co., Inc., 143-145 W. 22 St., New York, oscillators & frequency shift keyers, 232 ea., $179,854.

Okenite Co., Passaic, N. J., electric power cable, 17,700 ft., $33,263.

Olesen Co., Otto K., 1534 Cahuenga Blvd., Hollywood, Calif., lamp assembly, photo-

Monel

a tough general-purpose alloy to keep in mind for use where corrosion resistance must be combined with high physicals

If you were asked to list the requirements of an ideal alloy for general non-structural aircraft use, you'd probably put down:

- **Resistance to corrosion**
- **High Strength and Toughness**
- **Hardness**
- **Heat Resistance**
- **Ductility**
- **Good working properties**

You can add to this list, of course. You might, for example, include *good impact resistance* or *spring properties* among the things you consider important.

You'd find all these characteristics — and others, too — in the nickel-copper alloy, Monel.

A simple, solid-solution alloy, Monel is resistant to corrosion by aircraft fuels, salt water and other corrosives.

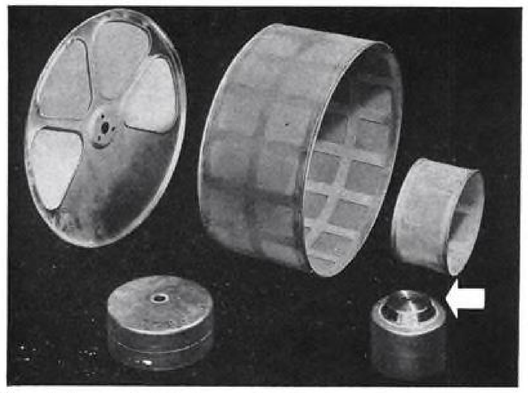
Monel is stronger than mild steel. It retains its strength up to about 600 F. and useful strength up to 1000 F., has good resistance to fatigue, and increases in strength at sub-zero temperatures without significant decrease in ductility or impact strength.

Like most nickel alloys, Monel is readily workable. It can be fabricated into any equipment which can be made of steel.

Forging, machining, and tube pipe bending, welding, brazing and soldering can be handled by methods in everyday use. Through all manufacturing and fabricating operations, and throughout its service life, Monel retains its essential characteristics.

SHEAR STRENGTH OF MONEL RIVET WIRE

Temperature of Test, °F.	Shear Strength, psi. Soft Temper	1 B&S No.
Room	48,500	54,500
½ hr. at temp. before testing		
600	45,000	52,000
800	37,000	47,500
1000	29,000	38,000
24 hr. at temp. before testing		
800	38,500	49,500
1000	30,500	38,500



They Safeguard Aviation Fuel. These are important working parts of a segregator that removes water, sludge and foreign particles from aircraft gasoline. Silver soldered to the top of a float like the one shown above (left foreground), is a special valve disc of Monel (arrow). Non-rusting and corrosion-resisting, the Monel valve disc provides a positive-acting, leak-proof seal. The strong, tough Monel screens guard segregator inlets and outlets, straining the fuel and keeping out dirt and grit.

Because it offers all these advantages, you can see why Monel is a wise choice for the float discs and screens pictured above. They are vital parts of a segregator developed to remove dirt, grit and water from aviation fuel before it goes into the planes. The Monel parts not only give trouble-free service, but they also provide a safeguard against fire. For Monel, in addition to its other characteristics, is low-sparking.

There are probably many places where you can put such an unusual combination of properties to work. Keep Monel in mind for applications where its qualities can simplify fabrication operations, reduce maintenance problems or contribute to air safety.

You'll find detailed information about Monel (and its companion alloy, "R" Monel) in our 28-page reference manual, *Engineering Properties of Monel and "R" Monel*. We'll be glad to send you a copy — without charge or obligation. Just write and ask for Technical Bulletin T-5.

Meanwhile, we hope you'll remember that Monel — like all Inco Nickel Alloys — is on extended delivery because of defense needs. When you order, therefore, it's important to include NPA rating and complete end-use information.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street, New York 5, N. Y.

Nickel Alloys

MONEL® • "R"® MONEL • "K"® MONEL
"KR"® MONEL • "S"® MONEL • NICKEL • LOW CARBON NICKEL • DURANICKEL® • INCONEL®
INCONEL "X"® • INCOLOY • NIMONICS®

graphic spare parts, data, 96 sets, $17,161.

Olympic Radio & Television Inc., 34-01 38th Ave., Long Island City, type C-1 amplifier, 163 ea., $72,827; APN-12 radar set, 1,984 ea., $2,006,611.

Oshkosh Trunks & Luggage, Oshkosh, Wis., container assemblies, aerial delivery, type A-22, 12,000 ea., $560,628.

Pacific Mercury Television Mfg. Co., 5955 Van Nuys Blvd., Van Nuys, Calif., transmitting & receiving station, $37,941.

Pako Corp., 1010 Lyndale Ave. N., Minneapolis, dryer, 362 ea., print washer, 628 ea., spare parts, data, literature, drawings, $583,700.

Paramount Wire Co., Inc., 100 Bleecker St., New York, steel wire, copper coated, 10,500 lb., steel wire, zinc coated, 100,000 lb., steel wire, copper coated, 30,000 lb., steel wire, copper coated, 150,000 lb., $111,616.

Parker Aircraft Co., 5827 W. Century Blvd., Los Angeles, fuel level control valves, $75,950; valves, $27,837.

Parker Appliance Co., 17325 Euclid Ave., Cleveland, bender tube, 60 ea., $75,043; nozzle-aircraft fuel servicing 2½" type D-1 w/3" adapter in a/w/ spec. MIL-N-5877, 274 ea., $83,687.

Postushin Aviation Corp., Los Angeles, rework-165 gal. auxiliary fuel tank into 230-gal. fuel tank, 1,519 ea., $225,632; tank assembly, 20,000 ea., $3,591,000; 120-gal. fuel tanks, 17,950 ea., $1,570,000.

Peck, Stow & Wilcox Co., Southington, Conn., shears, 188 ea., $31,349.

Peoria Consolidated Mfg. Inc., 1700 First National Bank Bldg., Peoria 2, Ill., bin, cargo, for transporting, 840 set, $322,199.

Perfection Stove Co., Cleveland, fuel tank, 230 gal., 16,000 ea., $5,958,338.

Permoflux Corp., 4900 W. Grand Ave., Chicago, headset-HS-33A, 10,000 ea., $114,500.

Pesco Products div., Borg-Warner Corp., 24700 North Miles Road, Bedford, Ohio, spare parts, $60,608.

Pfaff & Kendall, 84 Foundry St., Newark, N. J., masts AB-158/GR, 1,616 ea., $2,065,091.

Piqua Engineering, Inc., 112 E. Ash St., Piqua, Ohio, magazine, spare parts, reel assembly, 248 ea., 56 ea., $157,955.

Polan Industries, 220 Eighth St., Huntington, W. Va., case set, 5,706 set, $431,545.

Premier Instrument Corp., 52 W. Houston St., New York, camera PH-629/YF, 664 ea., $330,678; photo equipment, 56 items, $55,478.

Press Wireless Mfg. Co., Inc., West Newton, Mass., voltage divider, TS-453/U, 139 ea., $106,603.

Princeton Film Center, Carter Road, Princeton, N. J., production of a motion picture, $27,359.

Propeller div., Curtiss-Wright Corp., Caldwell, N. J., spinner assembly, 557 ea., afterbody assembly, 600 ea., $489,082.

Radio City Distributing Co., Inc., 720 S. Austin St., Dallas, survival kit, emergency, type F-1, 10,000 ea., $597,500.

Radioplane Co., Van Nuys, Calif., type A7 catapult set and test boxes for AFC2 flight control system, 20 sets ea., 27 ea., $229,473; OQ-19 target aircraft, 423 ea., $1,276,799.

Ray Film Industry, Reid H., 2269 Force Parkway, St. Paul, production of a motion picture, script, 10 copies, release prints, 50 ea., $58,116.

Raytheon Mfg. Co., 138 River St., Waltham 54, Mass., F2A-1A flash assembly with spare tubes, 615 ea., handbook revision, set, $579,957.

RCA Victor div., Radio Corp. of America, Camden, N. J., radar beacons, AN/APN-70, 732 ea., $3,524,960; components & radar receivers, 4,080 ea., $7,484,228; optical systems, 10 ea., $34,942; radio set AN/ARC-21 and components, $7,000,000; AN/TPS-10D radar set, 1 ea., AN/MPS-8 and tabular list of parts, 1 ea., $304,831; spares, $115,000.

Reeves Instrument Corp., 215 E. 91 St., New York, antenna & radio modification kit, 1 group, $6,000,960.

Reliable Welding Co., Louisville, Ky., welders & spares, 86 ea., $120,581.

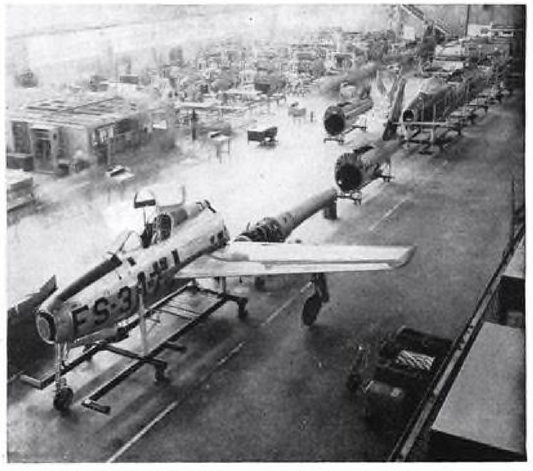
Republic Aviation Corp., Farmingdale, L. I., training parts, tools & equipment, $2,073,800.

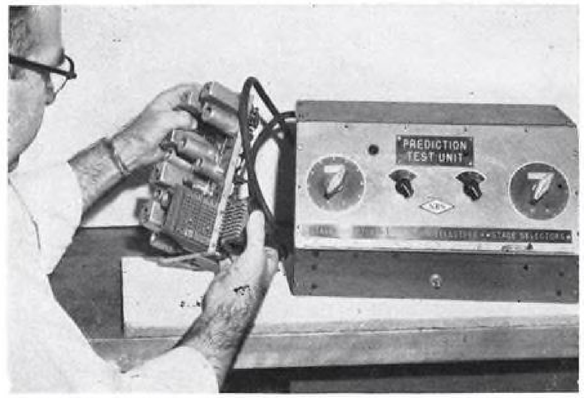
Republic Open House

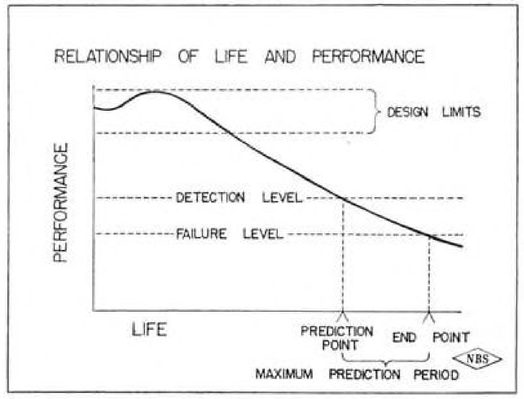
MUNDY PEALE, president and general manager of Republic Aviation Corp., looks at the first production F-84F, mounted on pedestal for display during company's recent "open house" at Farmingdale.

MOBILE TRAINERS, such as this fuel system and various electrical, air conditioning and hydraulic systems in the F-84G are built by Republic's Pt. Washington division for shipment to NATO and USAF units in Europe. The trainers are specially designed for air shipment.

PRODUCTION LINE of sweptwing F-84Fs is rolling at Republic's Farmingdale, N. Y., plant. The company has orders for an undisclosed number of the jet fighter-bomber-escort craft, powered by 7,500-lb.-thrust, Curtiss-Wright-built J65 Sapphires. The F is designed for mid-air refueling, but the fueling receptacle has been moved to the upper surface of the wing from the leading edge, where it was on the earlier G model.







FAILURE PREDICTOR developed by Bureau of Standards depends on relation between life and performance, shown at right.

Search Is on for Electronics Reliability

NBS device will improve equipment dependability by foretelling breakdowns, conference hears.

By Philip Klass

Chicago—The number one problem worrying military electronics designers today is that of obtaining greater reliability, judging from the recent three-day National Electronics Conference held in this city.

The technical session on television, which had been last year's conference favorite, according to one NEC official, ran a poor third this year to the sessions on reliability, and on reliable magnetic amplifiers, all three held on the same afternoon. An estimated 500 people overflowed even the standing room to hear papers on reliability.

► **Keynote**—Ideas and techniques for improving reliability were not limited to the one specific session; the subject came up frequently in papers given in other technical meetings.

Even the three keynote luncheon speakers stressed the subject:

• "Reliability . . . should be our major objective in military electronics," stressed **E. W. Engstrom, vice president in charge of RCA's laboratories.**

• The military has "an ever increasing appreciation of the importance of reliability," said **Maj. Gen. George I. Back, Chief Army Signal Officer.**

• "More engineers should familiarize themselves with, and apply, statistical techniques to improve the quality (and hence reliability) of electronic equipment," urged **Dr. Harner Selvidge, director of Bendix Aviation's Special Products Development lab.**

► **Avionics Highlights**—Equipment and techniques of special interest in the avionics field included:

• **Portable failure predictor** to forwarn of approaching equipment failure.

• **Technique for detecting early formation** of cathode interface impedance before it causes vacuum tube failure.

• **Short-life rating method** for components to be used beyond normal rating.

• **Continuous indicating loran to** speed up navigation and improve accuracy.

• **Improved cathode ray storage** tubes which will give better radar scope presentations.

• **New type rectifier,** and possible transistor, made of cadmium sulfide.

• **Non-linear, multiple-mode servo** systems with improved response.

• **Improved mag-amp servo system,** with higher gain and speedier response.

• **Gyro-stabilized camera mount** for aircraft.

• **Tiny printed-circuit connector** for interconnecting printed circuitry and/or wires (AVIATION WEEK Nov. 10, p. 54).

• **Automatic factory equipment** for producing printed-circuit assemblies (AVIATION WEEK Nov. 17, 1952, p. 36).

► **NBS Failure Predictor**—The National Bureau of Standards has developed a failure predictor designed to spot early stages of component deterioration which if undetected would eventually lead to equipment failure. The device is not intended, however, to give advance warning of the "sudden death" type of component failure such as structural failure in a vacuum tube.

The predictor may lift avionics equipment users off the horns of a dilemma, i.e., whether vacuum tubes should be completely replaced at regular intervals. Mass replacement is intended to avoid failure by slow deterioration. However, it does so at the risk of introducing more sudden-death-type failures.

Most sudden-death failures in tubes occur during the first few hundred hours of use; when tubes reach "middle age" without failure, they have passed this high mortality period and may give less trouble than new tubes, providing, of course, they haven't deteriorated too badly in performance. The failure predictor could identify "middle aged" tubes which were still in good operating condition and allow them to remain in service.

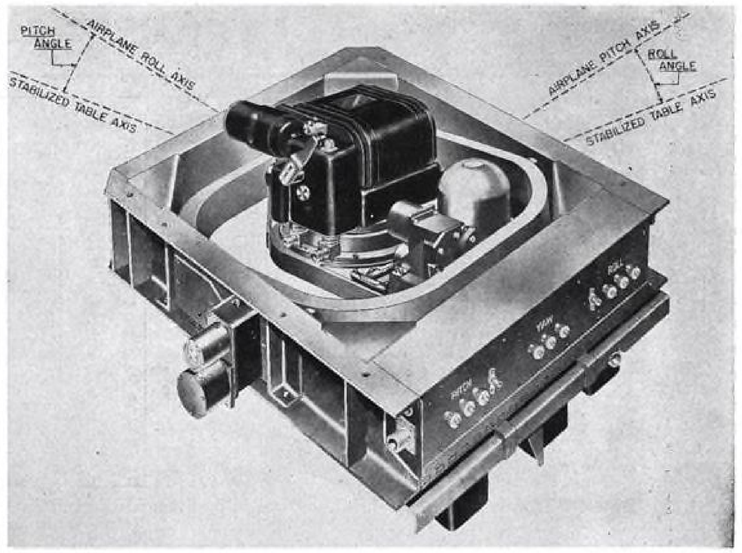
► **Proof of the Pudding**—NBS tried its experimental failure predictor on six 18-stage radio receivers which were subjected to 1,000-hour accelerated aging tests (extreme temperature and voltage cycling). At regular intervals the receivers were checked with the predictor.

