AVIATION WEEK

A McGRAW-HILL PUBLICATION

OCT. 4, 1954

50 CENTS

How Sundstrand Constant Speed Drives meet exacting requirements of modern aircraft!

Rugged reliability

Service records prove that Sundstrand Constant Speed Drives withstand electrical system overloads and shocks, plus everything the airplane may impose in the way of vibration, temperature variations, G forces. The Drives are as rugged and reliable as the plane's engines, and require no more servicing.

Lightweight, compact design

The Sundstrand Drive is the lightest, most compact drive ever built of comparable power and performance.

Versatile in application

Three basic types . . . "package," "sandwich," and "cartridge" . . . are available. One of these types is suitable for virtually any airplane application.

Close control to provide parallel operation

Among constant speed drives, the Sundstrand development is unique in its ability to drive its generator in parallel with one or more other drive generator units. Because output speed holds frequency variation under steady state conditions to ±¼% . . . while under transient conditions of load and input speed, droop is small and recovery fast . . . load division is maintained within ±2 kw. The result—maximum reliability and flexibility of the electrical system over the entire range of input speeds and acceleration rates.

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Wherever the plane will go, Sundstrand Constant Speed Drives will operate efficiently. At altitudes from sea level to 65,000 feet . . . at temperatures from —65° to 250° F. . . . under all climatic conditions . . . the Sundstrand Drive performs with utmost dependability. No attention in flight is required.

(Left) **"Package-Type" Drive**—can be strut or bracket mounted in line with power take-off pad.

(Right) **"Sandwich-Type" Drive**—extremely compact for mounting in nose cone, or other available pad.

(Left) **"Cartridge-Type" Drive**—mounts within engine gear box.

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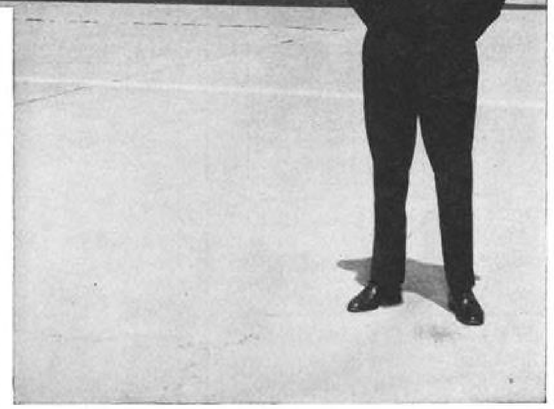
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Diamond Alkali's executive plane crew reports:

"Less tire wear, no ice worry, no brake maintenance . . ."

YOU MAY recognize Chuck Wheeler (right). For 22 years, he was a pilot for a major airline. Yes, he's still flying, but now he's ferrying officials of the Diamond Alkali Company all over the United States.

We caught up with Chuck's DC-3 crew at their home base—Lost Nation Airport, Willoughby, Ohio. Told him we wanted a story on their B. F. Goodrich equipment.

Right off we asked how he liked B. F. Goodrich Dimpled Tires. "They cut and nick less than regular tires," replied Chuck. "A feature we certainly appreciate when landing on rough runways," he continued.

We asked Hank Symanek, the plane's mechanic, about brake maintenance. "No maintenance *at all*," he said. And he estimated that's in 900 landings. Speaking of B. F. Goodrich Expander Tube Brakes, Art Jones, co-pilot (lower left) added, "We chose them because they work smoothly and hold without fading."

Neither pilot ever worries about wing ice. "Our B. F. Goodrich De-Icers never let us down. In winter we can fly above bad weather," they explained. They reported they've had no worries about prop ice either with B. F. Goodrich Anti-Freeze Fluid Feed Shoes. Maintenance? None.

Before we left, Chuck Wheeler mentioned that they were so sold on this B. F. Goodrich equipment that all of them have B. F. Goodrich LIFE-SAVER Tubeless Tires on their cars.

This interview is more proof of what we've been saying right along. That to get the best in safety and dependability, it's a good idea to consult with B. F. Goodrich engineers before you equip your plane. Other B. F. Goodrich products for aviation include: Pressure Sealing Zippers, Avtrim, inflatable seals, fuel cells, Rivnuts, accessories. *The B. F. Goodrich Company, Aeronautical Sales, Akron, Ohio.*

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Aviation Week

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NEWS DIGEST

Domestic

Lockheed XFV-1 is being fitted with a modified Allison turboprop engine, and the Navy vertical-takeoff fighter will resume its flight test program within a few weeks. Meanwhile, Convair is flight testing its XFY-1, Navy's other VTO, at Brown Field near San Diego.

Third A4D Skyhawk produced by Douglas Aircraft Co. at El Segundo, Calif., has made its first flight. Some changes have been made in the lightweight Navy attack aircraft as a result of flight tests of earlier models. Height of the nose gear has been increased to give a higher angle of attack on takeoff for better carrier performance.

J65 turbojets coming off Wright Aeronautical's production line at Wood-Ridge, N. J., are developing about 7,500 lb. thrust, although official rating is 7,220 lb.

Feeder airlines have set up a three-man committee to select a new Washington, D. C., representative for the 14-member conference of local service airlines by Nov. 1 to replace Donald Nyrop, who resigned Oct. 1 to become president of Northwest Orient Airlines (AVIATION WEEK Sept. 6, p. 72).

Sen. Pat McCarran, 78, author of the 1938 Civil Aeronautics Act and the 1946 Airport Development Act, early supporter of an independent U. S. Air Force and sponsor of a comprehensive bill rewriting and codifying civil aviation law, died last week.

First F-100s slated for an operational USAF squadron now are ready for delivery at North American Aviation's Los Angeles plant. They will be assigned to George AFB, Victorville, Calif.

First turboprop simulator for the Lockheed C-130 will be designed and built by Curtiss-Wright Corp.'s Electronics Division at Wood-Ridge, N. J., under an Air Force contract.

Lockheed F-80R, USAF's first operational jet fighter to set a world's record, is being put in the Air Force technical museum at Wright Air Development Center, Dayton. The F-80R's record: 623.8 mph., set June 19, 1947.

Allison J33-A-35 operated 1,400 hr. without overhaul at Tyndall AFB, Fla., a service representative reports.

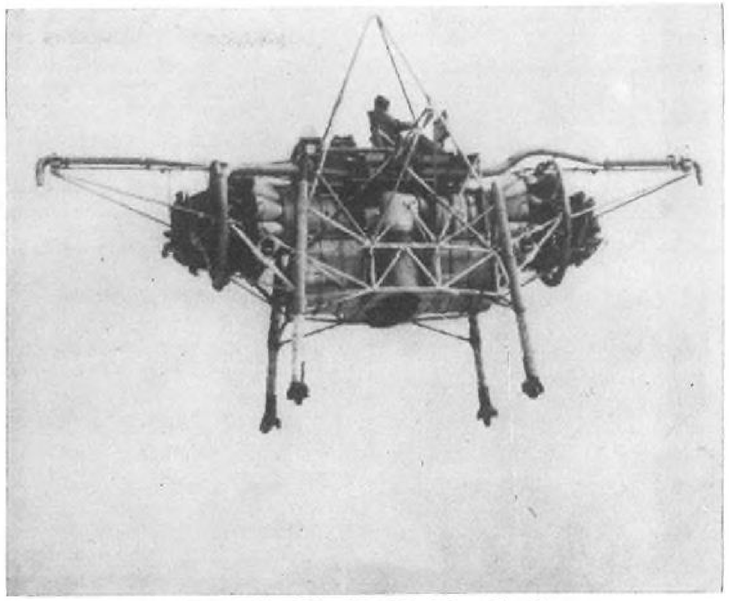
Fairchild Engine & Airplane Corp. has won a new USAF contract to modernize 305 additional C-119Gs at the Aircraft Division's Hagerstown, Md., plant. The company also received a contract for modification of an undisclosed number of C-119s for the Royal Canadian Air Force.

Autopilot competition for the North American F-100 (AVIATION WEEK Sept. 13, p. 11) has been won by Minneapolis-Honeywell's new E-10.

Cessna Aircraft Co., Wichita, has received a $1-million follow on subcontract from Lockheed Aircraft Corp. for work on the T-33 jet trainer.

U. S. lightplane builders shipped 247 utility and executive aircraft at a combined value of $3,639,000 during August, bringing total deliveries for the first eight months of 1954 to 2,151 at $27,220,000, Aircraft Industries Assn. reports.

Two-place TF-86, North American Sabre jet trainer, has started a tour of Air Force bases. First TF-86 crashed last March (AVIATION WEEK Mar. 29, p. 115).



British Fly VTO Testbed

An early phase in Britain's development of piloted vertical-takeoff aircraft has begun with first free flights of this "flying bedstead," built by Rolls-Royce. The VTO climbed to about 25 ft. in early flights. Powerplants are two Rolls-Royce Nene jets, mounted horizontally opposed, with their exhaust ducted downward beneath the pilot. The fore and aft nozzles take air bled from the jets and provide stabilizing forces regulated by the pilot by a conventional control column and rudder pedals.