The device enabled NBS to spot almost 75% of all tube failures many hours before they actually caused equipment failure, J. H. Muncy of NBS said. This represented 90% of the slow-deterioration-type tube failures which are possible to predict.

The 10% failures which the predictor might have caught, but didn't, included:

• Two tubes in "non-critical" stages not being checked.

• Four tubes in a single stage where



PLATFORM developed by Goodyear Aircraft Co. keeps camera level, aligned in azimuth.

parasitic oscillations interfered with the measurement.

• One tube whose change in characteristics was masked by a change in the value of an overloaded resistor.

Of the tube failures which were not potentially predictable, all were either open or shorted heaters, half of which occurred during a single hour of operation. There were insufficient failures of components other than tubes, Muncy said, to justify any conclusion as to their predictability.

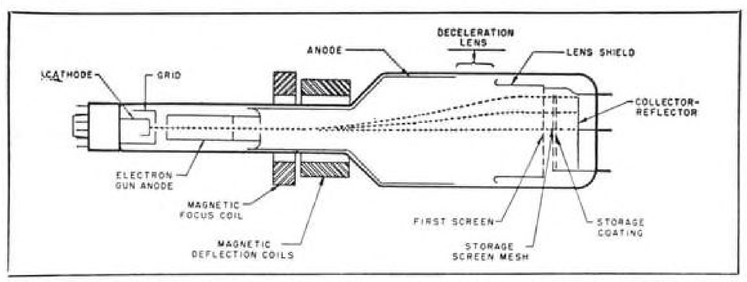
► **How It Operates**—The experimental NBS predictor checks the voltage gain of those radio receiver stages whose performance is seriously affected by weak or gassy tubes. Receiver stages which NBS tagged as "critical" were: R-F amplifier, first mixer, high I-F amplifier, second mixer, two stages of low I-F, two crystal oscillators, and two frequency multipliers.

Gain checks of these "critical" stages are made by connecting each tube and its associated components as a resistance-coupled amplifier. A 3,000-cycle input signal is then applied and the output voltage checked. Muncy cautioned that stage-by-stage checks are necessary; overall input-output checks can mask significant changes in individual stages, he said.

NBS modified the receivers under test to enable the predictor to be quickly connected to the radio receiver, and to permit rapid stage-by-stage checks by merely positioning a selector switch. This involved "breaking" the grid and plate return leads, routing them through a multi-point connector, and adding a few passive components such as capacitors and R-F chokes. (Such modification wouldn't be needed if the original equipment were initially designed to accommodate a predictor.)

► **Easy To Use**—NBS wanted its predictor to provide a direct "good, no-good" indication to permit its use by a semi-skilled operator without requiring the reading of a volt-meter and the necessity of interpreting the results. For this reason the magnitude of the 3,000-cycle input signal is preset for each different selector switch position to produce a single output voltage from every property functioning stage.

If the output voltage falls outside satisfactory limits, a voltage-magnitude sensing circuit in the predictor triggers a red warning light, giving positive indication of pending failure in the stage under test. Without much added complexity, Muncy said, a stepping switch could be used as the selector switch to automatically check each stage in sequence, stopping whenever it discovers a weak stage.



IMPROVED RAYTHEON cathode tube can store intelligence for as long as a week.

Admitting that the principles used in the NBS device are not new and that the unit is only an experimental start, Muncy urged designers to incorporate fault anticipation provisions in their new equipments.

► **Why Components Fail**—A detailed analysis by Bell Telephone Labs of 202 components which had failed in selected Navy BuShips' electronic equipment succeeded in pin-pointing the basic causes of failure:

• 50% failed because of poor component quality (chargeable to component manufacturer).

• 25% failed because of previous failure of other components in the circuit.

• 25% failed because they were not sufficiently rugged to withstand military use and environment (mis-application).

The cause of failure for 194 other components in the BuShips study either can't be established or is still under study, O. C. Eliason of Bell Labs said. He explained that field engineers' reports on the equipment malfunction accompanied the defective components and aided Bell materially in its analysis.

Eliason urged equipment manufacturers to apply lab analysis to component failures in order to develop basic corrective action; he also called for improved inspection and quality control procedures by component manufacturers.

► **Mechanical vs. Electrical Failures**—Don't overlook the importance of good mechanical design in your search for reliability, Victor Harris of Vitro Corp. of America warned his NEC audience.

A recent study of BuShips electronic and radar equipment showed that mechanical faults caused less than half the equipment failures but were responsible for 65% of the equipment "down time." Harris advice: "The time has come for electronics engineers to call on the mechanical engineers for help . . ."

► **Sleeping Sickness**—Cathode interface impedance (sometimes called "sleeping sickness" because it builds up in vacuum tubes more rapidly during standby conditions) can cause trouble in computers, radar and communications equipment. H. M. Wagner of the Signal Corps Engineering labs warned. Many tube failures which previously were blamed on loss of tube emission and transconductance have more recently been charged to cathode interface impedance, Wagner said.

Wagner described a test procedure which will spot interface impedance in

GROUND OBSERVER CORPS NEEDS 300,000 VOLUNTEERS

Early this summer top U.S. Air Force officials met with Civil Defense directors from 46 states and four territories, and reviewed in confidential detail the current efforts to defend America from surprise enemy attack.

"Despite a $300,000,000 radar fence around the nation's perimeter, gaps exist through which enemy aircraft could penetrate our defenses undetected," the meeting was told.

That's why America needs a total of 500,000 civilian skywatchers as members of the Ground Observer Corps. Nearly 200,000 have already volunteered.

"The only practical means of filling the gaps in our defenses is through a 24-hour operation by civilian volunteers," the meeting was told.

Why isn't America's radar network sufficient?

Defense gaps exist because of radar's line of sight principle, and radar's failure to penetrate opaque masses. Every mountain, every hill casts a shadow behind which enemy aircraft could sneak undetected. Even in perfectly flat country the curvature of the earth shortens the effective range. Equally alarming, radar is susceptible to jamming.

These gaps cannot be filled by Air Force personnel due to the staggering expense. That's why civilians are needed in 27 perimeter states to man Ground Observer Corps stations 24 hours a day. Here is a critical, patriotic job that requires just a few hours a week from each volunteer.

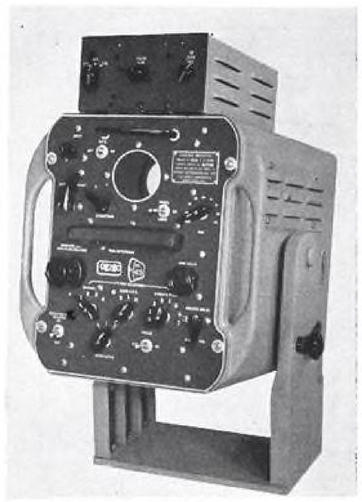
Aircraft too are an important part of our national warning system and of course are the backbone of defense against attack. Three advanced Lockheed planes play a vital role:

The WV-2 *Super Constellation* Early Warning Aircraft, developed for the Navy and the Air Force to extend radar's range in a whole new concept of national defense.

The P2V *Neptune* Navy Patrol Bomber, charged by the Navy with anti-submarine patrol and protection of U. S. coastal waters.

And the F-94C *Starfire*, the nearly automatic all-weather interceptor, which does the final job of climbing to the attack at terrific speed, locating the invaders, and shooting them down with more than human accuracy.

When the U. S. has all necessary planes and personnel—civilian and military—it will be difficult for enemy aircraft to penetrate U.S. defenses.



ADAPTOR atop Sperry loran indicator improves accuracy of position "fixes."

its early stages, even in brand new tubes. The technique uses low-amplitude test pulses and a low-duty cycle to minimize the possibility of increasing interface impedance during the test.

▶ **Sub-Min Tube Reliability**—Subminiature tubes using filaments are more rugged and reliable than those using heater-cathodes, according to Ross Wood of Raytheon Mfg. Co. Wood said filamentary-type sub-min tubes are more rugged because:

- **Heater-to-cathode** shorts and leakage are eliminated.
- **Fewer welds** and less structural complexity are involved.
- **Lower filament operating** temperature is used.
- **Physical clearance** between filament and grid is twice as great.
- **Smaller filament mass** reduces danger of shock damage to supports.
- **Higher natural frequency** possible with filamentary-type tube reduces microphonics effects.

Under controlled conditions (normal voltage, room temperature, no shock or vibration), Raytheon tested 50,000 filamentary-type sub-min tubes which showed an average life expectancy of over 58,000 hours, Wood said. A breakdown of these tests showed:

- **Glass Failure**—1 per 3,000,000 tube hours
- **Mechanical Failure**—1 per 390,000 tube hours
- **Electrical Failure** (change in characteristics)—1 per 70,000 hours.

Wood urged closer liaison between the equipment designer and the tube manufacturer to assure correct tube application and usage.

▶ **Short-Life Ratings**—Most avionics components are rated at operating temperatures and loads which assure a

service life of 1,000 hours or more. In guided missiles, and certain other applications, component life can be considerably shorter than 1,000 hours.

These components can be operated at much higher loads and temperatures, saving space and weight, if shorter life is acceptable. But the big question is: How much can the rating be upped for short life use?

A. P. Jerencsik and W. T. Sackett, Jr., of the Battelle Memorial (research) Institute, described a new technique for obtaining short-life ratings on components. They call it the "Stress-Step Method."

Preliminary tests on carbon film resistors indicate that the new method reduces the cost and time required to establish short-life ratings, Jerencsik said. It also gives results which show more consistency between individual components in a test batch than are obtained with previous methods, Jerencsik said.

► **Semi-Automatic Loran**—Manual manipulation of loran receivers is eliminated (except for initial station tuning) with a new small adapter developed by Sperry Gyro. This cuts the time needed to obtain a position fix. The 12-tube adaptor is designed for use with the Sperry medium-frequency (1900-kc) loran receiver.

Coast Guard tests to date show that the new device improves accuracy in establishing ship or airplane position by a factor of two or three to one, according to Roger Williams of Sperry who delivered the paper.

(Loran is a navigational device which establishes a "line of position" based on the phase difference in radio pulses transmitted simultaneously from a pair of geographically displaced ground stations. If two pairs of ground stations are used, two distinct lines of position can be obtained, whose intersection fixes a ship's or an aircraft's position.)

Alignment of the leading edges of the two radio pulses, now performed manually, is automatically accomplished by a servo system in the new Sperry device. If the continuous-indicating adaptor is used with two loran receivers, a navigator can obtain almost instantaneous position fixes—an important matter in highspeed aircraft.

► **Better Accuracy**—Tests to date show that a human operator can generally match pulse-time difference within three microseconds, whereas the new adaptor cuts the time to one microsecond, under conditions of 2:1 signal-to-noise ratio, Williams said. Under more adverse 1:1 signal-to-noise conditions, manual alignment averages out to five microseconds compared to only three microseconds for the new device.

Williams emphasized that even with the new adaptor, the human operator must first acquire the station signal

to be sure he has locked on the groundwave and not the skywave. After initial signal acquisition, a very narrow sampling gate in the adaptor prevents the receiver from locking on the skywave, Williams said.

▶ **Improved Storage Tubes**—Two improved versions of cathode-ray storage tubes were described by engineers from Raytheon Mfg. Co. and Radio Corp. of America. The storage tube looks attractive for use in both ground and airborne radar scopes where it can provide more uniform picture brightness and a higher level of light intensity.

If several scans of the radar antenna are "stored" in the tube, an important additional bit of information is made available. A moving target will then produce a "blip" whose length is proportional to the target's relative speed. The storage feature also improves signal-to-noise ratio because the recurring nature of the signal makes it appear at much brighter intensity than random occurring "noise".

Two types of storage tubes were described:

• **Single-gun storage tube** in which "writing" and "reading" functions are alternately performed by a single electron beam was described by R. C. Hergenrother of Raytheon. The improved version has a new "electron lens" which focuses the beam so that it strikes the screen perpendicularly. Writing speed, he said, is about 48 microseconds per line; erasing or reading time is about ten times as long.

Already in pilot production, the new tube can store information for periods up to one week without noticeable deterioration and can provide many "playbacks" without loss of stored information, Hergenrother said.

• **Two-gun storage tube,** called the Graphechon, has been redesigned to improve registry between the reading gun and writing gun, cutting position error to less than 1.25%, W. T. Dyall of RCA said. The paper was prepared jointly by Dyall, G. R. Fadner and M. D. Marsh of RCA.

A newly added circular electrode has improved the uniformity of screen illumination by reducing secondary emission effects, Dyall said. The tube has a 20:1 signal-to-noise ratio and gives a minimum resolution of 400 lines. However, Dyall said, the maximum writing speed is not sufficient to give gray-scale (half tone) reproduction.

▶ **Cadmium Sulfide Transistors?**—Cadmium sulfide crystals have attractive rectifier characteristics and show promise as "n-type" transistors, Gene Strull of Northwestern University said. He described test results which showed that cadmium sulfide rectifiers will:

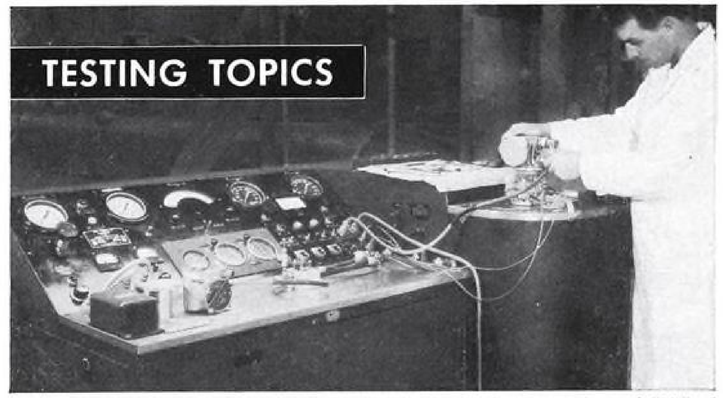
• Operate from 0.1 to 40 v.; optimum operating voltage is about 7 v.
• Withstand twice the maximum rated voltage without permanent damage.
• Withstand twice the destructive voltage for 3 seconds without damage.

Strull said that cadmium sulfide transistors have been made which give proportional control, but no amplification. The difficulty of making contact to the crystal appears to be the main barrier to a successful cadmium sulfide transistor, Strull said. He also reported that cadmium sulfide crystals show a strong photoelectric effect.

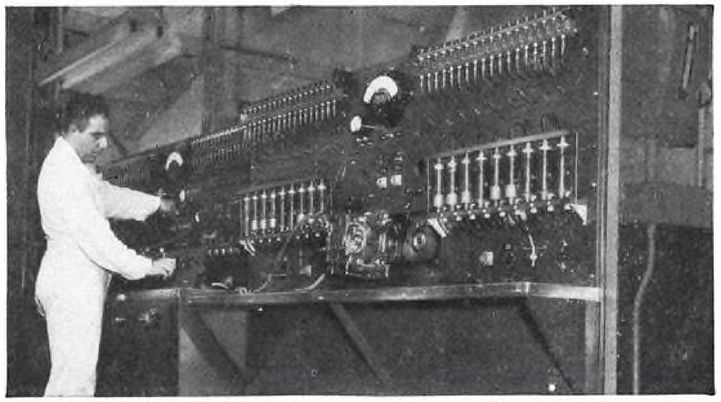
▶ **Non-Linear Servos**—A non-linear servo system which uses a changeable damping ratio to improve its dynamic response was described by K. N. Burns of the University of Illinois. A low damping ratio is used at the start, to permit rapid recovery. Once the error signal reaches zero (at the point of initial overshoot), an automatic switching device changes to a high damping ratio, giving critical damping.

Another multiple-mode servo system, which is linear for small error signals but which switches over to operate at maximum torque, reversible polarity, for larger error signals was described in a paper by R. C. Boe and K. C. Mathews of Cook Research Laboratories. The authors say the technique gives speedier response than conventional linear systems.

▶ **Mag-Amplifier Servos**—"Many high



GREER PROPELLER GOVERNOR TEST STAND checks the mechanical "IQ" of the brains behind the performance of hydromatic constant speed propellers. This machine will test double acting, single or double capacity and reversible governors.



GREER HI-LO MAGNETO TEST STAND, above, tests both high and low tension magnetos, distributors, and coils of Pratt & Whitney and Wright Aircraft engines.

performance servo applications previously restricted to vacuum tube amplifiers may now utilize the advantages of magnetic amplifiers with no loss in performance," H. H. Woodson of the Naval Ordnance lab said in urging the use of half-wave, magnetic amplifiers in bridge-type circuits.