International

Turbine-powered convertiplane that uses two multi-blade rotors set horizontally in the wings is being developed by France's Louis Breguet. During takeoffs and landings, vanes over and under the rotor wells deflect their slipstream for thrust control. In forward flight, the vanes close and normal jet power is used. First flight is expected in three years.

Avro Canada's CF-105 is being studied by top officials of Britain's Hawker Siddeley group. In Toronto to inspect the new supersonic delta-wing fighter (AVIATION WEEK June 14, p. 11) are: Sir Frank Spriggs, Hawker Siddeley president; Sir Thomas Sopwith, board chairman, and Sir Roy Dobson, managing director.

Saab J-29F, new version of Sweden's sweptwing jet fighter, will have a modified outer wing to raise the aircraft's critical Mach number and improve its transonic flight characteristics. The fighter plane's de Havilland Ghost turbojet now is being fitted with an afterburner.

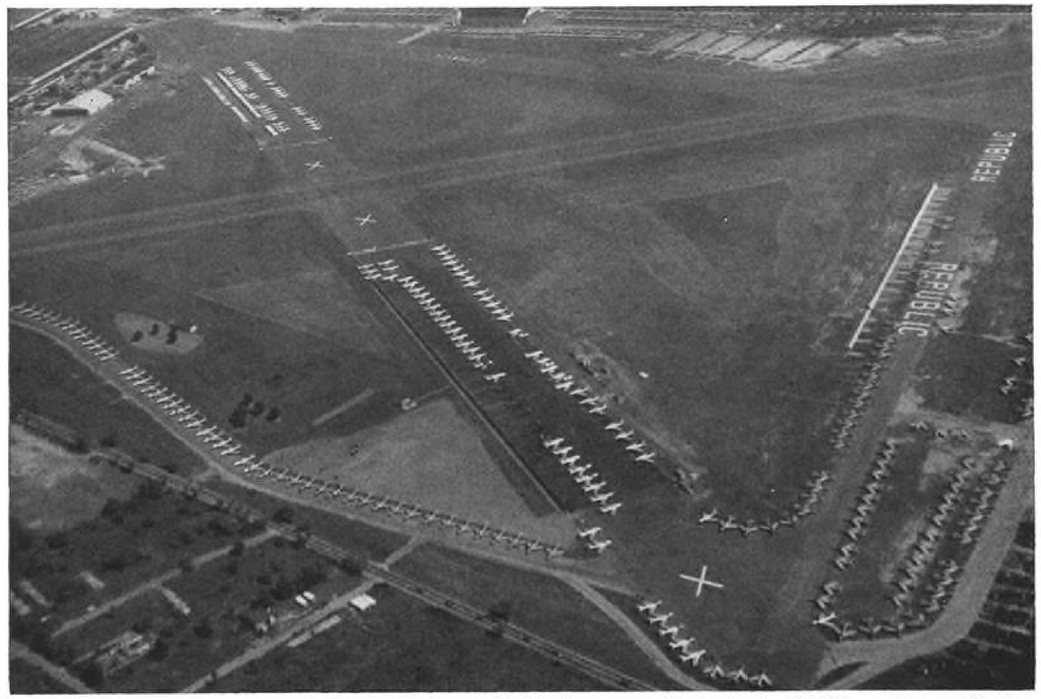
The Aviation Week

October 4, 1954

Picture Credits

7—Wide World; 12—Sabena; 21—(top) Hiller; 22—(top) Hiller; (bottom) Bill Clinkscales; 26-28, 30, 33, 40—P&WA; 52—Bureau of Standards; 83—Douglas; 92—(top right) Warren D. Shipp.

Washington Roundup



'CRIPPLES IN THE YARD': Republic-Farmingdale last week, showing some of the hundreds of F-84Fs awaiting modification.

Republic Problem

Air Force and Department of Defense officials, including Defense Secretary Charles E. Wilson, clearly are disturbed by the production bottleneck at Republic Aircraft, but use carefully weighed words in discussing the situation.

Following a visit of Wilson and other top-flight production experts to Farmingdale, L. I., (AVIATION WEEK Sept. 27, p. 13) the Secretary blamed early troubles with the F-84F on the fact that it was rushed into production. He said he was "not critical" of the changes that had to be made in tooling.

However, Wilson is determined that something must be done about "the cripples in the yard"—the planes that are standing outside, awaiting modification before USAF can accept them. He said Republic's orders have not been changed, but commented that "you can kick one (aircraft) around long enough that it finally becomes an obsolete plane" and "that is like trying to make '52 models in '54."

New York-Florida Battle

The complicated New York-Florida route case is developing at Civil Aeronautics Board, but it remains to be seen what the final limits of the proceeding will be. It could be anything from a relatively simple domestic route case to an involved project including service to such international points as Montreal-Toronto-Ottawa, Havana and various South American cities.

A pre-hearing conference attended by representatives of 19 airlines pointed up the problems CAB will face in defining the scope of the case.

The case stems from an 1947 application of Colonial Airlines for extension of its routes from New York and Washington to Miami with service to certain intermediate points. Subsequently, a number of carriers have filed applications for similar routes or routes which tie in with the New York-Florida segment.

Examiner Thomas L. Wrenn said the case should be of a domestic nature, but many observers felt it would be difficult to confine it to this, since Colonial serves Canadian points. Northeast, another applicant, also has Canadian routes, and some airlines felt that the inclusion of these northern international points justified consideration of applications for service to Havana and points south.

Navy Research Deputy

Appointment of Capt. Leonidas D. Coates as new Deputy and Assistant Chief of the Office of Naval Research insures continued attention to aeronautical affairs in this branch of the service.

Capt. Coates is an aeronautical engineer with long experience in the Bureau of Aeronautics, where he was Deputy Director of the Aircraft Division, director of the Guided Missiles Division and Deputy to the Assistant Chief for Research and Development. ONR policy calls for one of the top jobs to be filled by an air officer, the other by a seafaring man. New chief of ONR is Rear Adm. F. R. Furth, who replaced a Navy flier, Rear Adm. C. M. Bolster. —Washington staff

WHO'S WHERE

In the Front Office

Bernard L. Whelan, general manager of Sikorsky Aircraft Division of United Aircraft Corp., has been elected a vice president of UAC and, along with **Erle Martin,** general manager of UAC's Hamilton Standard Division, appointed to the UAC operating and policy committee. Both Whelan and Martin will continue as general managers of their respective divisions. Martin became a vice president in 1952.

Max King has resigned as vice president-advertising and public relations for Southwest Airways.

Edward A. Ritti is new general manager of Piasecki Helicopter Co. of Canada, Ltd., Arnprior, Ont., succeeding **J. C. Charleson,** who resigned.

John W. Kelly has become vice president-engineering for General Metals Corp.'s Adel Precision Products Division, Burbank.

Leston P. Faneuf, assistant general manager and secretary-treasurer of Bell Aircraft Corp., has been elected a director of Associated Industries of New York State, Inc.

Changes

K. M. Miller has been promoted by Lear, Inc., to assistant general manager of the Research and Development Division, Santa Monica, Calif.

Charles W. Sawhill is new general sales manager of Aeroquip Corp.'s West Coast subsidiary, Aero-Coupling Corp., Burbank.

William O. Boschen has been appointed sales director for Avien, Inc., Woodside, N. Y.

H. C. McDaniel has become technical information manager for Westinghouse Electric Corp., Pittsburgh, succeeding **C. A. Scarlott,** who has joined Stanford Research Institute at Palo Alto, Calif., as manager of technical information services. **R. W. Dodge** is new editor of the Westinghouse Engineer magazine.

Robert F. Cline has been named chief engineer for Mullenbach Electrical Manufacturing Co.'s Electronics Division, Los Angeles.

Frank G. Andrews has joined the faculty of the Flight Safety Training Division of the University of Southern California, Los Angeles.

Honors and Elections

Andrew B. Shea, president of Pan American-Grace Airways, has been awarded Chile's Order of Merit, grade of Great Commander, for his work in developing the airline.

Jacqueline Cochran, first woman to fly faster than sound, has won the International Air Federation's Gold Medal as the outstanding pilot of 1954.

Lt. Col. Floyd J. Sweet (USAF) has been elected president of the Soaring Society of America, succeeding **Jon D. Carsey.** SSA officers re-elected for 1954-1955: **Dr. Wolfgang Klemperer,** honorary vice president; **Capt. Ralph S. Barnaby** (USN Ret.), East Coast vice president; **Theodore Nelson,** West Coast vice president; **E. J. Reeves,** treasurer, and **Paul A. Schweizer,** secretary.

INDUSTRY OBSERVER

(Editor's Note: This column was written by Aviation Week *editors who attended the SBAC flying display at Farnborough, the IATA meeting in Paris and visited airlines and aircraft plants in Europe.)*

► American aircraft and engine manufacturers are in the midst of an intensive sales campaign among European airlines aimed at combating competition from British gas turbine equipment. Boeing team headed by sales manager Ralph Bell is plugging the enlarged version of the Model 707 jet transport. Douglas officials, led by Arthur Raymond, vice president for engineering, and Nat Paschall, vice president for commercial sales, are talking DC-7C for nonstop trans-Atlantic operations. Pratt & Whitney Aircraft men are trying to interest foreign airlines in the new supercharged version of the Wasp Major for possible use on the DC-7. Lockheed is pushing its T34-powered Super Constellation.