Stabilization of full-wave mag-amplifier servo systems using conventional techniques is difficult, Woodson said, because the time constant of the system changes with gain. This limits such systems to lower-gain operation. The half-wave, bridge-type mag-amplifier circuit offers minimum possible time constant (one-half cycle of supply frequency), and gain has no effect on time constant, Woodson said. Another advantage to the half-wave units is their ability to accept either a.-c. or d.-c. signals without a demodulator.

Woodson described a 400-cycle 2-stage mag-amplifier servo system developed by the Naval Ordnance lab. It uses a 2-phase a.-c. motor with tachometer stabilization. The system has a natural frequency of 60 radians per second and a corresponding phase shift of 50 degrees, Woodson said.

► **Stabilized Camera Mount**—The design of a roll, pitch, and yaw-axis stabilized aircraft camera mount, including analog computer analysis of the stabilizing servo systems, was described by P. J. Herman of Goodyear Aircraft.

The camera mount was designed to maintain the camera level and yaw stabilized, within 0.4 and 0.5 deg. respectively, under maximum velocities of 90 deg./sec. and maximum accelerations of 500 deg./sec.^{2}. It came as no surprise that the computer used to prove servo system stability (using a time scale of ¼ real time) was Goodyear's own GEDA analog computer.

Missile Guidance System Outlined

An inertial-type navigation and guidance system which determines true groundspeed, direction of motion, and distance traveled by a missile or airplane without using radio aids is described in a recently granted patent.

► **Integrating Accelerometers**—The patent sets forth a two-axis accelerometer which is gyro-stabilized to enable it to measure accelerations (inertial forces) resulting from airplane or missile motion in an east-west and a north-south direction. Electrical signals proportional to these inertial forces are individually integrated to give airplane or missile velocity in the east-west and north-south directions.

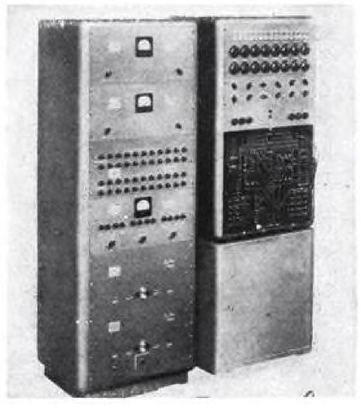
Another integration of the signal gives distance covered along the same two mutually perpendicular directions.

The north-south, east-west velocity signals could be visually displayed, the patent says, on meters or on a cathode ray tube to show groundspeed and direction of motion. The north-south, east-west distance signals could be fed to a spherical-trignometric computer to calculate present position based on the known starting position of the missile or aircraft. The device could also provide guidance signals to an autopilot.

► **Practical Problems** — The patent doesn't go into the design of the double-integrating accelerometer. But unless the accelerometer is extremely sensitive and accurate, and the integrator's errors are small, a very large cumulative error could build up. The patent also does not discuss how the east-west and north-south components would be resolved relative to the earth's vertical.

► **Background**—The patent, No. 2,613,071, was filed in June 1947 by Paul G. Hansel, Greenvale, L. I., N. Y., research engineer, and granted on Oct. 7, 1952, following removal of an Armed Services secrecy order.

From 1941 to 1947, Hansel was chief of the radio direction finding research group in the Signal Corps Labs. Since that time he has been engineer in charge of the radio engineering department of Servo Corp. of America.

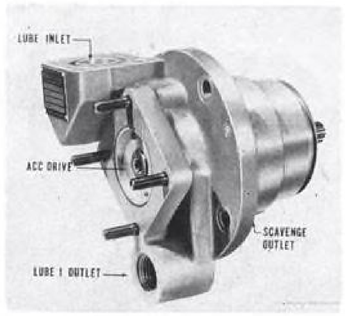


Computer Solves 7th Order Equations

A low-cost electronic analog computer which can solve 7th order differential linear total equations, and nonlinear equations if auxiliary equipment is used, has been announced by Beckman Instruments Inc.

Called EASE (Electronic Analog Simulating Equipment), the device employs rack-mounted unitized components which enable a purchaser to select elements and thus tailor computer to his individual needs. Additional information is available in Bulletin 294-67 from Beckman Instruments Inc., Special Products div., South Pasadena.

NEW AVIATION PRODUCTS



Jet Engine Pump

A new compact lubricating pump assembly for jet engines combines two pressure and one scavenge pump element, and an accessory drive and mounting pad. It is being produced by Romec.

The accessory drive can be used for tachometers or other engine-mounted units. Rated capacity of each pressure pump element is 2½ gpm. and 6 gpm. for the scavenge. Rated speed is 4,200 rpm. with a discharge pressure of 60 psi. and rated inlet pressure of 25-30 in. Hg absolute.

The assembly operates at –65 F using grade 1005 jet lubricating oil (MIL-O-6081) as the pumping medium. Each pump element is a positive displacement, non-pulsating, rotary-vane type. Weight of entire assembly is 3.5 lb.

Romec div., Lear, Inc., 110 Ionia Ave., N. W., Grand Rapids, Mich.

Isolation Amplifier

A seven-channel audio isolation amplifier which permits mixing of signals from receivers whose outputs could not otherwise be combined has been developed by Flite-Tronics, Inc.

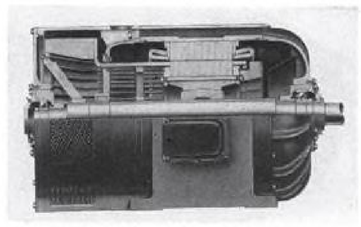
The equipment, CA-1, permits single or mixed voice, marker, range and other audio signals on one or more loudspeakers. It eliminates requirement that signals be matched to various make receivers. The isolation amplifier can be twin-mounted with the MB-3 Marker Beacon receiver made by the firm, which it follows closely in external styling and size.

Two CA-1s can be used to provide complete channel isolation in the cockpit between the pilot and co-pilot, according to the firm.

A special time-delay muting circuit which prevents marker signals from interfering with plane-tower talk also has been included. The arrangement does not affect visual marker indication. Audio muting of the marker signal is accomplished when the pilot presses the microphone button to transmit. The time delay feature is activated on release of the button, muting marker signals an additional 30 seconds, so the tower can answer back without interruption.

The unit weighs 3¼ lb., measures 7¼x4¼x7½ in. with shockmount.

Flite-Tronics, Inc., 3303 Burton Ave., Burbank, Calif.



High-Slip Motor

A new type high-slip induction motor which, it is claimed, will reduce operating costs because there is no loss of electrical efficiency has been announced by General Electric Co. The new unit is totally enclosed and fan-cooled, and is designed to accelerate high-inertia loads such as punch presses, centrifuges, hoists, etc. A new extended-bar design allows efficient dissipation of heat, GE says, resulting in the motor being 30% smaller and 40% lighter than conventional designs.

Low-resistance rotor bars are extended on one end of the motor and pass through a rotating baffle plate; the bars are then brazed to strips of high-resistance metal in the form of a radial-blade fan. The fan blades provide the higher rotor resistance necessary for high-slip characteristics.

The new motor, designated Type KRX, is available in 30 to 150 hp. at 900 and 1,200 rpm., with 5-to-8, and 8-to-13% slip. Voltage ratings are 220, 440 and 550.

General Electric Co., Schenectady 5.

CAB Accident Investigation Report on PAA Puerto Rico Crash

Maintenance, Flying Technique Blamed

The ditching of a Pan American World Airways' DC-4 near San Juan, Puerto Rico, on Apr. 11, 1952 with the loss of 52 lives is blamed by the Civil Aeronautics Board on poor maintenance by the carrier and questionable flying technique by the pilot. Five crewmen and 12 passengers were saved. CAB's complete report:

THE ACCIDENT

A Pan American World Airways' aircraft, a Douglas DC-4, N 88899, was ditched at approximately 1220,[1] Apr. 11, 1952, about 11 miles northwest of San Juan, Puerto Rico, after taking off from the Isle Grande Airport. On board were five crew members and 64 passengers, including six infants. Fifty-two passengers lost their lives as a result of this ditching, and the aircraft sank in water approximately 2,000 feet deep and could not be recovered.

HISTORY OF THE FLIGHT

Pan American World Airways' Flight 526A originated at San Juan and departed there at 1211, Apr. 11, 1952, for New York, N. Y. The crew consisted of Captain J. C. Burn, First Officer W. T. Hutchins, Second Officer J. R. Laubach, Purser A. Perez, and Steward R. Torres. According to company records, the aircraft at the time of takeoff weighed 31,868 kg. (70,256 lb.), which was within the allowable gross takeoff weight of 33,113 kg. (73,000 lb.). The load was properly distributed with respect to the approved center of gravity limits of the aircraft.

Prior to departure, the captain filed with Air Route Traffic Control an IFR (instrument flight rules) flight plan to New York International Airport, N. Y., to cruise at an altitude of 8,000 feet, estimating the flight time as eight hours and three minutes. This flight plan was approved.

The crew testified that the aircraft was taxied to the end of Runway No. 9, the pre-takeoff check made, and the takeoff run started. During the takeoff and the initial climb, the aircraft appeared to be sluggish but not to an extent to cause concern. At an altitude of approximately 250 feet with the gear up, the flaps were raised and power was reduced to climb power. Climbing at an indicated air speed of 155 miles per hour, the first officer noticed that the oil pressure of No. 3 engine was falling and the oil temperature increasing. This condition was immediately pointed out to the captain, who requested that the San Juan tower be advised that they were returning to the airport. Accordingly, at 1213 the flight advised the tower of its intentions, and the tower replied, "Roger 526A, cleared to land, Runway 9, wind east one eight, altimeter two nine nine five. I'll notify your company." The company was notified and upon request, emergency field equipment was alerted.

Because the oil pressure of No. 3 engine continued to drop rapidly and the oil temperature correspondingly increased, the propeller of this engine was feathered and power was increased to rated power on the remaining three engines. By this time the aircraft's altitude was approximately 350 feet. When power was increased, the No. 4 engine backfired several times; however,

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

immediately following these backfires, the engine continued to run in a normal manner. A climbing turn was initiated to a westerly heading, and the captain said that for best climbing conditions he reduced the aircraft's air speed during the turn to 145 miles per hour. This reduction in air speed was accomplished by using up elevator. Upon reaching an altitude of about 550 feet, No. 4 engine again backfired and ran rough. Manifold pressure was reduced on this engine to approximately 32-35 inches, and again the engine ran smoothly. Subsequent attempts to operate No. 4 engine at increased power were unsuccessful due to recurrent roughness.

At 1217 the tower asked the flight to report its position and received this reply: "We are still quite a way out." And at 1218, the tower advised the U. S. Coast Guard Rescue Coordination Center at San Juan that the flight was in trouble and gave its position as seven miles, 300 degrees from the tower.

The captain gradually reduced the air speed to 135 miles per hour, and at this time the heading of the aircraft was changed slightly to the right to maintain a course approximately parallel to the coast line. Because the aircraft was losing altitude, engines No. 1 and No. 2 were increased to takeoff power. The second officer was sent to the passenger compartment to advise the purser and steward that fuel was to be dumped, and all fuel dump valves were then opened. After the second officer returned to the cockpit, the flight advised the tower, at 1219, that it might have to ditch, and the captain instructed the second officer to alert the passengers. The second officer returned to the cabin, indicated that a ditching was imminent, took a forward seat in the cabin and fastened his safety belt.

At 1220, an Air Force C-47 flying in the vicinity notified the San Juan tower that a DC-4 seemed to be ditching and accordingly was advised to circle the area. Flight 526A continued to settle, and the throttles of engines Nos. 1 and 2 were advanced to their stops. With the air speed near 120 miles per hour, the flaps were lowered to five degrees. Shortly after this, a landing on the water was made. The landing gear and flaps were lowered, and the fuel dump valves closed. The second officer obtained a life raft, which he carried to the main cabin and launched through a forward emergency exit on the right side. The first officer, after an unsuccessful attempt to loosen another life raft, abandoned the aircraft through a cockpit window. The captain entered the cabin and assisted passengers in evacuating the aircraft through the main cabin door until he was swept overboard by the action of the sea against the door. The aircraft sank approximately three minutes after landing on the water.

At the time of the accident the weather was: high broken clouds at 35,000 feet with lower scattered clouds at 3,000 feet, visibility 20 miles and wind from east-southeast, 16 miles per hour.

INVESTIGATION

From a large oil slick which was observed on the water following the sinking of the aircraft, it was determined that the ditching occurred at latitude 18° 32.6′ north and longitude 66° 15.5′ west. This is approxi-

mately four and one half-miles off the north coast of Puerto Rico and 11 miles from the airport.

Captain Burn said that when the "pre-takeoff" check was accomplished all engines operated normally but that during the take-off the aircraft was a little slow in accelerating. However, the engine instruments indicated that they were delivering normal power with all pressures, temperature, and fuel flow gauges indicating a normal operation.

According to the captain's testimony, from the time No. 3 propeller was feathered until landing on the water, he was either attempting to establish a climb or was flying the aircraft in a nose-high attitude in an effort to maintain altitude, and air speed and altitude were diminishing throughout the entire period. He stated that because the aircraft was continuing to lose altitude, he changed his original heading, which was toward the airport, to avoid a possible forced landing in a congested area or on a coral reef.

He stated that no appreciable yawing of the aircraft was noticed when the No. 3 propeller was feathered, and that after a minor trim correction he experienced no difficulty in maintaining directional control. Throughout the latter portion of the flight, the first officer had the check list in hand, and both he and the captain checked all the instruments and controls in the cockpit seeking an answer to the aircraft's continuing loss of air speed and altitude. This check also showed all controls positioned properly and engine instruments indicating normal operation for the conditions involved. The captain said, however, that immediately prior to ditching, the fuel flow of the Nos. 1 and 2 engines appeared to be low. Approximately two minutes after the fuel dump valves were opened, the landing was made. The crew said the landing was made tail low and was not considered sufficiently rough to damage the aircraft; however, prior to leaving his seat, the first officer looked out of his window and saw the aircraft's tail section floating in the water. It was later found that the tail section had broken off behind a bulkhead to the rear of the cabin door. Although heavy seas were running at the time of the accident, none of the seats were torn from their fastenings.

Three 20-man rafts and one 10-man raft were carried on board the aircraft as a part of the life-saving gear. These were stowed in an open rack to the rear of the pilots' compartment. In addition to the life rafts, a pneumatic life jacket was available for each passenger. These jackets were located in a pocket on the back of each seat. Above each pocket was a sign, in both Spanish and English, describing the location of the jackets.

According to the testimony of the purser and steward, they were seated in the rear of the aircraft when the second officer returned to the main cabin the second time and by a downward motion of his hands indicated the aircraft was about to be ditched. Although they did not hear this crew member say anything, they understood that ditching was imminent, made certain their seat belts were fastened, and donned their life preservers. After the aircraft contacted the water, they shouted to the passengers that the life jackets were located in the backs of the seats and then proceeded forward,

opened the two emergency exists on the left side of the cabin, climbed out on the wing and assisted passengers through these exits. The passengers were not told where the jackets were located or instructed in their use by any crew member prior to ditching. As a result, considerable confusion occurred.

The second officer was able to loosen a 20-man raft from its moorings in the pilot's compartment and carry it to the main cabin where he launched it through a forward emergency exit on the right side of the aircraft, through which he also departed. The first officer and a woman passenger tried to loosen additional rafts, but were unsuccessful, and because of the rapidly rising water were forced to abandon ship, both departing through the right cockpit window.

Immediately following the ditching the captain went into the cabin and ordered the passengers to abandon ship; however, there was very little response. He then aided a passenger to open the main cabin door, and began forcibly evacuating passengers through that exit. While so engaged, the door slammed closed, and the captain gripped the handle in an effort to open it again, but as he did so a wave caught the door violently pushing it outward, throwing him into the water. Due to the heavy seas, he was unable to return to the aircraft.

Of the 12 passengers who survived, seven evacuated the aircraft through emergency cabin exits, four through the main cabin door, and one through the right cockpit window. The first and second officers boarded the only life raft launched, and took aboard five surviving passengers, the purser and the steward. The captain and seven other passengers were picked up by rescue aircraft after floating in the water from 30 minutes to an hour.

When the U. S. Coast Guard Rescue Coordination Center was advised that the aircraft might ditch, they immediately prepared for action. A Coast Guard PBY amphibious aircraft was alerted to prepare for rescue operation, and a few minutes later was dispatched to the scene. The U. S. Coast Guard cutter "Bramble," together with a Navy tug, and other smaller surface craft also proceeded to the scene. An additional PBY aircraft was ordered out, as were two SA-16 amphibious aircraft of Flight "C," First Air Rescue Squadron, U. S. Air Force, from Ramey AFB, Aguadilla, Puerto Rico. One Coast Guard aircraft and two Air Force aircraft landed and engaged in the rescue activities. Other aircraft, including the Air Force C-47 which had observed the ditching, circled the area to coordinate the rescue activities, drop flotation gear, and spot survivors. Seventeen survivors and a number of bodies were picked up by the crews of the rescue aircraft and the Bramble. Rescue activities were greatly hampered by the heavy seas, the waves being 10 to 15 feet high. Aircraft in the air spotted a number of sharks in the vicinity of persons in the water, and shark repellent was dropped.

On Apr. 10, the day prior to the accident, the aircraft involved was flown from New York International Airport to San Juan as Flight 527. Captain F. E. Adams, the pilot-in-command of this flight, stated that after departing the ramp at New York and during the engine run-up, No. 3 engine did not function properly. At this time it was noticed that the left magneto of this engine was completely dead. The aircraft was returned to the ramp for magneto service, after which the engine functioned in a normal manner. During the run-up, no unusual engine noises were heard, and the oil pressures, fuel pressures, and fuel flow, etc., were within operating limits. During the takeoff and climb the aircraft appeared to fly normally in every respect and with all engines running smoothly. After flying for approximately two hours and 35 minutes, No. 3 engine began running roughly. A short time later the engine backfired, and its propeller was feathered. Considerable difficulty was experienced in keeping the propeller in this position. Captain Adams further stated that the indicated fuel flow for the three operating engines was below what he expected and he noted this condition in the aircraft's Maintenance Log.

Pan American World Airways employs a chief mechanic, several assistant chief mechanics and an adequate crew of mechanics to perform all necessary maintenance at San Juan. In the event it is necessary to change an engine at this base, it is done upon advice from Miami.

Upon the arrival of Flight 527 at San Juan on Apr. 10, the aircraft was taken to the maintenance hangar for repair, and the right magneto on No. 3 engine was replaced. The fuel flow gauges were checked, and a comparison between the No. 4 gauge and the No. 1 and 2 gauges showed that No. 4 was registering 20-25 pounds low. No entry of this discrepancy was entered on the log sheet. As a precautionary measure, the No. 3 engine oil sump and screen were checked. Small metal flakes were found on the screen, and a similar flake was found on the sump plug. These metal flakes were tested by using a magnetized screw driver and were believed to be aluminum. During the run-up of the engine, the mechanic heard a scraping noise which appeared to come from the nose section. The assistant chief mechanic immediately checked the log and noticed that difficulty had been experienced in feathering the propeller on the last flight. As he was going off duty at this time, due to a routine crew change, he passed this information on to the next assistant chief mechanic relieving him.

The new crew ran No. 3 engine for approximately two minutes and because of the unusual noise in the nose section stopped the engine. The nose section was removed, and additional metal flakes were found in the lower part of the nose section housing. Mechanics were assigned to remove and check the sump plug and oil screen. As a result of this inspection, metal flakes were again found in the sump. A mechanic then drained and cleaned the oil tank and hopper. Examination of the hopper revealed the presence of approximately a teaspoonful of metal flakes. These flakes were tested by use of a magnetized screw driver and sulphuric acid; and in the opinion of the mechanics who made these tests, the flakes were aluminum. (The use of sulphuric instead of nitric acid to determine the composition of the metal flakes was not in accordance with the procedure outlined in the company's Maintenance Manual. The manual describes the reaction of certain metals to nitric acid, and the only similarity to these reactions when sulphuric acid is used is when the metal is aluminum.) The

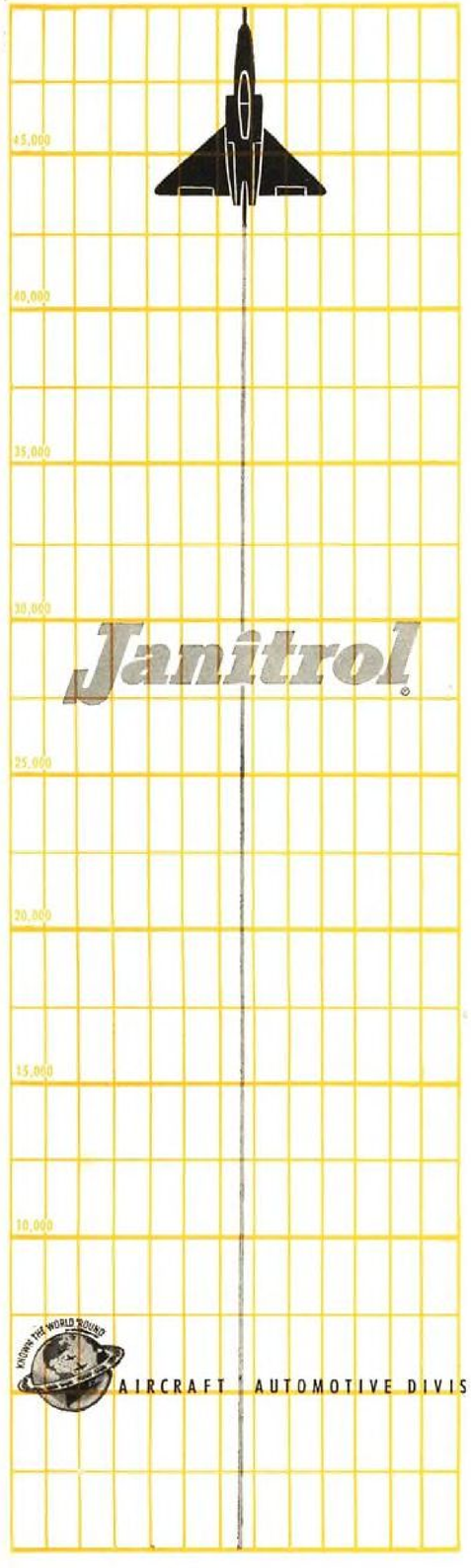
3

IGNITION

It's no great trick to fire up an aircraft combustion heater from ground level and be sure of a quick start every time. At high altitude, however, the spark must be "hot" enough to overcome ice particles, frost, and dirt accumulation in spite of corona.

Since problems of this nature seldom have ready-made answers, Janitrol engineers have for a long time developed their own ignition systems to insure unfailing operation under all operating conditions.

The job calls for a neat combination of gap distance, voltage, and their application to specific heater requirements to insure dependable ignition . . . . and, to minimize wear on spark plugs. Janitrol ignition units are constantly under development and test to achieve greater savings in weight and compactness.



Ignition systems developed for Janitrol aircraft heaters also play a part in other specialized aircraft equipment, for example, inert gas generators. Whatever the problem involving combustion, you'll do well to call on the skills, facilities and pioneering research which Janitrol can promptly place at your service. Call your nearest Janitrol representative—the earlier in the design stage, the better.

36 YEARS EXPERIENCE IN COMBUSTION ENGINEERING

New York, N. Y.: F. H. Scott, 225 Broadway
Ft. Worth, Texas: C. B. Anderson, 2509 W. Berry St.
Hollywood, Calif.: L. A. Curtin, 7046 Hollywood Blvd.
Washington, D. C.: F. H. Scott, 4650 East-West Highway
Columbus, Ohio: Phil A. Miller; Frank Deak, USAF Coordinator
Columbus, Ohio: Engineering, Production, Sales, 400 Dublin Ave.
Toledo, Ohio: Headquarters

KNOWN THE WORLD 'ROUND

AIRCRAFT · AUTOMOTIVE DIVISION, SURFACE COMBUSTION CORPORATION, TOLEDO 1, OHIO

nose section itself was not disassembled; however, it was given a cursory examination and a mechanic stated that a bearing was damaged. Also, flakes of metal were found in the bottom of the nose section. A mechanic placed his fingers through the opening to check the scavenger pump drive gears and found metal flakes inside next to the gears. These findings were called to the attention of the assistant chief mechanic.

The chief mechanic was not on duty when this work was done; however, had the assistant chief mechanic considered the matter of sufficient import, the chief could have been contacted, since he was subject to call at all times. The assistant chief mechanic did not consider this course of action necessary and according to company policy sent the following message to the company's Miami office:

> "OXMIA MJMIA OWSJU N88899 #3 ENGINE FEATHER STAGE 4 DUE ROUGH RIGHT MAGNETO STOP SAND FOUND ALUMINUM SHAVING ON SUMP STOP FLUSH ENGINE CHANGED OIL CHANGED RIGHT MAG STOP ON R/W FOUND BAD NOISE ON NOSE SECTION STOP PROCEDING CHANGING NOSE SECTION STOP WILAD AFTER R/R MASJU 110540"

In effect, this message means that he was changing the right magneto, that he had found aluminum flakes in the sump and oil screen, and that he was flushing the engine and changing the oil; also, because of a noise the nose section was being changed. Miami did not acknowledge receipt of this message or issue any instructions. According to the testimony of the mechanic, since nothing was heard from Miami, he considered that he had approval to proceed as stated.

The company's Maintenance Manual specifically states that when foreign material, such as aluminum, is found in the sump, etc., the following course of procedure is to be followed: "The entire oil system, including oil tank, oil radiator, oil temperature regulator and oil pump, must be thoroughly cleaned and flushed, or replaced, including the accessory section screen. Put about 10 gallons of oil in the tank and run the engine for about one-half hour, bringing it up to take-off power once for five seconds only during this period. Drain oil, clean the strainer screen and fill oil tank to proper level. Run up engine again, pull screen and sump plug, also the small screen located between the oil pump and vacuum pump on the accessory section. If all right, release for flight."

When the nose section was changed, the above procedure was not followed, in that the specified engine run-up with only 10 gallons of oil in the tank was omitted. The purpose of this run-up with but 10 gallons of oil is to accomplish a more efficient flushing of the engine's oil passages, thereby depositing any additional metal flakes in the oil to be drained or on the oil sump plug and screen. By eliminating that part of the prescribed procedure this additional check was not made, and a necessary one-half hour of engine run-up time was lost. Instead, oil was placed in the tank to the

full level, and the engine was then run up for a few minutes and appeared to function properly. The oil sump plug and screen were then checked, and since no flakes of metal were found, the engine was released for service.

Subsequent to the accident, the nose section which had been removed was disassembled and examined by the Board's investigators, and certain parts were removed and forwarded to the Washington office for further examination and study. This examination revealed that the reduction drive gear bearing had partially failed. Failure of this bearing allowed the reduction drive gear teeth to move partially out of mesh. Continued operation in this condition would eventually result in complete failure of the reduction gear assembly.

The six sludge cups from the No. 3 engine propeller reduction gearing were forwarded to Washington, where the contents of these cups were given a spectrographic examination at the U. S. Bureau of Standards. This examination showed that metal particles were concentrated in the upper 1/32-inch layer of the sludge; and when these metal particles were separated, it was found that the major constituents were silver and iron. The minor constituents were copper, indium, chromium, manganese, nickel and lead. With the exception of the lead, which is an anti-detonating agent of the fuel that does not burn, all constituents were materials used in the manufacture of the engine. The remainder of the sludge below the 1/32-inch layer had lead as its major metallic constituent.

As the aircraft was departing the ramp, the log was placed aboard, which was the first time that information was available to the crew that the nose section of No. 3 engine had been replaced; however, none of the crew checked the log before takeoff.

The Latin American Division of Pan American World Airways maintains a flight and ground training school at its Miami Base. All flight training is taught by professional instructors. These instructors devote their entire attention to pilot instruction and do not fly the line.

Captain Burn was employed by Pan American World Airways as a co-pilot Sept. 9, 1942, and checked out as co-pilot on DC-4 aircraft June 27, 1946. In the fall of 1950 he was trained for 35 hours in the Dehmel trainer and received several hours' training in a Boeing 377 aircraft, following which he served as a co-pilot on this type aircraft for a period of approximately one year. In January of 1952, Captain Burn completed his ground school training and 18 hours of flight training on DC-4 equipment. This was given as transition training from co-pilot to captain.

On Jan. 9, 1952, upon completion of his transition training, Captain Burn was recommended by his instructor for pre-command and type rating checks on DC-4 aircraft. As a result, on this date Captain Burn was given both an oral examination and a flight test by the Chief Flight Instructor, who, feeling he needed additional time, flew with him on the two following days, after which he was given the necessary ratings. Captain Burn had flown approximately 208 hours as pilot-in-command in DC-4 equipment prior to the accident.

A review of the aircraft's records indicated

that prior to departing this flight, the engines had the following total time since last overhaul: Nos. 1, 2 and 4 engines, 1256:24, and No. 3 engine, 1122:11. In the Maintenance Log, under "flight entries," were several comments which indicated that the aircraft was sluggish in climbing. In each instance, the aircraft was below the allowable gross weight. Other comments reflected fuel flow below normal and considerable magneto trouble. The log, under "Maintenance and Service," indicated that the fuel flow items were "continued to Miami."

ANALYSIS

Only a minor trim correction for yaw was required from the time the propeller was feathered on No. 3 engine until the aircraft was ditched. This was true despite the fact that during certain portions of the flight, takeoff and maximum power were used on Engines Nos. 1 and 2. During these power settings, No. 4 engine was set at 32-35 inches of mercury. From this it can be seen that the No. 4 engine was producing considerable power; otherwise, there would have been a decided yawing moment when power was increased on engines 1 and 2. It has been established by flight tests that the DC-4 aircraft loaded in a like manner will maintain level flight, and climb slowly, with only two engines operating at a maximum continuous power and with the propellers of the remaining two engines feathered. Therefore, the aircraft, under the conditions described, should have at least maintained altitude.

Referring to the Performance Chart in DC-4 CAA Approved Flight Manual, it is noted that with altitude and temperature, etc., corrected to the conditions surrounding this accident, and with two engines operating at maximum continuous power, propellers of the remaining two engines feathered, the aircraft will climb at the rate of approximately 25 feet per minute. Also, with three engines operating at maximum continuous power and the fourth engine's propeller feathered, the aircraft will climb at approximately 400 feet per minute.

Engines which have considerable time in service may suffer a loss in power. All of the engines involved had approximately 1,200 hours of service since overhaul. As the engines were not equipped with torquemeters, it was impossible to determine accurately what their actual power output was on this flight. However, even assuming that there was a loss of power due to time in service, it is difficult to understand how the accumulated power of the three engines operating as stated could be less than that from two good engines operating at maximum continuous power.

Throughout the flight and the subsequent ditching, the captain stated he followed the prescribed procedures outlined in the company's Operation and Flight Manuals. He said that, after feathering the No. 3 propeller, he established an airspeed of 145 miles per hour throughout the climb but after experiencing difficulty with No. 4 engine he then established an airspeed of 135 miles per hour in an effort to climb at the maximum rate. Although the company's Flight Manual states that these airspeeds are correct for 3-engine and 2-engine operations, respectively, this applies to air-

craft equipped with lower horsepower engines than those on this aircraft. The manual also states under "Engine Failure" and "During Climb After Takeoff," "should an engine fail after power has been reduced to climb power or at any time after takeoff, set power on good engines to 'rated power' or 'takeoff' if necessary. After power has been increased, the engine feathering procedure should be completed."

Captain Burn said that after he had established airspeed of 135 miles per hour, the aircraft continued to lose altitude, and that the two good engines were not increased to takeoff power until he decided to dump fuel. Since it was established that the fuel dumping operation was started approximately two minutes prior to the landing on the water, it can be seen that a considerable period of time was dissipated in attempting to climb at rated power. In an emergency such as this, where the maximum altitude was only 550 feet, it would seem that good flying technique would not permit a loss of airspeed by maintaining a continuous nose high attitude. This could well have meant the difference between maintaining level flight and losing altitude.

The attendants were not advised in sufficient time that the aircraft was to be ditched for them to adequately prepare the passengers for a water landing. When the second officer first came to the cabin, he told the attendants to close all electrical circuits to prevent a possible fire as fuel was to be dumped. This was done, and according to the purser and the steward, they considered these instructions as routine and did not interpret them to mean a ditching was imminent. When the second officer next returned to the cabin, they could not hear him from where they were seated, but from his actions they knew the aircraft was to be ditched. They immediately put on their own jackets but made no attempt to warn the passengers. Additional lives might have been saved if previous instructions had been given the passengers in the location and use of the jackets.

The company's policy of stowing all life rafts in a single compartment to the rear of the pilots does not permit ready accessibility. In this location they are available only to the crew, and because of the close quarters in this section of the aircraft, they cannot be readily launched. In this instance, only one raft could be released from its moorings, as a second raft was jammed when attempts were made to release it. If more life rafts had been readily available, additional lives might have been saved.