► European airline circles are buzzing with rumors of Douglas Aircraft's twin-engine gas turbine-powered helicopter project aimed at replacing the DC-3 in the world airline market. Indications are it will be a 40-passenger version grossing 50,000 lb. and powered by two gas turbines offering single engine performance. It is designed with rotors located on each side of the fuselage rather than fore and aft as in Piasecki designs. Douglas is extremely interested in the Rolls-Royce R. B. 109 turboprop of about 4,000 eshp. as a powerplant for this helicopter.

► Armstrong Siddeley Motors has organized a special rocket division to push development of liquid-fueled rockets. Firm already has developed Snarler, a 2,000-lb.-thrust, liquid-fueled rocket and is working on the Screamer, a project still under security wraps.

► Hawker's Hunter now has its four 30-mm. Aden guns mounted in a removable armament package similar to the arrangement of cannon on the Russian MiG-15.

► International Air Transport Assn. organized a helicopter committee at its Paris meeting under the chairmanship of A. V. J. Vernieuwe, copter transport pioneer and operations manager of Sabena Belgian Airlines. First meeting is scheduled for November in Montreal. Membership will be open to non IATA members who are engaged in helicopter transport operations.

► De Havilland has its Super Sprite cold rocket packaged for quick attachment to fighters and bombers for auxiliary takeoff and climb power. Super Sprite package has parachute recovery gear to float down after it is jettisoned from airborne planes. The rocket produces 4,200 lb. thrust for 40 seconds and weighs 1,900 lb. fully installed with fuel in the jettisonable package.

► The French are interested in obtaining the Pratt & Whitney Aircraft J57 turbojet to power the Sud-Ouest Vautour bomber, scheduled for production for the French air force and NATO units. The Vautour is a twin-engine ground attack plane in the 600-mph. class, powered by two Snecma Atar 101B turbojets. USAF security restrictions are likely to kill this deal, since policy refuses to allow foreign export of the J57.

► Bristol is developing a variety of drop tanks for British aircraft, including specially tailored drop tanks for longrange versions of the Canberra bomber. One 100-gal. drop tank design has been successfully test flown on a Hawker Hunter at supersonic speeds.

► IATA member airlines are taking a closer look at mixed-class service on the same aircraft with a view toward abandoning the idea. A great number are finding that they will be refusing passengers in one class which may be overloaded while having empty seats in the other section.

► In another effort to reduce future operating cost, IATA airlines are attempting to present manufacturers with specifications for a cheap turbine fuel in the hope that they will design their engines accordingly.

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FROM HEART OF BRUSSELS, at heliport only a five-minute walk from center of the town, Sabena S-55 leaves on scheduled flight.

Sabena Maps Big Copter Service Buildup

By Robert Hotz

Brussels—A major expansion of transport helicopter operations is planned by Sabena Belgian Airlines as a result of 12 months' operation of the world's first scheduled transport copter service.

Sabena now operates a 650-mile passenger and mail network with four Sikorsky S-55 helicopters.

Major features of the expansion plan, described to AVIATION WEEK by Sabena officials, are:

• **Construction** of a $33-million downtown rooftop heliport building as the hub of the new copter network. Site of the present Sabena surface heliport is a five-minute walk from the center of the Brussels business district.

The heliport is planned to be built in three increments. The first, aimed at being operational in 1958, will cost $11 million and will handle as many as six twin-engine, 40-passenger copters at the same time.

• **Expansion** of the present single-engine helicopter services next year to tap such new markets as the prosperous German Ruhr and the Saar districts.

• **Development** of an intensive copter network within a 200-mile radius of Brussels is being actively planned. This service must await twin-engine copters carrying 40 passengers and cruising more than 150 mph.

Sabena officials told AVIATION WEEK the first year's operation convinced them they are on the right track with their line of helicopter development. The airline ended its first copter year Sept. 1.

ARRIVING AT AIRPORT, S-55 descends near fixed-wing transports awaiting its passengers.

PASSENGERS DISEMBARK from Sabena Sikorsky, head to connect with longrange airliners.

Exclusive Series

This is the first in a series of exclusive Aviation Week reports on Sabena's experience in operating the first international scheduled helicopter transport service by the executive editor of Aviation Week who flew the helicopter service and interviewed key Sabena officials.

► **Population Factor**—The key to Sabena's intense interest in helicopters is a combination of geography and population that has Brussels as the hub in an area containing 74 million persons and 130 towns, each with more than 30,000 inhabitants.

All of this is within a 200-mile radius of Brussels, including the German Ruhr and Saar, the giant ports of Antwerp and Rotterdam, the heavy industrial areas in northern France and Belgium and the great population centers of London and Paris.

In contrast, a similar circle around New York City would yield only 22 million persons.

Sabena believes this is the best territory in the world to develop transport copter operations. It promises heavy dividends if tapped correctly, says the airline.

► **Future Planning**—Sabena cites three major points learned during the first year's operation of regularly scheduled passenger, mail and express service that pave the way for future copter development. They are:

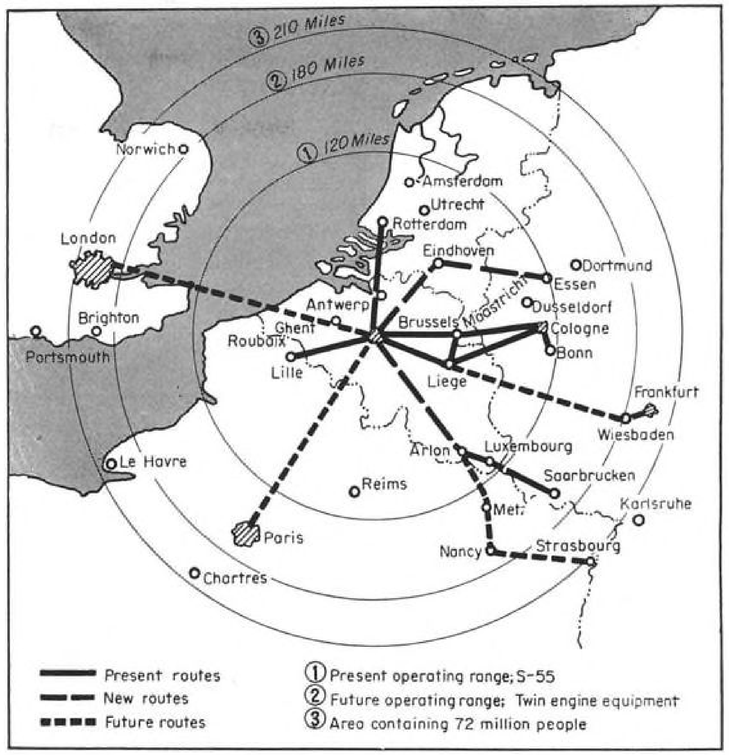
• Helicopter service proved reliable. The Belgian airline flew 20,000 passengers and 6,000 hours with a perfect safety record. During this period, Sabena had only two engine failures and both times made safe autorotational landings.

Schedule reliability was 83%. This is a good figure considering the copter is restricted to visual flight regulations and operational techniques still are developing.

The worst month was foggy December, with 61% of scheduled operations carried out. Since March, schedule reliability has averaged better than 90%, with a high in August of 93%. This is not bad compared with similar early days of fixed-wing transports. Sabena averaged a surprisingly high six-hour daily utilization of its copters, equalling the Belgian line's Convair record.

• Helicopter service proved to be a genuine feeder for fixed-wing services, pouring in 3,800 passengers to Sabena's longrange services to the Congo, the U. S. and southern Europe by way of direct connections at Melsbroek Airport, the airline's Brussels terminal.

The additional revenue gained by Sabena from these passengers, some diverted from competing airlines, enabled the Belgian carrier to break even on the first year of copter operations, even though the direct operating balance sheet was in the red. Sabena is counting heavily on siphoning passengers through the Brussels hub because of attractive copter connections in the surrounding territory.



PRESENT AND FUTURE POTENTIAL for Sabena's copter services is shown on this map.

• The helicopter created a demand for a new type of interurban air service for northwestern Europe. About 15% of the copter passengers never before had flown in any type of aircraft. Most of these customers flew on interurban business and not as passengers for connecting fixed-wing services.

Sabena now is besieged with requests from the burgomasters of towns in Germany, Holland, Belgium and France to extend the service, linking their communities with the copter network. The airline is convinced of the soundness of tapping this new market, although equipment problems prevent immediate full exploitation.

► **Best Copter Bet**—Although Sabena plans a limited expansion of its present services with Sikorsky copters—angling for the purchase of an additional pair for the new services—major expansion awaits the arrival of a new type of transport equipment featuring 40-passenger capacity, twin engines with single engine performance, faster cruising speeds and instrument flight capabilities.