The mechanics at San Juan who performed the service on the No. 3 engine and changed this engine's nose section said that all work done by them was performed as prescribed in the company's Maintenance Manual. The assistant chief mechanic, however, did not consider it necessary to change the engine, although a large quantity of metal flakes was found in the oil hopper, etc. This did not necessarily mean that these particles had traveled through the engine; however, it did indicate that some part or parts of the engine had failed. To determine the extent of this failure, the engine should have been further disassembled. This was not done. Instead, a nose section was installed despite considerable evidence of metal particles in the old nose section

and the lower front of the power section of the engine. A dispatch describing the action being taken was then sent to the company's Miami office. That office, having received this information, should have issued instructions to San Juan that this engine be changed. Due to the condition of the No. 3 engine, the aircraft was not airworthy when it departed San Juan.

The analysis of the contents of six sludge cups from this engine's propeller reduction gearing definitely showed particles of metals other than aluminum. The top 1/16-inch of sludge was predominantly silver and iron, whereas the major metallic constituent of the remainder of the sludge was lead. The rate of deposit of material can be expected to increase in the event of a progressive failure in the engine. Therefore, the silver and iron deposit in the top 1/32-inch of sludge indicated that a progressive failure was occurring. The above reasoning is in accord with the observed wear pattern on the propeller reduction pinions and drive gear.

The evidence indicates that the maintenance operations of this carrier at San Juan were not conducted in accordance with the high standards required for airline operation.

As a result of this and similar accidents the Board has proposed amendments to Parts 40, 41, 42 and 61 of the Civil Air Regulations with relation to emergency and evacuation equipment and procedures, to assure a greater degree of safety to the occupants of aircraft flying over water routes. It has been found that accidents have occurred when there was insufficient time to adequately plan and prepare for a ditching. Among others, the following amendments to the Board's regulations have been proposed:

1. All required rafts and life vests shall be approved, shall be adequately equipped for the route to be flown, and shall be installed in approved locations. They shall be readily available and easily accessible to the crew and passengers in the event of an unplanned ditching.

2. In the case of extended overwater operations each air carrier shall establish procedures for orally briefing passengers as to the location and method of operation of life vests and emergency exits and the location of life rafts. Such briefing shall include a demonstration of the method of donning a life jacket. Such briefing shall be accomplished prior to takeoff on all extended overwater flights on which the aircraft proceeds directly over water. On flights not proceeding directly over water, the briefing shall be accomplished some time prior to reaching the overwater portion of the flight.

The Board is continuing studies of problems relating to aircraft ditching and evacuation.

FINDINGS

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

1. The carrier, the aircraft and the crew were properly certificated.

2. Weather was not a factor in this accident.

3. The company's maintenance department at San Juan should have been alerted to a dangerous condition when metal particles were found in the nose section of No. 3 engine.

4. Pan American's Miami office, having received information regarding the No. 3 engine from the maintenance department at San Juan, should have issued instructions to San Juan that this engine be changed.

5. Due to the condition of No. 3 engine, the aircraft was not airworthy when it departed San Juan.

6. No. 3 engine failed immediately after takeoff, which was followed by a partial loss of power from No. 4 engine.

7. The captain demonstrated questionable flying technique under the existing conditions.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was (a) the company's inadequate maintenance in not changing the No. 3 engine which resulted in its failure immediately subsequent to takeoff, and (b) the persistent action of the captain in attempting to re-establish a climb, without using all available power, following the critical loss of power to another engine. This resulted in a nose-high attitude, progressive loss of airspeed and the settling of the aircraft at too low an altitude to effect recovery.

By the Civil Aeronautics Board:

Donald W. Nyrop
Oswald Ryan
Josh Lee
Joseph P. Adams
Chan Gurney

Five-Fold Air Cargo Gain Seen by 1959

- **Lockheed study coincides with Douglas conclusions.**
- **Findings based on past trends, new equipment.**

By Lee Moore

Air cargo volume will increase five-fold by 1959 and surpass passenger volume. It will give the airlines 37% of their total revenue, compared with today's 20% including mail subsidy. So says a new Lockheed Aircraft Co. market forecast which is called "Air Cargo Trends."

The forecast reaches the same conclusions as a similar study by Douglas Aircraft Co. early this summer (AVIATION WEEK June 30, p. 67), although the forecasting methods used are different.

Other findings of the Lockheed report, released today after 18 months research by Lockheed cargo engineers L. R. Hackney and Charles J. Rausch:

• **Bigger profit potential** per dollar of investment than passenger business. The cargo plane can earn 55% of its cost in one year, compared to 40% for a passenger plane, Lockheed reports. Reason: higher load factor, less personalized attention required.

• **1½ billion ton-miles** a year by 1960—a volume equal to dispatch of almost 50,000 railroad freight cars across the U. S. per day for a year.

• **New 1049Bs and DC-6As** are the key to making good on this potential, Lockheed says. A fleet of ten Douglas DC-6As and ten Lockheed 1049Bs could carry 238,416,000 ton-miles a year, which is more than the domestic industry total hauled last year, Lockheed estimates. The Super Connie 1049B's capacity is 45% greater than its modern Douglas equivalent, the DC-6A, Lockheed claims.

• **Growth trend in the market** will speed up later in the decade as airlines modernize flight and ground cargo equipment, replacing old planes with 1049s and DC-6As (Chart 2).

• **Regardless of rate trend,** the airfreight market will expand about as predicted, Lockheed says. One reason is that it is not the air rate alone that counts, but its relation to the rising cost of competitive surface transport (Chart 1). Air-freight grows automatically with the industry trend to tighter inventory control, quicker delivery, and customer acceptance as a means to cut down material shortages, crating requirements, damage in shipment and effect of plant shutdowns.

• **Air express and mail** will increase in a steady trend. Express and mail, together with freight, make up the overall "cargo" category.

• **Airfreight mushroom** prediction by Lockheed "will depend to a large extent on the plan of action followed by the

Lockheed Comparison of Cargo Plane Capacities

	Payload (lb.)	Block Speed (mph.)	Ton-Miles (8-hr. day)
Curtiss C-46	12,500	180	9,000
Douglas DC-4	21,000	200	16,800
Douglas DC-6A	28,400	285	32,376
Lockheed 1049B	38,500	305	47,096

Source: "Air Cargo Trends" study by Lockheed Aircraft Co.

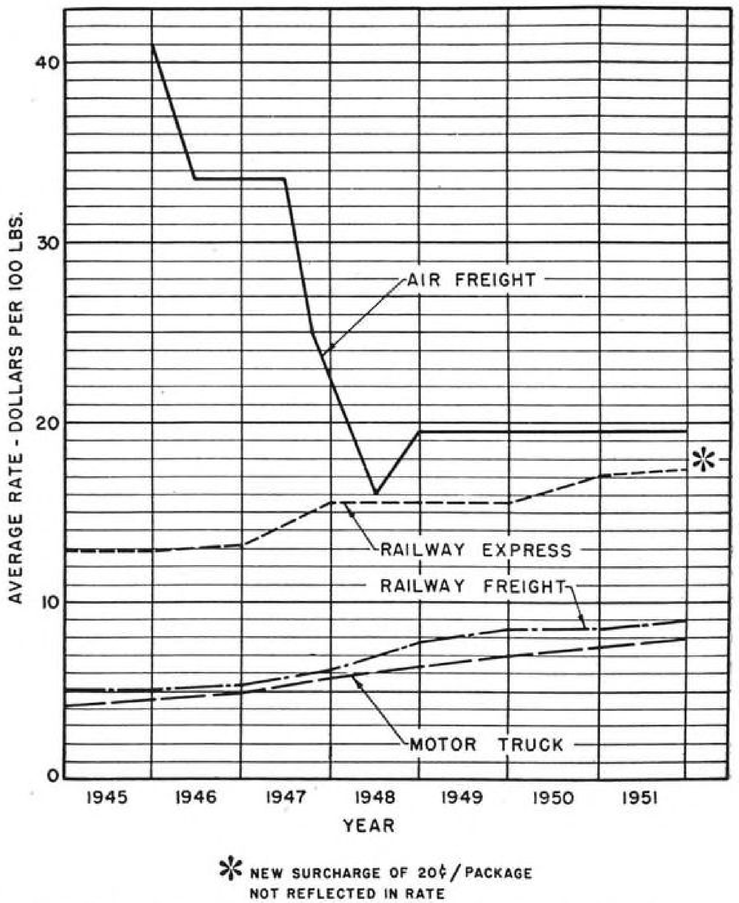


CHART 1. Rate comparison, air-rail-truck for 100-lb. shipments, Burbank-New York.

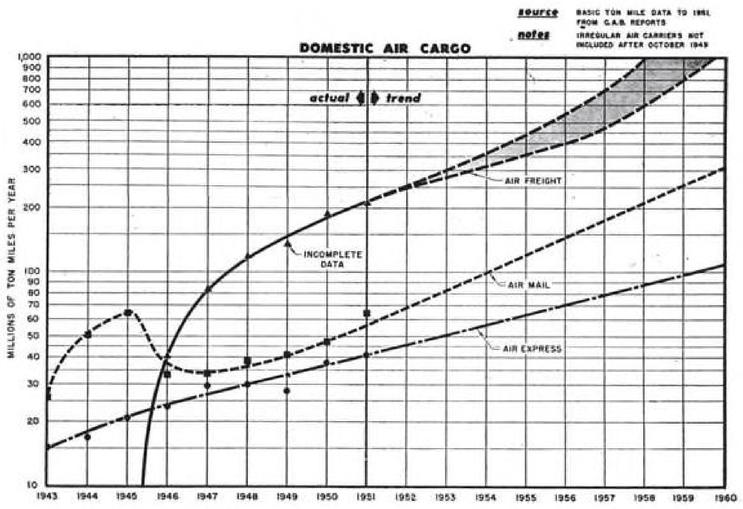


CHART 2. Growth patterns of airfreight, mail and express as plotted by Lockheed.

air carriers." The lower limit shown on Chart 2 (bottom of shaded area) for 1960 takes the more conservative assumption that airlines do not modernize air and ground equipment more than they presently plan to. The upper limit (top of shaded area) assumes the airlines buy new fleets of 1049B and DC-6A planes and new, efficient ground handling equipment and freight terminals.

"This upper limit also assumes," says Lockheed, "that the airlines will effect a positive campaign to increase airfreight's overall participation in the cargo transportation field and that airfreight rates will continue to maintain a downward trend in relation to the balance of the transportation industry."

Lockheed reports hopefully that recent new cargo plane orders by Slick, American, Flying Tiger, Seaboard & Western indicate the "new trend in the air cargo industry—that of buying equipment specifically designed for the job rather than converting obsolete passenger airplanes to haul cargo." On this subject, Lockheed concludes: "Other airlines must follow this trend if they expect to meet this competition both in speed and economy of operation."

This re-equipping "will inaugurate a new upward slope on the trend curve, just as new passenger transports have always influenced that segment of the transport industry," says Lockheed.

Even the billion ton-miles of airfreight predicted for 1958 would be only one-third of one percent of 1950 inter-city surface traffic on commodities capable of being air-lifted, Lockheed finds.

▶ **Prediction Method**—The Lockheed forecast is mainly based on future projection of past trends, as in Chart 2. The new upturn at the latter half of the decade is based on Lockheed's conclusion that new equipment will give a new growth trend to air cargo as new technological developments have to other transport businesses.

The Douglas prediction was based more on correlation of volume with rates, which it forecast would drop from 18 cents to perhaps 12 cents a revenue ton-mile by 1960 (AVIATION WEEK June 30, p. 67).

Both reached about the same conclusion—five- to six-fold increase in potential.

▶ **Passenger Lines Cautious**—The scheduled passenger airlines recently made a cargo forecast of their own. Instead of a five-fold increase, the Air Transport Assn. sees only a 63% gain in the cargo volume of its passenger airline members. The same ATA forecast sets an 82% rise in passenger business.

The ATA cargo prediction, however, does not include the specialized all-cargo carriers; they are not ATA members. Flying Tiger Line has seven DC-6As on order, Slick five DC-6As, and Seaboard & Western five 1049Bs.

Allowing for possible overoptimism by the sellers of cargo planes—Douglas and Lockheed—and overconservatism by the passenger airlines' association, the 1960 air cargo expansion forecasts seem to average out somewhere between two-fold and six-fold.

Regardless of rate of expansion to 1960, however, few deny that the ultimate potential for moving cargo is greater than that for moving passengers, the Lockheed study concludes. Rate of air cargo expansion this decade depends on some unpredictable variables such as surface transport rates, airline financing, war and business.

New Planes Assigned To Reserve Fleet

All four-engine transports delivered to U.S. owners after the end of this month must be modified to be capable of 48-hour mobilization for overseas use by the Military Air Transport Service.

Changes mainly involve readiness for conversion to 2,500-mi. range, celestial and long-range radio navigation facilities and light cargo accommodations.

This directive by Commerce Department's Defense Air Transportation Administration evolved from two year's planning that started under the National Security Resources Board. Defense and Air Force have approved the plan.

▶ **Option on Extras**—Modification specifications and contract prices are determined by the Air Materiel Command in negotiations with the individual airlines. The airlines (and a few corporation owners of four-engine transports) have the option of getting the extras put on the new planes at the factory or later, depending on cost and convenience.

Meanwhile, the airlines are going ahead with prototype modification of one of each type from the 295 existing transports assigned to the Civil Reserve Air Fleet by DATA and MATS. This fleet is slated for the initial airline mobilization in event of war.

Cost experience on modification of these first planes will be the guide for AMC in settling contract terms with airlines for modifying the rest.

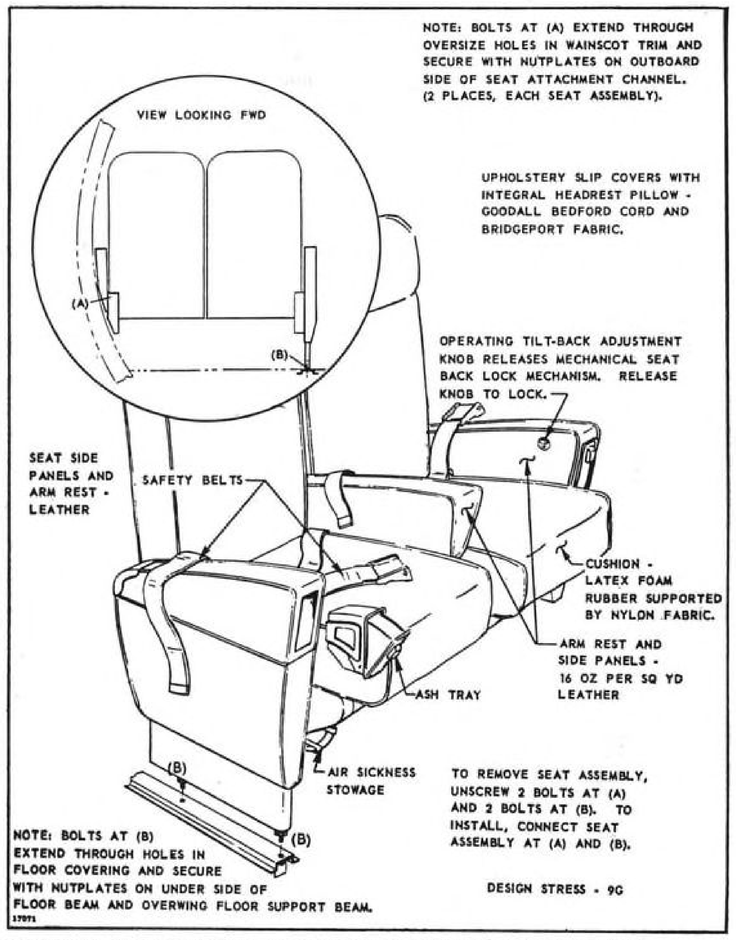
▶ **Allocation Problem**—With the airlines committed to send many or most of their four-engine planes overseas in a war, allocation of remaining planes among the airlines for commercial service becomes a problem. The Civil Aeronautics Board already has sent out tentative quotas to the airlines and last week received the last of their individual protests to the proposed allocation.

The Board has promised to issue final allocations by Dec. 22. Under the CAB program, local service routes would lose almost all their planes to the more important trunk routes. For instance, Northeast might lease some DC-3s to American and United. Since American is slated to turn over a large proportion of its DC-6s to the airlift, Delta would operate more of the AA-Delta interchange with its own DC-6s.

Aviateca's New Service

(McGraw-Hill World News)

Puerto Barrios, Guatemala—Nonsked passenger and air cargo service between this Caribbean port and San Salvador has been inaugurated by Aviateca, Guatemala's government-owned airline, following a long delay caused by friction between the two neighboring republics.



CONVAIR 340 SEAT features are detailed in this itemized engineering sketch.

Aviation Safety

Good Seat Engineering Saves Lives

By Alexander McSurely

Increased attention to design of airliner seats, coupled with the inherent strength factor of pressurized cabins, already has paid some handsome dividends in the number of passenger lives saved.

Credit for the greater emphasis on crash-protection in new airliner cabins can be divided between Cornell University's Crash Injury Research organization in New York and the U. S. plane manufacturers and engineers willing to make use of the facts which CIR's accident analysis work continues to develop

▶ **Seat Engineering**—Development of increased safety factors in the passenger seat supplied for the postwar Convair 240 and the later 340 offers one of the best current examples of intelligent engineering to meet the crash protection problem.

The Convair seat back incorporates several design features tending to minimize injuries to the passenger who might be thrown into the rear of the seat in front of him.

Light sheet-metal construction is used throughout the seat back with a padding of foam rubber. Progressive yielding of the sheet-metal structure under impact provides a substantial cushioning effect for the head or upper torso of a person who might happen to be thrown against it under certain crash conditions.

▶ **Pushes Forward**—Convair has designed the seat back to move forward from the rear, which provides another element of protective yield under crash conditions. Also, the airline hostess now can quickly adjust the seat backs

to upright position without pushing the "recline button."

Forward and rear seat beams are large diameter 24ST dural tubes. The aisle-side structure is a welded assembly of one-inch 61ST tubing riveted to the forward and rear tubular transverse beams.

The outboard structure is designed to conform to the contour of the airplane. This seam-welded closed box structure of 61ST alloy sheet incorporates ferrules for attachment of the seat to the side of the fuselage. Seat structure is divided into halves by a tubular spreader bar also of 61ST material.

It stabilizes the forward and aft beams and provides sockets for the center arm rest.

Cushions for seat back and seat are of rubberized hair in airfoam rubber. Seat-bottom cushions are supported by lightweight nylon cloth laced tightly between forward and rear beams. Resiliency of the nylon cloth and of the cushions makes additional springs unnecessary.

Seat backs are of simple torque box design made of light-gage .032 24ST sheet alloy.

The telescoping seat locks used provide an infinite number of locking positions for the reclining backs.

Four attach points are provided for the newer 340 seat, two on the side of the fuselage and two on the floor at the aisle side. Either bolt-type studs or quick-release studs may be specified by the purchaser.

► **Crash Analysis**—The Northeast Airlines crash of a Convair 240 in Flushing Bay, near La Guardia (N. Y.) Airport, Jan. 14, 1952, provided an unusual case for study of the protective qualities of properly designed seat backs equipped with the modern safety belt installation designed to withstand 3,000-lb. loads, combined with the favorable environment of a strong, pressurized transport fuselage.

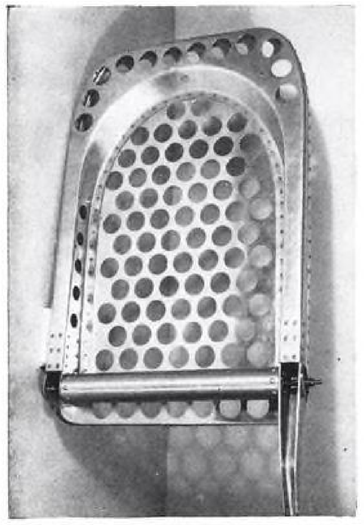
Analysis showed that the airplane ditched in 15 ft. of water during minimum visibility conditions while making a normal approach of about 135 mph. at a normal rate of descent of about 500 ft. per min. The right wheel touched the water first, swerving the airplane to the right. Then the nose gear, left main wheel and wing struck the water. Impact tore off the landing gear, left wing and left engine nacelle. Right wing suffered less damage and stayed with the hull.

► **No Passengers Killed**—All 33 passengers and crew of three escaped unhurt or with injuries regarded as minor, with three exceptions. One had a fractured hand, another a contusion of the spine and the third a slight injury to the kidney attributed to the twisted position in which the passenger was sitting when the plane hit. Pilot and co-pilot reportedly struck their heads against the glare shield in the cockpit without severe injury. The stewardess, in the "safety" seat farthest aft in the cabin, was uninjured.

Advantage of the special Convair seat back design is indicated by the fact that backs of six seats were struck hard enough to cause permanent deformation of the structure, presumably by the heads of passengers sitting behind them. It is probable that other seat backs served as metallic cushions for other passengers' heads without causing plastic deformation of structure or head injuries.

► **G-Loads**—Estimates are that the hull and wings absorbed peak loads in the range of 10 to 15G in the impact. Crash Injury Research investigator A. Howard Hasbrook studied the crash wreckage, and the photographs he took indicated that seat and seat anchorages met and may have exceeded prescribed CAA design load requirements of 6G forward, 6.6G downward, and 1.5G sideways. Failure of some seat anchorages indicates that these loads were exceeded, although the mean force of deceleration from first impact until the plane stopped did not exceed 2 to 3G.

Approximately 63% of the seats in the forward cabin area had failures of anchorages. Only one-third of the rear seats broke their anchorages in the center and aft area. Analysis attributes this principally to localized force on the bottom of the fuselage partially due to tearing off the nosewheel. These forces were transmitted with only slight modification through the strong center section structure to the cabin center.



PROGRESSIVE YIELDING metal back.

RECLINED and upright seat positions.

SEAT BACKS GAVE but seats held.

The new Convair 340 seat, a development of the 240 seat designed by G. K. Sherman, Convair senior design engineer, is built to withstand design loads of 9G, forward, 8.5G downward, 5G upward, and 3G side-load, and is considered by Convair as one of the most advanced seat structures now in use.

► **Future Trend**—Study of the Northeast 240 crash indicates a future design trend to even sturdier structures than the 340 seat. The trend is expected to be felt in smaller executive and business aircraft as well. One new four-place design, Prof. Otto Koppen's Helioplane, is being designed with seats which will take 15G loads fore and aft.

Expectations are that the modern pressurized transport hull is capable of taking crash impact loads perhaps in the neighborhood of 30Gs, with relatively slight damage. If this is true, designers of interior cabin structure are not getting full advantage of their basic structure when they design seats which would fail at perhaps one-third of the load that the hull will take.

Hasbrook, and Hugh De Haven, director of Crash Injury Research, think that the now phenomenal safety record of the Northeast 240 crash at New York virtually can be assured in a large percentage of air transport accidents of the future if the airline operators insist on a few well-defined design precepts:

- Design seat backs of ductile metal structure that will cushion the shock of head or body contact without serious injury.
- Design seat backs to fold forward to provide further "give" at initial impact.
- Anchor seats firmly to primary structure of the airplane, so passengers will "stay put" under relatively high G forces.
- Anchor passengers firmly to their seats with snugly tightened 3,000-lb.-load seat belts now required by Civil Air Regulations.

Braniff Asks Higher Domestic Mail Rate

Braniff Airways has asked Civil Aeronautics Board to set a higher temporary domestic mail rate than the 53 cents a ton-mile proposed by CAB. Reason given is Braniff's merger with Mid-Continent, which was still a subsidized carrier. The Board argued that efficiencies gained by the merger should make the merged company able to get along on the non-subsidy 53-cent rate.

Since the rate is only temporary, CAB has plenty of time to consider Braniff's plea. Post Office department demanded a full hearing on the Board's

original proposal of a permanent 53-cent rate for Braniff. Post Office, skeptical of Braniff's ability to make good on that rate, asked CAB to require the airline to set up an "earnings equalization reserve" if the Board set a permanent rate as low as 53 cents a ton-mile. This delay has led CAB to propose the temporary rate in the interim while the "equalization reserve" is debated.

Nonsked Licensed

Canadian Air Transport Board has licensed Rochester Aeronautical Corp. to fly nonsked charter services from within 50 mi. of its Rochester, N. Y., base to any point in Ontario, Canada's Atlantic Coast provinces and Newfoundland, south of 52 deg. latitude. The carrier is restricted to using planes having disposable load not exceeding 6,000 lb. The service may not deliver traffic between Canadian points.

SHORTLINES

► **Air France** will get 30 new planes next year, including Super Connies, Vickers Viscounts, the French Breguet, and Britain's jet Comet.

► **Air Transport Assn.** decides Dec. 9 whether to adopt a monthly sample survey of traffic origin and destination, now proven practical by ATA staff. This data used to be collected semi-annually and published two years later.

► **American Airlines** airfreight volume topped $1 million in October with more than 4 million ton-miles carried—an industry record which AA says it hopes to surpass again in December.

► **Australian National Airways** will get a government loan to buy second-hand planes in sterling areas.

► **Braniff International Airways** nine-months revenue passenger miles gained 21% over a year ago. . . . Company has applied, along with United and Continental, for one-plane through service from Pacific Northwest to Kansas, Oklahoma and Texas via interchange at Denver, starting with UAL DC-6s and adding Braniff and Continental DC-6s later.

► **British European Airways** predicts 48-64-passenger copters flying 160 mph. by 1960, but subsidy is needed to develop two prototypes, costing $10 million, says Chief Executive Peter Masefield.

► **British Overseas Airways** eastbound trans-Atlantic passenger traffic gained 49% and freight 29% April-September over a year ago. . . . Company will cut its winter service in half, although TWA and Pan American are cutting only slightly.

► **Central Airlines** October traffic hit an all-time high of 5,008 passengers, with record load factor of 20%, showing that some locals still have a long way to go for self-sufficiency.

► **Chicago & Southern** interchange with TWA for the New York-Pittsburgh, Memphis-Houston service will get CAB approval. It will not compete with Eastern's direct New York-Houston monopoly route.

► **Civil Aeronautics Board** plans prehearing conference on its "general fares investigation" in a few weeks. Since the previous conference, the airlines withdrew their plan to drop roundtrip discounts. Main issues now are general fare level and question of tapering unit fares with increasing distance. . . . CAB will wait several weeks at least before replacing G. Bernard Slebos, chief of Routes and Carrier Relations division. He is joining Pan American as director of economic planning. . . . CAB has approved scheduled and nonsked military business contracts for another year. Nonskeds, prevented by Board rules from increasing civilian business, now are concentrating on the unrestricted military contract business.

► **International Civil Aviation Organization** has set limits on the number of documents needed for air entrance and transit in international travel, an improvement on the 1950 move to cut red-tape hampering travel. Visas, transit permit and currency restriction are the chief items. New rule also helps private and nonsked business, not covered in the 1950 agreement.

► **Pacific Northern Airlines** first year of United States-Alaska traffic ending Sept. 30 totaled 19,335 passengers, 1,232,669 ton-miles cargo and 240,473 ton-miles air mail. Total PNA traffic that year on all routes is up 68% for passengers, 325% cargo and 178% mail compared with a year ago.

► **Pan American World Airways** starts service to Rangoon Dec. 3. . . . Company has made its 40,000th trans-Atlantic flight, will operate 28 roundtrips a week this winter, nine more than a year ago. Summer traffic was 50% heavier than a year ago.

► **Pioneer Air Lines** October traffic of 18,109 passengers was 13% over a year ago and was an all-time record. . . . Company flying 36-passenger Martin 2-0-2s, averaged 15½ passengers per revenue-mile flown, compared with 10½ two years ago.

► **Trans World Airlines** is expected by CAB to ask a 'round-the-world route in the "Northwest Airlines, et al. trans-Pacific certificate renewal case," prehearing conference on which was slated for last week. . . . Company's Bombay Tokyo survey flight returning to U. S. across the Pacific this month is a starter. . . . Company plans 26 trans-Atlantic roundtrips a week this winter, compared with Pan American's 28.

► **United Air Lines** reportedly has an agreement with a third Japanese applicant for trans-Pacific certificate—Iino Shipping Company, which would fly Tokyo-Honolulu, meeting United there. . . . UAL October revenue passenger miles at 229,266,000 were up 29% over a year ago although down 4% from September. . . . Company faces a military demand for flight engineers at co-pilot-level pay.

► **Wisconsin Central** has a CAB show-cause order for temporary mail pay of $790,368 from Mar. 1 to Aug. 1 this year, equal to 55⅜ cents a plane mile. New present temporary rate is 67¾ cents.

Where to Buy
PRODUCTS - SERVICES
ACCESSORIES

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

FIELD ENGINEERING Representative: Progressive Manufacturer, Automatic Controls has opening for Technical representative calling major aircraft accounts. Midwest location. Aero engineering sales background necessary. Salary and bonus. Permanent career. P-5911, Aviation Week.

LEADING PRODUCER of metal rotor blades for helicopters seeks two project engineers with five years' layout and design experience with aircraft structure and fittings. Prewitt Aircraft Co., Clifton Heights, (Suburban Philadelphia,) Pa.

SALES ENGINEER under 30 years old with a flair for writing wanted. Good job and future open in advertising department of a well-known instrument company located in New England. P-6051, Aviation Week.

TECHNICAL WRITER wanted: If you have a technical background, some sales experience, and can write we have a good job with a future waiting for you in the industrial advertising field. P-6048, Aviation Week.

YOUNG ENGINEER wanted who likes to write. Should have some experience in sales work. P-6046, Aviation Week.

WANTED AERONAUTICAL Engineer to teach aeronautical engineering in program of Flight Safety conducted for USAF by University of Southern California. Desirable qualifications: B.S. in A.E.; teaching and practical experience in aerodynamics, structures, etc. Salary $7000 to $8000, depending on qualifications. Address Dr. Louis Kaplan, Office of Flight Safety, University of Southern California, Los Angeles 7, California.

POSITIONS WANTED

ATR PILOT Airline experience. Single and multi engine land and sea aircraft and engine's license (A&E) age 31, $100 hrs. All transport types, Engineering Background. PW-5994, Aviation Week.

EXPERIENCED PILOT. Over 10,000 hours. Multipengine experience in Beechcraft, Lodestar, DC-3, DC-4, Constellations. 6 years foreign service. Desire position in U.S.A. PW-6040, Aviation Week.

MECH. ENGINEER with Commercial Pilot & "E" Licenses for position combining Engineering and flying. Age 27, Single. PW-5989, Aviation Week.

COMPANY PILOT or sales Rep. Airline and sales background. All ratings including A & E Amphibian exper. College Grad., family man, domestic or foreign. PW-5717, Aviation Week.

PILOT, 8000 hrs—16 yrs. continuous flying, 3500 multi. ATR, FI, E Mech. ratings. Age 37. Eager. Ex Ref. PW-5953, Aviation Week.

TOP FLIGHT Salesmanager — M.E. Background: 20 years successful sales management and technical sales experience; age 42. Presently sales and service manager for manufacturer of technical specialty in field of guided missiles, electronics, and aircraft gas turbines. My personal sales in excess of $1 million past 12 months. Strong contacts with Buaer, Buord and USAF as well as industry. Desire connection where my full capabilities can be utilized. PW-5985, Aviation Week.

How PROSPEROUS Is The USA?

Just how prosperous *are* the people of the United States?

The sole purpose of this message is to help clear up the confusion and controversy that surrounds this important question.

To find out how much prosperity, or material well-being, the people of the United States now enjoy, it is necessary to get answers to these questions:

1. As compared with other times, what is the total amount of goods and services that we have available for our enjoyment?

2. How great, on the average, is the share of each American in this prosperity?

3. How does our prosperity compare with that of other nations?

National Product at Peak

The government statisticians who do the bookkeeping for the nation produce a figure called the Gross National Product. It is supposed to be the total obtained when you multiply the amounts of everything we produce by the prices of everything produced. This year the GNP, as it is commonly tagged, will add up to something like $345 billion.

Since this will be the highest total that GNP has ever attained, some people will acclaim it as evidence that we now are enjoying the greatest prosperity on record.

The GNP, however, is not an accurate yardstick of prosperity. It may go up because of price inflation alone without any increase at all in the output of goods and services. Also the GNP includes very large amounts of goods and services, such as those for the military, which are in fact a result of misfortune rather than of a condition that might properly be called prosperity. Moreover, there is no deduction from the GNP to make allowance for the equipment that is worn out in producing it.

Little Recent Progress

When we make adjustments such as these — to find out how much of our production really is available for the use and enjoyment of the civilian population — the *adjusted* national product since the beginning of World War II comes out about as follows. The effects of price inflation have been removed from these figures.

YEAR	ADJUSTED NATIONAL PRODUCT	
	Billions 1951 Dollars	Index (1946 = 100)
1940	$176.2	76
1946	232.5	100
1947	240.7	104
1948	244.3	105
1949	239.7	103
1950	260.9	112
1951	267.9	115
1952	264.3	114

From this table the fact stands out that progress in raising our level of prosperity has been halting. What progress we have made came in a few dramatic increases before or after a military build-up. Aside from those, the progress has been fairly slow. This year, 1952, it has been particularly discouraging.