The Sikorsky S-56, now getting into production at Bridgeport, Conn., appears to be the best bet at the moment. But there is intense interest shown by Sabena and other potential European operators—such as Air France, KLM Royal Dutch Airlines and British European Airways—in the new Douglas helicopter project (See page 11).

Operators are keen on gas turbine-powered helicopters because of internal passenger comfort and external noise reduction.

Oddly enough, during the 18,000 Sikorsky helicopter landings and takeoffs from European cities in four countries, Sabena received only one noise complaint from local residents.

► **1958 Goal**—Sabena is confident the twin-engine commercial helicopter will be operational in 1958 and is gaging construction of its downtown Brussels heliport accordingly. The Belgian airline plans to be ready for operations in time for the Brussels 1958 International Exposition.

The heliport is an ambitious project. Sabena believes the rooftop heliport is the answer to future commercial operations.

"Unless you bring the helicopters to the city centers you lose the biggest competitive advantage," says A. V. J.

Vernieuwe, Sabena's operations manager and a pioneer copter pilot. "We refuse to operate into any city where we cannot get downtown landing rights."

► **Obstruction Topper**—The new Brussels heliport will be five stories high with the landing platform 88 feet above the ground, topping all surrounding obstructions.

The main Brussels-to-Antwerp highway will run through the first floor, flanked by four square main bastions supporting a pre-stressed concrete roof. There is no internal column support for the landing platform. The roof is stressed to handle 50,000 lb. copters up to six at a time and resist 35,000-lb. impacts to 3.5Gs.

The passenger, mail and freight terminals and commercial offices will be housed in the four columns. The circular interior is not broken by columns and is used as a parking garage for the convenience of passengers using the copter service.

An aircraft carrier-type elevator operates from the roof, bringing grounded copters to the maintenance shops on the floor below.

Sabena believes folding main rotors will be needed but tail folding will not be necessary with its 100-foot elevators.

Provisions for a bus station also are made on the first floor to speed passengers to their connections for ultimate destinations.

The airline believes rooftop heliports for outlying towns in the network are a good investment since they will gather rents from commercial office space.

► **Three-Stage Expansion**—Sabena plans its copter expansion program in three stages in the following chronological order:

• **First:** Competition with present fixed-wing service on short hauls up to 250 miles. Key to this competition is service from center to center by helicopters.

Vernieuwe believes that Sabena's operations plus experiments he has made with flights from Brussels to London and Paris prove that copters can cut the center-to-center time of fixed-wing flights and airport buses by half (AVIATION WEEK Aug. 30, p. 22). The average speed now of this combination averages 57 mph. Even the 90-mph. cruising speed of the Sikorskys easily exceeds the combination time.

Example: Time from Paris to Brussels now is three hours 25 minutes by the fixed-wing and bus combination. Sabena flew a fully loaded Sikorsky from the Brussels heliport to downtown Paris, landing in a park opposite the Invalides central air terminal, in one hour 55 minutes. Another example is Sabena's 65-minute regular service from the center of Brussels to downtown Rotterdam, compared with three hours by auto and two hours 20 minutes by train.

Sabena copters require one hour 35 minutes for a flight from the center of Cologne to Brussels with a single customs and immigration check, compared with hours on a rail trip through German, Dutch and Belgian border routines.

The average rail speed between European terminals is 39 mph., reduced to 21 mph. when ferries across the channel are required. With the 150-mph. cruising speed of new helicopters, Sabena predicts a heavy siphoning of business from surface traffic.

Fares are the competitive problem in this type of business. Sabena concedes that the copter will be more expensive to operate in the foreseeable future than the fixed-wing transport. However, the airline also feels that in order to compete it must keep copter fares equal to those of fixed-wing transports.

This offers the helicopter an actual fare advantage competitively, since charges for airport buses and other extras, not necessary with copter service, must be added to the fixed-wing price.

• **Second:** Sabena plans to use its extension of the copter service to tap new markets for its fixed-wing longrange services. Most locations in the Belgian line's present and future network do not have airports. It requires a two to four-hour drive to reach the nearest fixed-wing terminal. By providing fast, convenient connections to Sabena services by way of Melsbroek, the carrier hopes to generate new airline business on a significant scale.

Sabena estimates that in the future it can get 25% of the copter passengers onto fixed-wing services and the revenue will support the direct operating costs of the helicopters.

• **Third:** Sabena will use the helicopter to create a new type of interurban air traffic. The airline feels that most of the 15% of its passengers who last year traveled by helicopter for their first flights represent the beginning of this interurban traffic.

The geographic location of Brussels appears to offer Sabena a better possibility of developing this type of operation than most other European airlines. The area within 250 miles around Brussels is a busy industrial and trading region, traversed intensely by businessmen. Sabena must create new air-routes for this traffic.

► **Profit Key**—The key to profits in this type of service is frequent stops to pick up and discharge passengers. Sabena is strongly conscious that time on the ground severely cuts block speeds, and the airline is developing special techniques that cut the ground time to an average of three minutes per stop. The Belgian carrier also is showing great interest in exploiting local fairs and expositions to generate interurban traffic.

The most successful to date was an all-day excursion during the spring over the tulip fields of Holland. Sabena flew 4,000 passengers over the tulip fields at an altitude of 100 feet and provided a stop for inspection from the ground and a visit to a famous Dutch museum. The roundtrip fare from Brussels, including lunch, was $29.

Since the regular transport schedules operate only on weekdays, Sabena kept its copters busy on Sundays flying tours to Waterloo battlefield from Brussels. These tours were so popular that Sabena had to limit them because the pilots were exceeding their monthly flying time quotas.

► **U. S. Tourist Offer**—Next spring Sabena hopes to develop the tulip field tours from as far away as the U. S. by offering a package tour to U. S. buyers that would include the trans-Atlantic flight and a copter surveillance of the tulip fields in full bloom.

The Belgian airline now operates four daily roundtrips on routes from the hub at Brussels to Rotterdam, Lille, Liege and Cologne-Bonn and a 250-mile mail circuit that passes through Belgium's coal-mining district.

A total of 20,000 passengers was carried by Sabena—13,000 on the regular routes, 4,000 on tulip field excursions and the rest on promotional trips.

Summing up the first year's experience, Vernieuwe says: "We now know that we are on the right track and we know in which direction to move for the future."

High Flyer

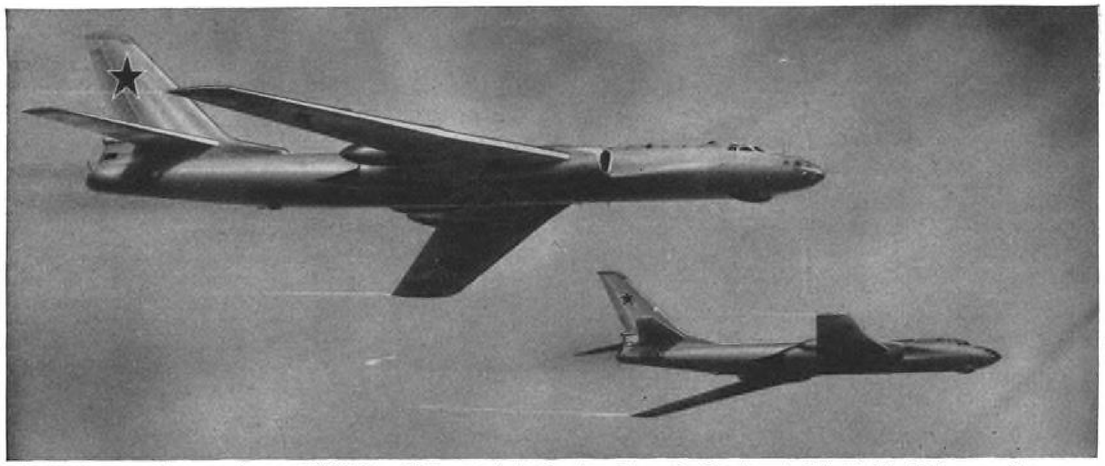
Convair's turboprop R3Y flying boat has reached altitudes of 30,000 ft. during its test program. The high-flying R3Y surprised at least one Navy jet fighter pilot, who swept back for a second look after discovering the big plane at that altitude.

Another Convair seaplane, the XF2Y, is being modified to a single-ski configuration. Skis did not show in recent pictures of the YF2Y undergoing taxi tests at sea, but that model still is equipped with twin skis.

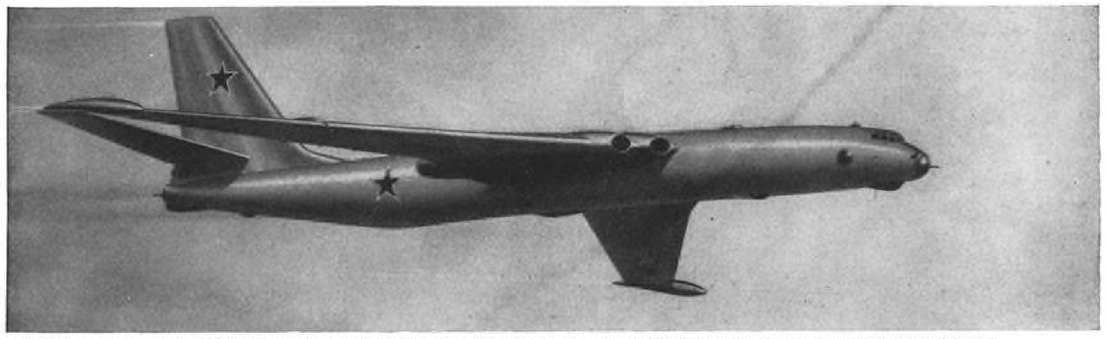
Some F-107 Details

North American Aviation's F-107 day superiority fighter will have an extremely thin 5% wing. Sweepback is same as F-100.

The F-107, designation for the F-100B, is scheduled for an improved version of the Pratt & Whitney Aircraft J57 engine with 15,000-lb-thrust rating. It will carry a radome in the noise, with the air scoop underneath.



BADGER is new code name given to USSR Type 39, large twin-jet bomber, shown for first time in this official artist's conception.



BISON is code name for USSR Type 37, four-jet heavy bomber, similar in size to USAF's eight-jet Boeing B-52 Stratofortress.

U.S. Tags Combat Names to Red Planes

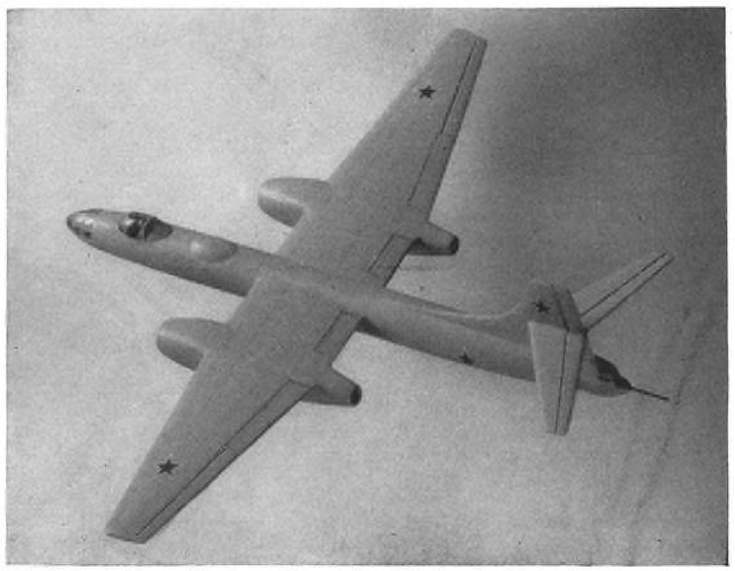
U.S. armed forces are assigning code names to Russian military aircraft and soon will issue training aids to speed recognition by spotters in event of enemy attack. The code names are patterned after the system used in World War II for Japanese aircraft.

Twelve Soviet planes so far have been listed and more designations will follow with distribution of training aid charts showing silhouettes and pictures of known Red aircraft with their military designations and code names.

► **Red Airpower**—Disclosure of the new program followed publication of an evaluation of Soviet air capabilities in Naval Aviation News, official publication of the Chief of Naval Operations and the Bureau of Aeronautics. Six of the code names were used for the first time.

The article also included the first picture, an artist's drawing, of the new sweptwing twin-jet bomber unveiled in Moscow at this year's May Day celebration.

The drawings were made by Edgar



BOSUN is twin-jet naval bomber with more than 600-mi. radius, designed to harass shipping.

Wischnowski, BuAer artist, from actual photographs.

The magazine's evaluation of Red airpower is concerned entirely with Soviet ability to attack Allied shipping and interfere with sea operations in event of a war in Europe. There is brief mention of strategic or tactical use of the aircraft in land warfare.

► **F, B and C**—Aircraft with code names in the article:

- **Bison,** a four-jet, sweptwing bomber first displayed at the May Day celebration in Moscow. It is similar to the Boeing B-52 in size.
- **Badger,** a twin-jet, sweptwing bomber.
- **Bull,** a copy of the U. S. B-29 medium bomber. It is known as the Tu-4.
- **Butcher** or Il-28. This is a twin-jet, straightwing version of the Badger, dating from 1950.
- **Bosun,** light twin-jet bomber with a straight wing, used by Russian navy.
- **Bob,** the Il-4, described as an obsolete twin-engine propeller bomber.

The MiG-15 fighter also is mentioned, but no code name is given for the aircraft.

Following publication of the Naval Aviation News story, the Navy disclosed six additional code names to AVIATION WEEK. They are Fang (La-11), Frank (Yak-9), Coach (Il-12), Buck (Pe-2), Bat (Tu-2) and Beast (Il-10).

These names indicate the code system will use names beginning with F for fighters, B for bombers and C for cargo or transport types.

► **Sea Attacks**—Naval Aviation News says the Red air force today includes about 20,000 aircraft. From the Navy's viewpoint, the article declares, these planes would be capable of attacking Allied sea movements in three ways:

- By "concerted air action over merchant convoys or naval vessels within fighter range of Soviet air bases (400 to 500 nautical miles)."
- By "effective low-altitude attacks, including attacks on merchant convoys and naval vessels, out to 600 nautical miles from Soviet bases using jet light bombers."
- By "locating and attacking shipping beyond 1,400 nautical miles from Soviet bases using Bull Tu-4 (B-29-type) medium bombers, or twin-jet, sweptwing medium bombers operating at medium or high altitudes. These planes also could furnish reconnaissance and direction to Soviet submarines in attacks on shipping."

The magazine says Russia does not have any aircraft carriers, but the Red navy has aviation units operating from shore bases.

In the event of a war in Europe, it predicts, the Russians might decide that a blockade of the continent would not be necessary.

This would be true if the Red armies proceeded on schedule in overrunning the democracies. If this failed, the magazine says, Russia already has air bases to "launch attacks . . . on Allied shipping in the English Channel, the North Sea, the Norwegian Sea and upon every port in northwestern Europe."

► **Formidable Weapons**—"The ability of Soviet naval aviation to carry out its anti-shipping mission is limited by its size," the article reports. "If the Soviets wished, therefore, to utilize the Bull (Tu-4) for naval purposes, they could assign some to the navy or could order the Bulls to perform naval missions. . . .

"The Soviet's Butcher (Il-28) twin-jet light bomber and a later twin-jet bomber, Bosun, with approximately the same capabilities can both carry a greater ordnance load at approximately twice the speed of the obsolete Bob (Il-4) twin-engined propeller bomber.

"Within a combat radius of more than 600 nautical miles, these twin-jet aircraft should be formidable weapons in anti-shipping attacks. For distances beyond the 600-nautical miles radius, the larger sweptwing twin-jet bomber aircraft seen in May should be even more formidable with their increased performance."

The magazine says Russia will be prepared to enter another war with more than five times the number of aircraft the Nazis had on hand when they started World War II. It adds that Moscow is determined not to lag in the development of airpower.

Trends in Subcontracting—Second in a Series

Small Business Fights for Survival

Specialists and jobbers organize in their bid for more AF contracts, cut internal costs—such as research.

By William J. Coughlin

Los Angeles—An economic readjustment now under way among aircraft subcontractors is being watched closely by both industry and government officials. It is not yet a crisis. It could be.

The economic reshuffle has been precipitated by several developments that followed the conclusion of the Korean war:

- **Air Force cutback and stretchout.** This not only has reduced the dollar volume of government spending available to small businesses as prime contracts but means major airframe plants are reducing the amount of subcontracted work due to the increased time available in their own facilities.
- **Intense price competition,** forced by an excessive number of firms competing for a much smaller volume of business.
- **Increasing complexity** of military aircraft and missiles, reducing the number of items small business is capable of producing (AVIATION WEEK Sept. 27, p. 19).

► **Threats**—The situation contains these threats to the well-being of the aircraft industry:

- Many small firms are being forced out of business or out of the aircraft industry, narrowing the base available for mobilization in an emergency.
- Research and development efforts in the accessory and component fields are being cut back.

To meet the keen competition, accessory and component manufacturers are reducing profit margins to the point where there are not enough funds available for research.

► **Inevitable Clash**—One surface indication of the gathering storm is the recent formation on the West Coast of two organizations of subcontractors. At least one of these plans expansion into a national association.

While not competing openly with the Aircraft Industries Assn., it is inevitable that these groups will clash with airframe manufacturers on the question of less subcontracting being done by the primes.

Their reason for organizing is simple: They want to maintain a large volume of subcontracting. The motive is not entirely selfish. Small business leaders believe they can do a better job on many contracts at lower cost than large concerns.

They warn that a trend away from subcontracting may destroy a segment of the industry that is vital in time of emergency.

► **Inherent Danger**—Top Air Force officials in Washington, D. C., concerned over the dangers inherent in the situation, are faced with the problem of deciding how much subcontracting is necessary to keep the industry healthy.

Can government-owned facilities at major aircraft plants be allowed to stand idle in order to maintain the present subcontracting pattern?

At what point does this begin to conflict with the Eisenhower Administration's drive to cut costs wherever possible?