Again, when account is taken of the number of people who must share in the goods and services that are available, our progress is even less marked. This is shown by the following table which gives the share of the average American in the national product. This, as the table indicates, is arrived at simply by dividing the total of available goods and services by the population on hand to share in them.

YEAR	POPULATION Millions	ADJUSTED NATIONAL PRODUCT Billions 1951 Dollars	ADJUSTED NATIONAL PRODUCT Per Person
1940	132.0	$176.2	$1,335
1946	141.3	232.5	1,645
1947	144.0	240.7	1,672
1948	146.6	244.3	1,666
1949	149.2	239.7	1,607
1950	150.6	260.9	1,732
1951	154.4	267.9	1,735
1952	156.9	264.3	1,685

Here it is clear that we have made little or no headway since the end of World War II.

U.S. Compared to Other Nations

Although we are making slow progress in increasing our prosperity, as measured during recent years by the amount of goods per person, we still are by long odds the most prosperous people on earth. This can be seen from the following table. It offers a rough measure of how the adjusted output of goods and services per person in the United States compared in 1951 with that in a number of other countries:

COUNTRY	PER PERSON
United States	$1,735
Canada	1,231
United Kingdom	614
France	510

To figure more closely "How Prosperous is the U.S.A.?" we must answer a number of other questions. One of the most important will be the subject of a later editorial in this series. It is "Who Gets What?" How have various income classes and occupational groups shared the total available goods?

Another question that has a basic bearing on the quality and durability of our prosperity is "How fast are we using up irreplaceable natural resources, such as oil, iron ore, and copper, to sustain it?" Any attempt to deal with this very complicated question must also be deferred.

A Problem for the Future

In the meantime, however, key facts about our prosperity are that:

1. Most of the increase in the nation's total production in recent years has been to meet military requirements rather than to improve the American standard of living.

2. The increase in the supply of goods and services actually available for the average American has been slow and halting.

3. We Americans are still extremely well provided with the good material things of life, as compared with peoples in other lands.

These three facts bring to mind a whole series of policy questions. What can be done to speed up progress in improving our prosperity? What—to repeat the question discussed in the previous editorial in this series—can be done to make our prosperity less precarious?

Here, however, the purpose is not to prescribe. It is simply to indicate as accurately as it can be done in a brief article the actual state of the nation's prosperity.

In doing this much, it can properly be remarked that the record presents to the American economy both a problem and an opportunity of surpassing importance. It is that of building a prosperity that will be both more progressive and more secure than any we have known in recent years. In the light of what clearly remains to be done, we shall make a grave mistake if we use up any of our energy in congratulating ourselves on the relatively meager progress here recorded.

McGraw-Hill Publishing Company, Inc.

We desire personnel of the highest caliber—experienced in the field of airborne automatic electro-mechanical control equipment.

★

ENGINEERS

MECHANICAL DESIGN
ELECTRONIC
SERVO

DESIGNERS-LAYOUT MEN

ELECTRONIC
MECHANICAL

This work deals with the manufacture and development of highly complex equipment of the most advanced type in a new and expanding division of an established firm with 20 years of successful experience in the precision instrument field.

We cite a few of the good reasons why you might like to join our organization . . .

SALARY increases are based on merit and initiative—two weeks VACATION, HOSPITALIZATION BENEFITS, GM'S own INSURANCE PLAN—POSITIONS ARE PERMANENT due to long range manufacturing and developing programs—EXPENSES incident to interviews and moving all absorbed by company—HOUSING and LIVING CONDITIONS among the best and finest of any along Lake Michigan.

- We have a Junior Engineering Training Program of one year for inexperienced engineering graduates. Opportunity to become acquainted with all phases of industry.
- For the convenience and direct use of engineers in our Engineering Department, we have our own model shop where highest skilled mechanics are employed.
- Educational opportunities for advanced degrees available at U. of W., Marquette, Technical engineering offered at Milwaukee Vocational School.

. . . all inquiries answered—write or apply . . .

★ *AC SPARK PLUG DIVISION*

GENERAL MOTORS CORPORATION

1025 E. KENILWORTH PL. MILWAUKEE 2, WIS.

California Opportunity

For Acoustics and Vibration Engineers

To conduct tests and analyze problems in acoustics and vibration fields related to aircraft and associated products.

FOR FLIGHT TEST ENGINEERS

To engage in planning, testing and analyzing flight test data obtained on Douglas prototype commercial and military aircraft.

Salary open and dependent on experience and ability.

Contact Mr. W. H. P. Drummond, 3000 Ocean Park Boulevard, Santa Monica, California. Phone: Exbrook 4-3241, Extension 339.

DOUGLAS

DOUGLAS AIRCRAFT COMPANY, Inc.
SANTA MONICA, CALIFORNIA

Engineers and

OTHER TECHNICAL PERSONNEL

Needed

DALLAS, TEXAS

AERODYNAMICS
POWER PLANT
ELECTRONICS
STRESS ANALYSTS
SERVO MECHANISMS
STRUCTURES
CONTROLS
WEIGHT CONTROL
LIAISON
MECHANICAL
MATERIAL PROCESS
LOFTSMEN

ENGINEERING PERSONNEL SUPERVISOR
DRAFTSMEN

HOUSING AVAILABLE - TRAINING FACILITIES - PENSION PLAN
PAID VACATION & HOLIDAYS - GROUP INSURANCE
EXCELLENT WORKING CONDITIONS

ATTENTION ENGINEERING PERSONNEL

E-M-C-O AIRCRAFT CORPORATION

BOX 6191 DALLAS TEXAS

ENGINEERS
DESIGNERS

Opportunity in an established and growing company

Engineering & Research Division
OF
ALL AMERICAN AIRWAYS, INC.

DuPont Airport
Wilmington, Delaware

RADIO MAN

To repair and install aircraft radio equipment. Must have experience on Bendix, Collins, Lear, ARC. Vacation, excellent working conditions. High salary. Reply

P-5674, Aviation Week
330 W. 42 St., New York 36, N. Y.

MASTER PLANNER SCHEDULER

Qualified graduate engineer needed to perform functions of Master Planner and Scheduler for large engineering organization. Must be experienced in aircraft engineering field, particularly in engineering planning, estimating and scheduling work. State age, experience, present status and salary expected. Write.

P-5835, Aviation Week
520 N. Michigan Ave., Chicago 11, Ill.

WANTED!

INSTRUMENT SUPERINTENDENT

Capable of assuming complete supervision and administration of Instrument Assembly Division. Considerable experience necessary in all phases of assembling and fabricating of electro-mechanical devices. Basic knowledge of fabricating processes. Well versed in methods and tooling.

PROJECT ENGINEERS

Mechanical and Electrical

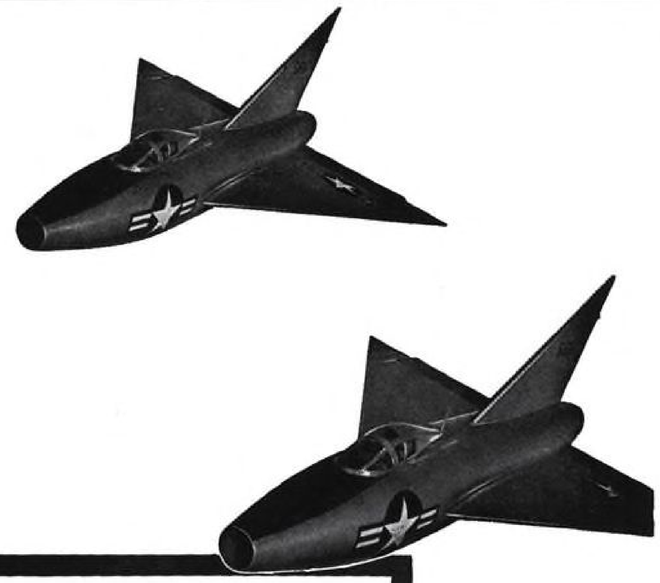
Responsible for initial design, prototype and production of small mechanical and electrical devices and instruments for aircraft and industry. Experience in detail design, manufacturing methods and processes desirable. Background in AC, DC, and magnetic circuits also desirable. BS in ME or EE degrees required.

Unusual Opportunities for the Right Men with a Growing Organization in Central Connecticut

Please send complete resume outlining background and experience to:

PERSONNEL MANAGER
P. O. BOX 358
WALLINGFORD, CONN.

All Replies Held in Strictest Confidence!



SPECIAL OPPORTUNITIES FOR

SENIOR ENGINEERS

Convair in cool, clean, beautiful San Diego invites you to join an "engineers" engineering department. Interesting, challenging, essential long-range projects in commercial aircraft, military aircraft, missiles, engineering research and electronics development. Positions open in these specialized fields:

Electrical Design	Servo-mechanisms
Mechanical Design	Aerodynamics
Structural Design	Thermodynamics
Structures	Operation Analysis
Weights	System Analysis

Generous travel allowances to those accepted. For free brochure, write Mr H. T. Brooks, Engineering Dept 200

CONVAIR

IN BEAUTIFUL

SAN DIEGO

3302 PACIFIC HIWAY
SAN DIEGO 12, CALIFORNIA

ENGINEERS!

New Aircraft Projects
AT
RYAN

Ryan

SAN DIEGO

OPENINGS FOR

- **Aerodynamicists**
- **Airframe Designers**
- **Stress Analysts**
- **Power Plant Engineers**
- **Draftsmen**

Work will be on new Ryan aircraft projects

Replies to Director of Engineering will be held in strict confidence.

RYAN
AERONAUTICAL COMPANY
San Diego 12, California

AEROPLANES
Aircraft Parts:

- PROPELLERS
- CARBURETORS
- MAGNETOS
- 25,000 AIRCRAFT PRECISION & HAND TOOLS

TESTING EQUIPMENT
AIROPLANE ENGINES

• • •

VARIOUS AIRCRAFT STARTERS—GENERATORS—RELAYS—VOLTAGE REGULATORS
INVERTERS, SWITCHES

• • •

MACHINE SHOP — SHEET METAL & WOODWORKING MACHINERY

OFFICE EQUIPMENT:

- DESK & OFFICE CHAIRS
- OFFICE MACHINES
- FILES & SCHOOL ROOM FURNITURE

PUBLIC AUCTION SALE

formerly of
AERO INDUSTRIES

to be sold on the premises:

BUILDING 621 OAKLAND AIRPORT OAKLAND, CALIF.

Tuesday, December 2 — Starting at 10:00 A.M.
"and continuing until sold"

* * *

Open for Inspection November 25th up to Time of Sale, Including Saturday and Sunday
10:00 A. M. to 4:00 P. M.

* * *

This is a Very Choice Stock of Aircraft Equipment For Further Information or Circular

Telephone, Wire or Write

Irwin Friedman, Auctioneer

764 Mission Street San Francisco, California
EXBROOK 2-5864

LOCKHEED LODESTAR

Now in major overhaul. Can be finished your specifications. One of last built. R-1820 205A Engines.

ENGINEERING AND MANUFACTURING CORP.
P. O. Box 479
Galveston, Texas

LOCKHEED PV-1

Speed 260 mph (T.A.S.) - Range 1500 Mi.

We have several Lockheed PV-1 Venturas that are ready for immediate flyaway. They are now unconverted. Aircraft are very low time—one having a total of only 440 hours since new. These ships are in unusually fine condition. Will stand rigid inspection.

These Ships may be inspected at Fort Wayne, Baer Field

Call or Write

LEEWARD AERONAUTICAL
Fort Wayne, Ind. Ph. H-2145

ONE STOP EXECUTIVE AIRCRAFT SERVICE

Major Rebuild **Authentic Integral Fuel Tank Sealing**
Interiors **Radio Installations** **Relicense**

One of largest stocks of new Lodestar parts in the country

We can handle your work.

ENGINEERING and MANUFACTURING CORP.
P. O. Box 479 Galveston, Texas

BEAUTIFUL EXECUTIVE LODESTAR

Model 18-56 C.A.A. #N24A

8,000 hour overhaul—New Wright R1820-72A Engines — 24 volt system — Dual Instrument Panel — Complete Radio with Omni — Distinctly Tailored Interior.

L. B. S. Aircraft Corporation
Miami International Airport
Miami, Florida Phone: 64-0611

INSTRUMENTS

Authorized Factory Sales and Service

for

* Eclipse—Pioneer
* Kollsman
* U. S. Gauge

C.A.A. Approved Repair Station #3564

Contractors to U. S. Air Force

Our stock of instruments is one of the largest in the East.

IMMEDIATE DELIVERY

CALL • WIRE • WRITE

INSTRUMENT ASSOCIATES

Telephone: Great Neck 4-1147
351 Great Neck Road, Great Neck, N. Y.
Telegraph: WUX Great Neck, N. Y.

HANGARS FOR SALE

IMMEDIATE DELIVERY—WE INSTALL

40', 148', 198' widths, any length

ANDERSON STRUCTURAL STEEL CO.
1700 Sawtelle Blvd., Los Angeles 25, Calif.
ARIZONA 32681 BRADSHAW 21242

LOCKHEED PARTS

Lodestar—Connie

Fuselages - Wings - Nose Sections Ailerons - Flaps - Rudders - Landing Gears - Wheels - Dem. Power Plant Units - Doors and other items as well as all component airframe parts.

Transport Aircraft—Engines—Airline Equipment

IRLINE EQUIPMENT CORP.
Newark Airport, Newark, N.J.
MARKET 2-0963-4

EXECUTIVE TRANSPORT AIRCRAFT

DOUGLAS, LOCKHEED, BEECH, GRUMMAN, and CURTISS aircraft for sale. For top value executive aircraft call or write
ATLANTIC AVIATION CORP.
P. O. Box 146, Hasbrouck Heights, New Jersey.
HA 8-1740.
Complete aircraft maintenance facilities at Teterboro, N. J., and Logan Airport, Boston.

DOUGLAS C-47

CARGO VERSION

Zero time since major O.H. on engines and airframe. Completely equipped with radio and de-icer equipment.

LEEWARD AERONAUTICAL
1104 C. of C. Bldg. Miami, Fla.
Phone 9-1218

BUYING OR SELLING

Either way our 28 years of experience and nationwide contacts are at your service in Personal, Executive and Transport Aircraft.

JIM WELSCH
AIRCRAFT SALES
60 East 42nd Street, Suite 628
New York 17, New York Murray Hill 7-5884

DOUGLAS DC-3

Ready for immediate use and delivery. Zero time on engines. Completely equipped. Full radio and de-icer equipment.

LEEWARD AERONAUTICAL
Miami, Fla.
1104 C. of C. Bldg. Phone 9-1218

WHAT DO YOU NEED?

Buy from one of America's largest stocks of

UNUSED AIRCRAFT PARTS

1500 COMPLETE UNITS OXYGEN BREATHING EQUIPMENT

For high altitude flying—new surplus—complete, ready for use. Manufactured for U. S. Navy. Available for inspection. Priced at a fraction of original cost.

AIRCRAFT ENGINES

WRIGHT

Quantity		Quantity	
1	R1820-52 Low total time since new	4	R1820-60 Low total time since new
16	R1820-54 Low total time since new	4	R1820-62 NTSN

PRATT & WHITNEY
1 R1830-43 LTSO

750 OXYGEN and CO_2 CYLINDERS
Various Sizes—Shatter Proof
High pressure—with valves

1 CARLOAD
Miscellaneous Engine Parts for RANGER V-770

TURRET PARTS
Manufactured by or for General Electric Control units—grips—motors Amplidynes, etc.

500 LBS
Nichrome Alloy Wire .0031 enameled Manufactured by Driver-Harris Co.

MISCELLANEOUS COMPONENTS

(Many items in this group have not been listed in previous ads.)

Quantity	Part No.	Mfg.	Description
20	36001-0	Eclipse	Compass
11	14601-1F-B1	Eclipse	Gyro Indicator
71	828TY13Z2	Weston	Oil Temp Indicator
40	119862	Weston	Carb. Air Temp Indicator
10	15401-1	Eclipse	Amplifier (PB10)w/ED3 MOUNT
66	10078-1AG	Eclipse	Gyro Indicator
62	CQ-9	Eclipse	Clutch Switch (PB10)
57	MF45-3911-20Z	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	CO_2 Mfg. Co.	Fire Detector
384	564-2A	Eclipse	Oil Separator

PRATT AND WHITNEY AIRCRAFT ENGINE PARTS

Quantity	Part No.	Description
166	1045A	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
900	48350-D	Crankcase Ass'y
200	84083	Cylinder
100	84084	Cylinder
200	84085	Cylinder

CARBURETORS! MAGNETOS! SPARK PLUGS!