USAF is seeking a compromise solution but is finding it difficult to know at what point to begin to compromise.

► **How Critical?**—Conflicting opinions on the seriousness of the situation are clouding the issue further. Just how critical is it?

"There definitely is not an economic crisis," one government official asserts. "There has been a slight readjustment but it certainly cannot be called a recession. The statement that the primes are pulling business back to themselves is greatly exaggerated."

"Just the other day," says a subcontractor, "we were advised by one of our prime contractors, who recently was granted by the military services a $9.3-million expansion, that our company can expect the volume normally subcontracted to us to decrease to zero within the next six months. We have been running approximately $30,000 per month with this prime over the last three years.

"The decision of this prime was not based on our efficiency of performance, quality or price. The pressure on the prime to keep his government-furnished facilities occupied prompted this decision."

"Since the start of the Korean incident, small business participation in the total aircraft procurement program has risen to nearly 10% of the total Air Force budget today," says a USAF procurement officer.

"Our figures show a large number of aircraft subcontracting firms have gone out of business in this area within the past year," says a Small Business Administration official in Los Angeles.

It is plain that when you talk about economic crisis in the subcontracting level of the aircraft industry, many are not speaking the same language.

► **Specialists, Jobbers**—Before you can analyze the problems of the subcontractor, you must know what type of subcontractor is under discussion.

The subcontracting groups might be broken down this way:

- **Highly specialized firms** turning out avionic components, fuel pumps, oxygen equipment or other products of an accessory nature.

Despite certain dangers inherent in the air weapons system concept, contractors furnishing this type of product probably always will be furnishing it because airframe manufacturers will not go to the expense of producing these items in their own plants. These firms, however, are facing economic difficulties of their own, not connected with any pullback of subcontracted business into prime plants.

Specialized subcontractors such as foundries and heavy machine shops also might be placed in this group. Many of the manufacturers in this group do not fall within the accepted definition of small business since they have more than 500 employes.

- **Less specialized subcontractors,** such as job shops turning out sheet metal wing sections or fuselage units.

This group is hard hit by slack periods in which prime contractors do work in their own shops instead of subcontracting it.

Aviation Week reported in the first of this series on Air Force concern over the reduced dollar volume of business available to subcontractors as a result of the cutback and stretchout of the defense program (Aviation Week Sept. 27, p. 19).

Aviation Week's staff has been studying the effects of this economic readjustment on the subcontracting and component levels of the aircraft industry, talking to scores of subcontractors, government officials, Air Force procurement officers, Aircraft Industries Assn. officials, congressmen, and others.

The accompanying article is the second in a five-part series reporting on industry efforts to meet this economic problem.

There can be no question that the volume of subcontracting has been reduced by a large amount. But percentagewise, the figures are not as alarming as they are when considered in dollar volume.

In fiscal 1954, there was $3 billion less available to subcontractors from the major airframe plants than in 1953. But the airframe plants subcontracted only about 10% less of the dollar volume received by them than they did the previous year. This 10% represents the size of the so-called "pullback" by the airframe plants, not the dollar figure.

It is the reduction in dollar volume that is causing the difficulty.

► **Competition**—In pointing out that the problems of small business stem from the reduction in dollar volume, not from extensive reduction of subcontracting by prime manufacturers, the director of material for North American Aviation, Rulon Nagely, says: "Economic problems of the group have not been caused by any large pullback. It is a matter of competition.

"If they can't compete—price, delivery and product-wise—they have to get out."

Homer Rhoads, president of Hydro-Aire, an accessory firm, is inclined to agree. "The component field was overextended during the Korean emergency," Rhoads says. "Now there is a surplus of component manufacturing facilities. The price competition therefore is terrific. A weeding-out is going on. It's a temporary period, but we have to pull in our horns and weather it."

► **Surviving the Storm**—What are subcontractors doing in their efforts to survive this economic storm? Some companies, like Hydro-Aire, are streamlining their operations internally to obtain firmer financial footing. Others are appealing to Congress and to the Administration to strengthen the position of the subcontractors in the nation's mobilization program.

A number of firms have decided that in dealing with the government and with prime manufacturers, strength lies in numbers.

Two separate organizations of subcontractors have sprung up on the West Coast out of this "united we stand, divided we fall" thinking. One is the Small Defense Industries Assn.; the other is the Aircraft Parts Manufacturing Assn. These two groups will be discussed in detail later.

► **Typical Specialist**—The position of Hydro-Aire, which manufactures such accessories as fuel pumps and is edging into the avionics field, is worthy of further study. With approximately 1,000 employes and a yearly volume between $13 million and $14 million, it is a typical specialist.

President Rhoads has decided to keep Hydro-Aire, a member of Aircraft Industries Assn., out of the two new organizations of subcontractors. Many of the large component and accessory manufacturers have made the same decision.

Majority of the membership of the new associations is from the second group, the less specialized subcontractors doing little original design work.

► **Research Burden**—Problems of the accessory manufacturers, carrying the burden of their own research and development efforts, are somewhat different than those of subcontractors who do little or no engineering of their own.

Hydro-Aire's president lists these problems resulting from the intensive price competition in his field:

- Inability to obtain sufficient profit margin to cooperate with airframe manufacturers in development of units both know will be needed in the next three years.

Since the subcontractors cannot afford their own research, this means the primes may be forced to do it under the weapon systems concept. The alternative is for the government or the prime manufacturer to finance research by the component manufacturers.

- Too narrow profit margin means that in the event of an unforeseen difficulty, the subcontractor's profit is wiped out.
- Lack of sufficient profit reduces the subcontractor's ability to bid on a number of forthcoming projects, since there is no money to finance this type of engineering.

It may cost an accessory manufacturer anywhere from 100 to 1,000 engineering hours, at an engineering overhead of $8 an hour, to bid on a proposal along with perhaps a dozen other firms. Perhaps once in five times, he will get the contract. The cost of engineering the four unsuccessful bids must be absorbed by the subcontractor.

Standardization might help this by

requiring less expenditure on prototype items not likely to pay off. But standardization thus far has been difficult to achieve.

► **Widening the Margin**—"It all goes back to one basic thing," says Rhoads. "We're not getting enough for our products."

There are two ways to widen a profit margin. One is from the top, by increasing the price you charge. The present competitive situation makes that extremely difficult. The other is from the bottom, by reducing what it costs you to make the product. That is what Hydro-Aire is doing.

"We have to treat this coldbloodedly," the company's president says. "We have to cut back some of the money going into research and development on things we would like to go into. We're preparing to be the fittest in a battle for survival of the fittest.

"The sales department actually is turning down proposals. There is no lack of business, but it is a question of how much of our own money we can afford to spend. We are going to pull in our horns and take only the business which we can afford while maintaining a high standard of quality. The ones who will stay in business are those who will keep enough money coming in to maintain top quality.

"On some proposals, we are just going to have to sit out the dance in order to survive."

► **Possible Solution**—Rhoads offers one solution to these problems. Under the weapon systems concept, he points out, the prime contractor is given more responsibility and authority. Why does the prime not turn around and pass along some of that responsibility?

"He could pass out some design study contracts to finance research in the accessory field," Rhoads suggests.

If something like this is not done, the Hydro-Aire president warns, the inability to spend money on component research will slow the whole aircraft development cycle.

"Those of us in the accessory business will not be able to keep ahead of requirements and will have to wait until the money becomes available. Often that will be too late."

► **Greatest Danger**—Perhaps that is the greatest danger in this group during the period of economic readjustment: the intensive competition is resulting in profit margins so narrow that money to finance further research and development may be lacking.

This is a problem that time probably will solve by reducing the number of firms competing in the field.

The shift in the other subcontracting group, the small job shop, can be more dangerous simply because it may be more permanent.

(Next: The Small Subcontractor)

Wilson Explains Defense Buying Policies

(EDITOR'S NOTE: *Secretary of Defense Charles E. Wilson last week issued a statement which in effect was an answer to charges by Sen. Henry M. Jackson that the government is concentrating contracts with General Motors Corp. Since it is an official appraisal of defense procurement policies and procedures,* AVIATION WEEK *herewith publishes Wilson's statement in full.*)

"Recently there has been criticism of the Department of Defense in regard to its procurement policies and procedures. This criticism apparently results from a lack of knowledge and understanding of the facts and of the Defense Department's procurement policies and the administration of them, particularly in regard to the placement of contracts with the larger companies in our country.

"In particular, some recent criticism referred to the total contracts placed with one large contractor during the first 18 months of the Eisenhower Administration. This comment is based on a misunderstanding of fact. While it is true that most of the contracts in money value to which reference was made were finalized during the spring of 1953, they were actually negotiated or placed on letters of intent during the previous Administration.

► **No Policy Change**—"What has been done in the last 18 months was to formalize through actual contract commitments that had been made under the previous Administration. In addition, our military program has been brought into balance, especially during the last 12 months. The figures for contracts actually placed during this 18 months in themselves indicate no change in policy whatsoever.

"If the figures had been used for contracts placed by the previous Administration during the first year of the Korean war (July 1, 1950, through June 30, 1951), false conclusions could have been arrived at on the basis that only large contractors were being favored by the previous Administration.

"The three military departments, through their procurement officers have the responsibility for the placement of contracts for all kinds of military supplies and equipment, including ships, airplanes, tanks, etc. This is necessary and proper because the military departments have the responsibility:

"1. for determining their specific requirements and the products ordered;

"2. for the quality of the products produced and whether they meet specifications;

"3. for approving all engineering changes to be incorporated into the production to improve the product; and

"4. for the production and delivery of the items in line with need and agreed-upon schedules.

"They also have the responsibilities for placing these contracts in line with the policies established partly by the Congress and partly by the Department of Defense as an executive branch of the government.

► **Tightened Up**—"Our present policies have tightened up on the procedures and the requirements in the interests of stopping loose spending and getting more defense for the dollars spent. The overall policies as between so-called small and large business firms, the various industries, the desirability of placing orders for procurement where employes are readily available as against placing them in areas where there is already full employment, and the dispersion of contracts have not been changed.

"There has been no major change in the procurement policies of the Department of Defense or the basis upon which contractors are selected or given repeat business.

"The importance of maintaining the mobilization base and the ability to quickly produce in big quantities if we are so unfortunate as to get into a war are currently receiving the closest attention.

"The Department of Defense recognizes the proper interest on the part of members of the Congress in how the money is spent for the necessary military items required by our defense program and stands ready at any time to cooperate in a fair audit of its policies and activities in regard to procurement.

"I personally deplore public statements that are based on misunderstanding or misrepresentation of the facts when they affect the essential defense of our country which should be above and beyond partisan politics."

Ohio F-100Ds

North American Aviation's $100-million contract for production of the F-100 Super Sabre at Columbus, Ohio (Aviation Week Sept. 27, p. 18), is for the F-100D, an improved version of the supersonic Air Force jet fighter.

Colonial Moves Ahead With Merger Bid Plan

Colonial Airlines, after obtaining clearance from Securities Exchange Commission and Civil Aeronautics Board, is moving ahead with plans to take new merger proposals from Eastern Air Lines and National Airlines (AVIATION WEEK Sept. 20, p. 95).

CAB chairman Chan Gurney wrote B. T. Dykes, Colonial president, that the Board has no objections to the bid project. He reminded Colonial that both Eastern and CAI bear responsibility for proving that EAL has divested itself of all control of the smaller airline's stock.

Gurney had no comment to make on the proposal to set up an independent voting trusteeship for all stock alleged to have been under control of Eastern.

JET-POWERED HORNET idles on Hiller flight line as sister copter hovers overhead.

COPTER FACTORY has expanded through programs set up by the military and Hiller.

Hiller Ramjet Near CAA Approval

Copter would be first jet-powered U.S. aircraft to win certification, marking important milestone for firm.

Palo Alto, Calif.—Hiller Helicopters expects Civil Aeronautics Administration to certify its ramjet Hiller Hornet by the end of this month, thus making it the first U. S. jet aircraft of any type to receive CAA certification.

Military services have ordered five of the aircraft for evaluation by the Army, Navy and Marines. Army designation is H-32. Navy designation for the two-place, tip-powered helicopter is HOE-1.

▶ **CAA Tests**—Engine certification must precede final CAA flight testing. Final 150-hr. run on the engine was begun early in September of this year.

Such tests as static and fatigue blade testing, structural engine testing, and tail boom static testing already have been completed.

Hiller's military contract calls for CAA certification of the Hornet before delivery of the evaluation aircraft to the services.

"The certification program has gone remarkably smooth considering that this also is the first program of this type for the Civil Aeronautics Administration," says a company official. "CAA cooperation has been wonderful."

The H-32 is a greatly modified version of the Hornet, which made its first flight in 1950. Company pilots report its flight characteristics are excellent. No performance figures have been released, but the new Hornet has reached an altitude of 8,500 ft. on its test flights.

▶ **Important Milestone**—Successful certification of the nation's first jet aircraft will mark another important milestone for the company, which ranks third in the helicopter industry in unit sales.

Recent rumors that the company is in shaky financial condition and about to be sold are denied by top company officials. One of the most recent linked it with Douglas Aircraft Co.

"Our position financially speaking is getting better all the time," says senior vice president A. J. M. Chadwick, who heads the Contracts and Sales Division. "Our facilities have been expanded by the military and by ourselves.

"Obviously the question of merging is going to be talked about from here on out because the helicopter field is here to stay. There will be more talk about what we are going to do. What we are doing is looking the field over to see whether such a step would be worthwhile from our viewpoint.

"Whether we merge or not, or whether we take other companies under our wing, is in the future. We are not intending to be controlled unless it is to our advantage."

▶ **Sales and Profits**—The firm's net income last year after taxes was $247,637 despite a heavy writeoff of research and development costs resulting from the Hornet program.

Commercial sales now make up about 20% of Hiller's total business, and company officials say the commercial market is expanding rapidly.

In addition to its jet program, the pioneer helicopter firm is producing H-23Bs for the Army and its civilian counterpart, the Hiller 12-B. Navy version is the HTE-2.

It also is turning out spare parts for the H-23 and overhauling that aircraft under the first Air Force IRAN (inspect and repair as necessary) contract for helicopters.

Another Hiller program covers component overhaul.

▶ **Convertiplane Research**—Hiller is carrying out three research studies for the Air Force and Navy, one of which is concerned with a convertiplane configuration.

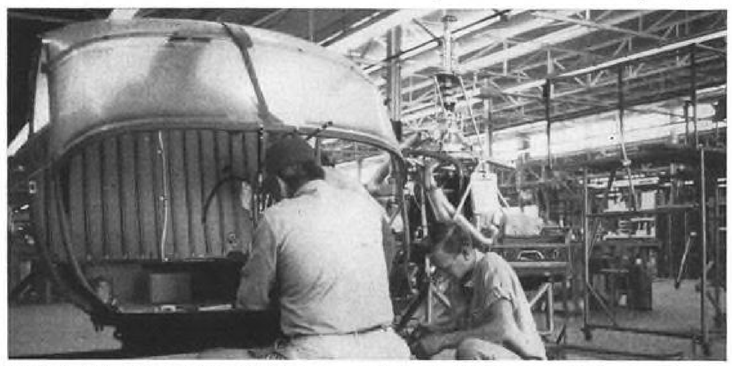
"We are following the convertiplane field closely," says Chadwick. "We think that it is one aspect of the helicopter field that will take up a large part of the market."

Company officials decline to talk about the details of their current entry in the convertiplane competition.

▶ **Commercial Plans**—There are no fixed plans for commercial production of the jet-powered Hornet, although vice presi-

HILLER H-23S take off on flight checks near Golden Gate before delivery to the Army.

TAIL BOOMS for H-23s are fabricated on assembly line in Hiller's helicopter plant.



TWO-PLACE COCKPIT for H-23 is prepared for installation near final assembly line.

dent A. W. B. Vincent, head of commercial sales, says there might be some available next year.

Commercial output depends on the military evaluation of the new helicopter.

"Without a military order, it is doubtful we can have commercial production."

The market for such a shortrange helicopter would be limited, Vincent says, but its simplicity and high lift capability make it useful for agriculture.

"We definitely will follow up the tip engine field," adds Chadwick. "Not exclusively—we'll follow other developments. But for a number of types of helicopter that is where we feel the power should be applied, whether it is generated there or not. While the present uses of this Hornet may be limited, it has opened new fields."

▶ **Hornet Lift**—The H-32 has 23-ft. rotor blades driven by small ramjet engines located at the blade tips. Empty weight is 530 lb. It can lift more than its own weight.

Test flights of the H-32 began late in 1953.

Ramjet engines were chosen for the Hornet due to their simplicity and more immediate availability, although Hiller engineers realized this would limit

range. Lower noise level and small size were other considerations.

Much of the fuselage is of Fiberglas. The rotor blades are all metal. Counterweighted tail rotor is single-blade and of a simplified construction designed to improve directional control.

A series of belts drives the tail rotor and accessories. Controls and cockpit are standard military arrangements with a few minor modifications. Instruments have been reduced to a minimum.

► **'Hands-Off' Flight** – Chief project engineer Wayne Wiesner believes pilots will like the governor that automatically varies engine power output with required flight power, maintaining constant rotor rpm. This eliminates necessity of coordinating throttle with stick movements.

A cyclic trim system can be used to center the stick automatically in any flight attitude. The Hornet is extremely stable and capable of "hands-off" flight due to the high inertia of its rotor system, Wiesner reports.

Rate of sink during autorotation is high, but the high rotor inertia resulting from the engines acting as tip weights allows more time for entry into autorotation following power loss. More time is available for recovery and landing due to this inertia.

In event of single engine failure, the pilot can make a normal landing–although some roughness might be encountered.

► **Added Control**–Tail rotor is not required for torque compensation but gives added directional control. There is a possibility that future versions might eliminate the tail rotor in favor of a simple rudder.

Hiller will deliver the Hornet with provision for an overhead stick, which company engineers believe might improve the ease of handling despite its less conventional appearance.