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

43 PIECES ENGINE QUICK CHANGE UNITS Applicable to GRUMMAN FM-1 AIRCRAFT. COMPLETE with ACCESSORIES

2000 OIL COOLER ASSEMBLIES W/VALVES
From 5" to 16" diameter
Manufactured by Harrison Radiator Co. and United Aircraft Products

18 PIECES ENGINE QUICK CHANGE UNITS APPLICABLE TO CONSOLIDATED VULTEE B24D

We own and offer all parts listed — plus many thousands more — stocked in our Baltimore warehouse. Write for **FREE CATALOG** Please make your request on your company letterhead.

COMMERCIAL SURPLUS SALES CO.

4101 CURTIS AVENUE, BALTIMORE 26, MARYLAND TELEPHONE: CURTIS 3300

Treatise on Pictorial Computer

Gadgetry is a practice—sometimes a way of life, I suspect—that continually plagues aviation. Latest fad is the pictorial computer, another black box crammed with the usual electronic micro-organisms. This gadget receives information from the VOR and DME, translates the data into geographical position and, by means of a moving strip map, shows the location of the airplane to the pilot.

Billed variously as "the poor man's radar," "great aid to navigation" and "the pilot's handy helper for holding patterns," the computer already has progressed to an amazing point. Having passed through the committee-laboratory stage, the device is now in the hands of manufacturers who are currently making the rounds with their sample cases in search of clients. Let us examine their product.

►**Accuracy, Reliability**—Consider first, accuracy. One of the computer's prime ingredients is the VOR bearing. The VOR possesses a normal average error of about 5 deg. when in perfect operating condition. Within the computer itself one manufacturer admits an additional 4 deg. So without considering DME error the pictorial computer probably will be wrong by about 9 deg. more often than is comfortable.

In crowded metropolitan areas some holding patterns are separated by only 12 miles, so a 9-deg. error will produce some neat overlapping of flight paths.

Then there is the question of reliability—an old and very real question in aviation. When does the pilot believe the thing? The VOR has lied to him—badly at times. The computer may do the same. The only answer, of course, is continual cross-checking by other means. Most assuredly the computer can show an erroneous location so it is not fail-safe. Therefore, all the pilot has is another gadget which can't be trusted alone because it might lead him to trouble.

The poor man, unable to afford the luxury of several navigational devices, cannot use it safely since it cannot stand alone. The airline pilot can navigate—and very well, too—with present equipment, so he doesn't need it. And we have never seen an airline instrument panel with enough spare room for a picture map large enough to be read in turbulence by cockpit candlelight.

►**Fail-Safe Problem**—Granted, some of these items of cost, size, weight, even accuracy, may in the distant future become more palatable. This still leaves several fundamentals which cannot be engineered out. One of these is the fail-safe problem. As long as a device can fail and the failure not be clearly evident to the pilot, we have a menace.

Second, and perhaps more important in the case of the pictorial computer, is the fact that today's flying, especially airline, needs cockpit information which the computer simply is not capable of presenting.

We need a means of detecting other aircraft—collision warning. We need weather scanning for ice, hail and turbulence. We need exact navigation information from a machine that does not have to rely on complicated ground equipment.

Obviously these requirements sound suspiciously like a plug for airborne radar. Exactly. It is too bad if so much brain power, time and money (much of it taxpayers') is wasted on another Rube Goldberg when the same effort might now be bringing a useful tool to our cockpits.

It probably is true that no information is ever a total waste. As a problem of pure research the work on this computer may in time be of some value. But as a practical aid for modern aviation, the pictorial computer is a good lesson in futility.

WHAT'S NEW

New Books

The Air Officer's Guide, by Lt. Gen. George H. Brett, USAF (Ret.), and Albert Douglas. With a foreword by Gen. Hoyt S. Vandenberg, USAF. Published by McGraw-Hill Book Co., Inc., 330 W. 42 St., N. Y. 36, N. Y., 367 pages, including appendix and index, illustrated, price $5.00.

In the Air Force—or any military organization—there are two sets of information: the Regulations and The Word. The former are written and specific; the latter is the interpretation of the rules, passed from mouth-to-mouth. This book is The Word, an informal briefing on what to do and—just as important—what never to do, if you are set on making the USAF a successful career.

Don't let the stiff title scare you, this is an enjoyable as well as informative book and the information is authoritative. In fact, it could also be read with benefit by any junior executive since much of the advice is applicable to civilian success.

There is a brief chapter digesting USAF history, several giving the inside story on and opportunities in Strategic, Tactical and Air Defense Commands, here and abroad. The chapter on what living conditions and accommodations are like at various Air Force stations should be helpful.

—EJB.

New Films

Breaking Through the Sound Barrier, a London Film Production, starring Ralph Richardson, Ann Todd, Nigel Patrick and John Justin. Running time 109 min.

This British effort, depicting the nerve-tensing job shared by a manufacturer, chief test pilot and design engineer to build and fly a supersonic fighter plane (played by the Supermarine Swift), is handled in a serious manner minus gloss, glitter and gadgetry.

The feminine role is devoted to questioning the need to "fly from London to New York in two hours." The team carries on, despite a fatal crash and success is achieved, punctuated with a "sonic boom." The flying scenes are superb.

—GLC.

Publications Received

• **General Billy Mitchell: Champion of Air Defense,** by Roger Burlingame; published by McGraw-Hill Book Co., Inc., 330 W. 42 St., New York 36, N. Y.; 1952; $3.00.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—NOVEMBER 24, 1952

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

LETTERS

Dubious Data?

Your editorial, "The Reversible Prop Controversy," on Oct. 27, presenting the matter thoroughly, brings forth data that seem to us to raise a separate but perhaps no less serious question: the worth of CAA records.

You detailed four more propeller-reversing incidents reported since True's article appeared. What struck us was the CAA version of one case:

"Monterey, No. 1 prop, American DC-6—throttle was pulled back through the detent stop, but the prop did not reverse because it was not pulled back far enough to activate reversal. Cause of throttle being free to come back through stop: loose throttle nut."

That isn't the way we heard it. According to our information about the incident, which we have reason to believe is authentic and accurate. No. 4 prop malfunctioned, not No. 1, and contrary to the assertion that there was no reversal, the prop reversed powerfully just before touchdown with such a pronounced side-slewing effect on the plane, perceptible to the people in it, that a rough and precarious landing resulted.

A checkup with the crew of this plane—American Flight 158 out of Mexico City, Sept. 20—and with the mechanics who serviced it, and the management who okayed the report and the CAA office which recorded it, should certainly be made to find out where along the line the truth got buried. Perhaps the CAB should be the agency to open an investigation of CAA malfunction-reporting procedures.

If an official report can turn the hazardous Monterey landing into a slight mechanical mishap, how many other cases have been misrepresented? And how many malfunctions go unreported entirely?

Adequate safety programs can't be built on dubious data.

KEN W. PURDY, EDITOR
True, The Man's Magazine
67 West 44th Street
New York 36, N. Y.

(AVIATION WEEK has also checked. We have seen both CAA reports on the Monterey incident. The first report did make the error on No. 1 propeller. It fails to say whether the propeller actually reversed. Pilots tell us that the reversing process requires several seconds to complete. During those several seconds before reversing is completed it is a moot point as to whether it can be said the prop does or does not go into reverse. However, AVIATION WEEK has found an occupant of the plane who reports that the ship did maneuver as Mr. Purdy reports, and that the landing was anything but routine. Pilots also inform us that not all propeller reversals are reported by CAA.)

Such Economy!

In AVIATION WEEK's recent issue Sinclair's double page advertisement shows Eastern's Constellation in flight and states Eastern's preference of "the finest products available"—but the aircraft in the picture appears to have two engines in the full feathered position! Sinclair advertises their aircraft oils for reliability and economy. Such economy!

We will assume that the "Connie" was on a training flight—but this to me indicates a very poor choice of pictures for such advertising purposes.

WALLY A. IRWIN
2141 South High School Road
Indianapolis 44, Ind.

From de Havilland

A word of appreciation of your article Sept. 15, "D.H. 110: Study of a Fighter's Evolution." This has taken a lot of work to complete and seems to be a pretty accurate account of our buildup of jet-fighter experience, and I find it very interesting.

M. SHARP
The De Havilland Aircraft Co. Ltd.
Hatfield, Hertfordshire
England

LAA's S-55

We all feel that Bill Coughlin's story about our S-55 program was exceptionally well presented. In fact, it read so good that I studied it thoroughly enough to find out for the first time just how many things we have done to that flying machine.

C. M. BELINN, President
Los Angeles Airways, Inc.
Box 10155 Airport Station
Los Angeles 45, Calif.

Praise

Congratulations on your handling of the article, "Lockheed Uses 'Ounce of Prevention,'" in the Oct. 6 issue of AVIATION WEEK. We in the Functional Test Inspection Department at Lockheed are proud of the writeup and the manner in which it was done.

Please advise if tear sheets of the article are available. We have many requests from departmental personnel for copies.

PAUL D. KOGER,
Department Manager
Functional Test Inspector
Lockheed Aircraft Corporation
Burbank, Calif.

We would like to seek permission to reproduce an article in your Sept. 29 issue, "All Watch Weight at Northrop." . . . We wish to reproduce it . . . for distribution in an engineering training program for recently hired draftsmen with no previous aircraft experience. We feel that the information contained in this article would be of extreme value to these men.

F. S. COE,
Engineering Personnel Liaison
Piasecki Helicopter Corp.
Morton, Pa.

Shevlin & Pulse-Jets

American Helicopter and the Army deserve considerable credit for accomplishment in the pulse-jet helicopter field which you reported Oct. 13. Certain impressions are given, however, which are not in accordance with facts.

It is stated that "When Air Force dropped pulse-jet, the Army picked it up. What Army did with it has now been disclosed by American Helicopter . . . "

This concern, with its affiliate Aeromarine Co., has been continuously engaged in pulse-jet engine research, development and production since 1945. This work has been carried out largely through private enterprise, but also with assistance of Navy, Air Force, and Army contracts. As a result, we have the longest and most successful experience with pulse-jet engines of any firm in existence.

In this regard, we have been producing pulse-jet engines commercially for years. Our pulse-jet engines and pulse-jet devices are in successful use all over the world. Further, it is believed that military commitments for our pulse-jet engines and devices are considerably greater than for those of any other firm.

Among other statements which might require clarification, we wish to refer to the following: "Short two-hour life of this valve previously was one of the major obstacles to pulse-jet development but American apparently has this licked. Life is now up to 50 hours."

As a matter of record, we have some time ago conducted life tests of one of our pulse-jets which exhibited an intake valve endurance in excess of 400 hours. Some of our commercial devices which have been on the market for years exhibit a valve endurance greater than 75 hours.

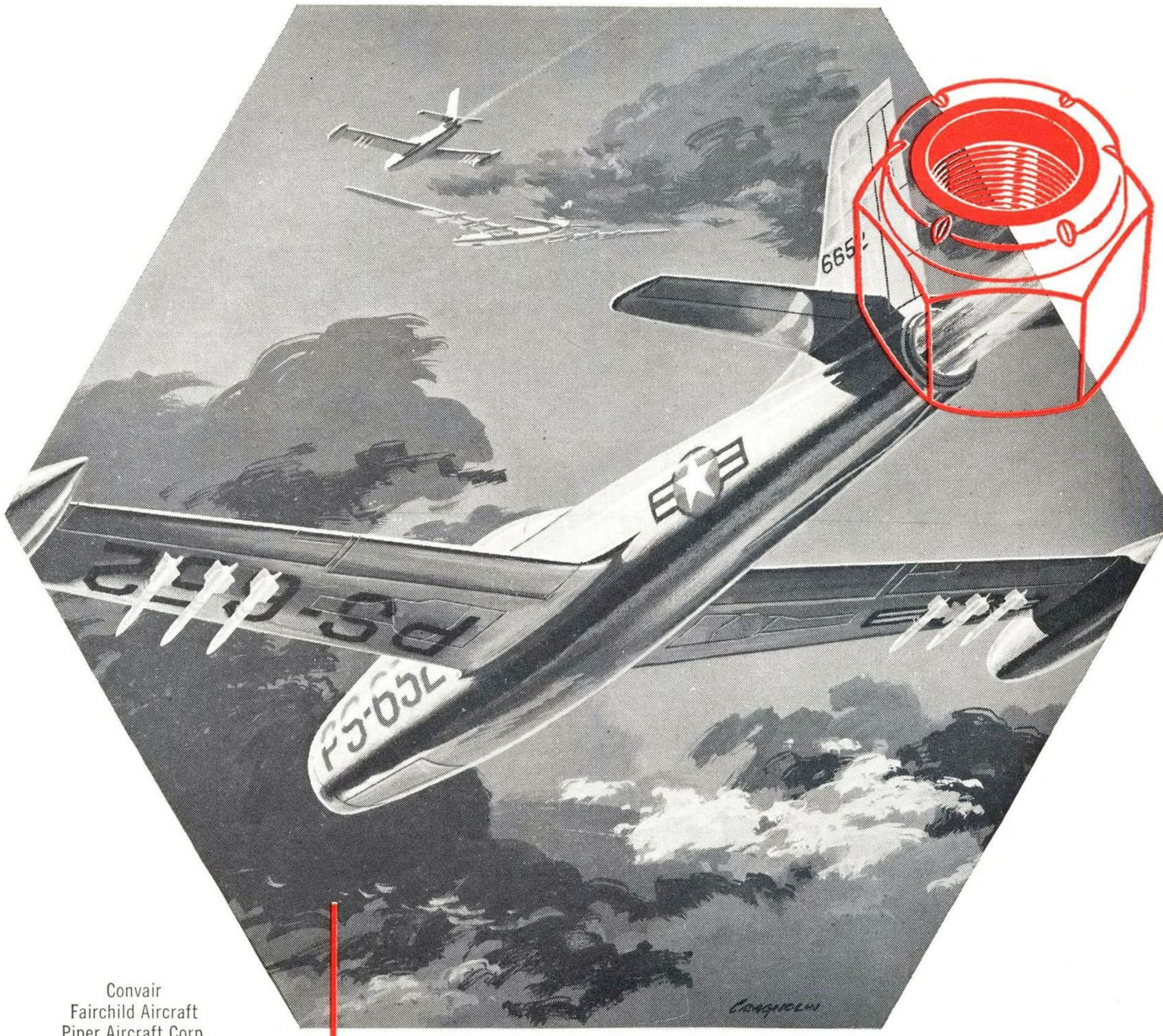
We certainly believe that American Helicopter and the Army deserve a great deal of credit for the accomplishments which you report in the helicopter field, but also feel that credit should be given where credit is due.

Pulse-jet engines, far from being dropped by the Air Force and being revived by the efforts of the Army and American Helicopter, have been the sole business of our firms for a good many years. Further, much of the development which has made possible engines such as used by American Helicopter was carried out by our firms long ago.

Present usage of pulse-jet engines should by no means be credited largely to American Helicopter and the Army, when our pulse-jets have been in commercial usage for years, and are believed to be in greater military demand than any other pulse-jets.

We have no desire to detract one whit from the accomplishments of American Helicopter Co. and the Army in the helicopter field, but do feel that some rather broad statements have been made which completely ignore the leading role in the pulse-jet field which has been and still is played by our firms.

W. L. TENNEY
Shevlin Manufacturing Co.
Vandalia, Ohio



Convair
Fairchild Aircraft
Piper Aircraft Corp.
Northrop Aircraft, Inc.
Chance Vought Aircraft
Bell Aircraft Corporation
Cessna Aircraft Company
Boeing Airplane Company
Beech Aircraft Corporation
The Glenn L. Martin Company
Chase Aircraft Company, Inc.
North American Aviation, Inc.
Republic Aviation Corporation
Lockheed Aircraft Corporation
Douglas Aircraft Company, Inc.
McDonnell Aircraft Corporation
Grumman Aircraft Engineering Corp.

Elastic Stop Nuts speed assembly and provide vibration-proof fastenings for every American aircraft now being built.

ESNA® TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA

Dept. N29-1125, 2330 Vauxhall Rd., Union, N. J.


HIGH TENSILE


ANCHOR


HIGH TEMPERATURE


SPLINE


CLINCH


GANG CHANNEL


NYLON CAP

Only ESNA manufactures a complete line of all types and sizes of self-locking fasteners.