An auxiliary power source is used for starting, bringing the rotor up to the rpm. at which the ramjet engines can begin to function.

"We ourselves still are impressed with the low maintenance requirements and comparative simplicity of flying," says vice president Chadwick. "It has good stability."

► **Improvements**–Future improvements that might add to the Hornet's range and performance are listed by chief project engineer Wiesner as:

- Possibility of going to a higher tip-speed, which would increase range.
- Streamlining the ship itself, perhaps including retraction of its skid gear.
- New engine possibilities, including possible use of still undeveloped ram rocket engines.

Hiller is directing research and development effort toward both large and small helicopters, utilizing the principles employed in its new Hornet.

The 146,000-sq.-ft. Hiller plant, located on a 61-acre site 40 miles south of San Francisco, is adjacent to the firm's flight test facility. The company has some 550 employes. –WJC

Two Mexican Airlines Merge With Aeronaves

Los Angeles – Three Mexican airlines have combined under the name of Aeronaves de Mexico to form the largest domestic air transportation system in Mexico.

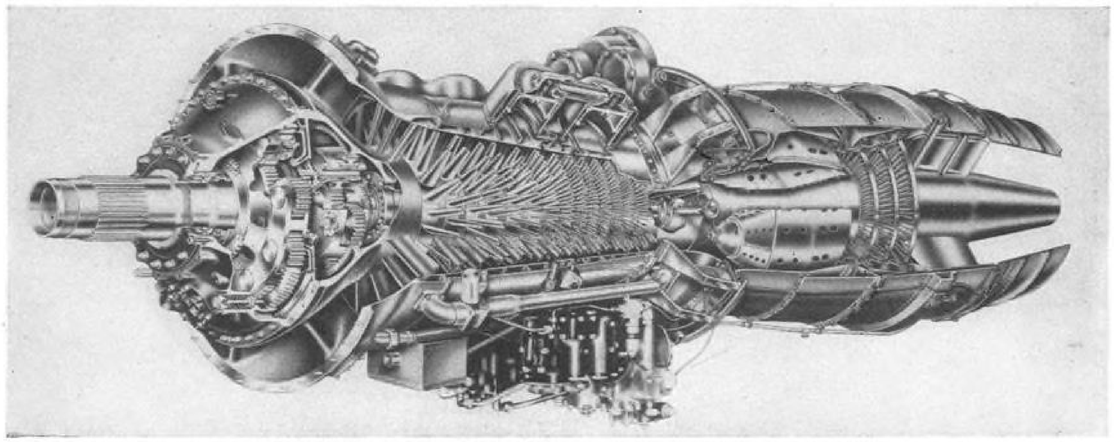
Mexico's former president, Miguel Aleman, is the airline's largest stockholder and played a prominent part in the consummation of the merger, underway since 1952.

The lines making up the new domestic airline are Aeronaves, Lineas Aereas Mineras (Lamsa) and Aerovias Reforma, according to a joint announcement made here by Alfredo Gayou, general traffic and sales manager, and Roman J. Virchis, West Coast district sales manager of the new airline system.

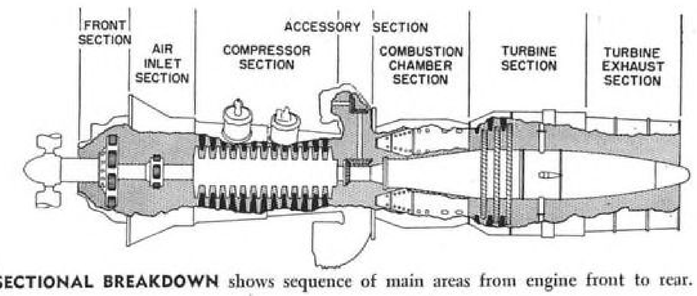
A fleet of four Convair 340s, two Douglas DC-4s and 23 Douglas DC-3s will be used to fly 25,000 mi. per day of scheduled service to 33 Mexican cities.

Air Force Gets New Convair-Liners

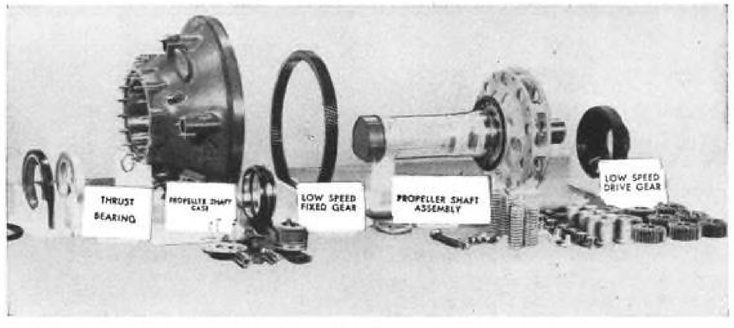
Convair recently delivered these three new 44-passenger C-131Ds to Military Air Transport Service for use on domestic routes, the largest number of 340-type transports handed over to a customer in one day. MATS flew the planes to Washington.



T34 CUTAWAY reveals details of reduction gearing, 13-stage single-spool compressor, 3-stage turbine. Rating is 5,500 eshp.



SECTIONAL BREAKDOWN shows sequence of main areas from engine front to rear.



FRONT SECTION COMPONENTS include propeller shaft and low-speed gear units.

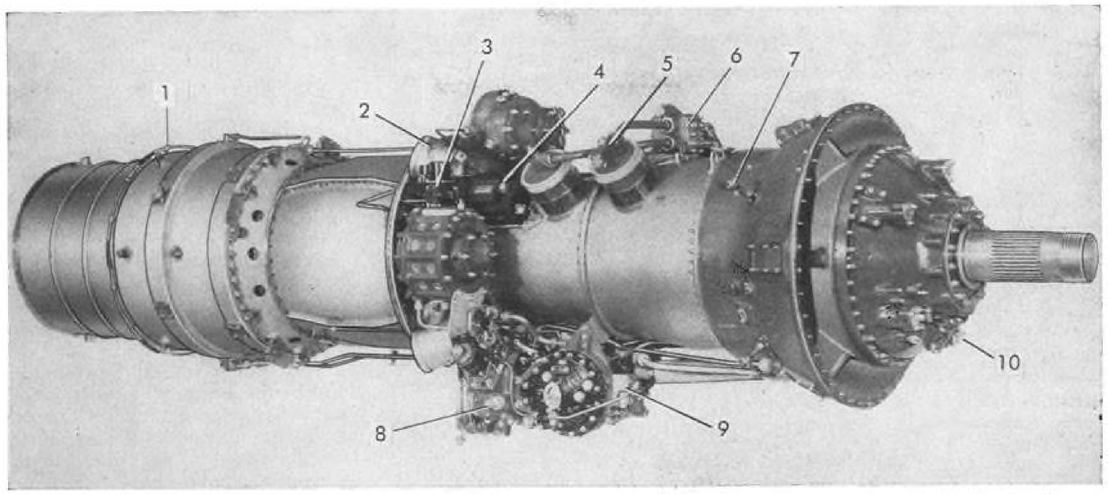
First Details

Interest in turboprop-powered transports is at a new high in both military and commercial circles. One engine playing a basic role in turboprop development in this country is Pratt & Whitney Aircraft's 5,500-eshp. T34 (Aviation Week Sept. 20, p. 19).

The engine is the powerplant for several of the military's huge four-engine cargo-transport types. Airline officials are interested in the results of these installations because the planes may be considered as flying prototypes for one form of future transport development.

Since early this year Douglas Aircraft Co.'s C-124B has been flying with T34s for the Air Force. Early last month, Lockheed Aircraft Corp.'s T34-powered Navy R7V-2 Super Constellation went aloft for its first flight. Boeing Airplane Co.'s YC-97J is scheduled for its first flight with T34 engines late this year as a cargo-transport-tanker.

This detailed analysis of the T34 engine is the first searching look at the insides of any American-built turboprop powerplant. Here is a nose-to-tailpipe design study of the P&WA engine:



EXTERNAL DETAILS: 1, thermocouple lead; 2, engine mount housing; 3, brake actuator; 4, ignition exciter; 5, air bleed valve; 6, valve control; 7, inlet thermocouple; 8, pressure oil relief valve; 9, coordinator control fuel filter; 10, scavenge pump.

Disclose P&WA's T34 Turboprop Makeup

Front Section

• **Front case.** Front end of the front case has a recessed liner supporting the propeller shaft thrust bearings. A boss on the case accommodates the oil transfer tube for connection to the oil transfer bearing.

A mounting pad is provided for a torquemeter transmitter adapter. Five circular recesses in the front of the case house emergency negative torque control assemblies. A pad on the case bottom accommodates the front scavenge oil pump.

• **Propeller shaft.** Prop shaft, cut with a No. 70 spline, supports a two-stage planetary reduction assembly. Lowspeed reduction drive pinion cage is integral with the shaft, while the highspeed gear assembly is held on the rear of the prop shaft by the reduction gear bearing support.

Rear end of the shaft is supported by two steel-backed bronze bearings inside the highspeed pinion cage. The shaft's main body is supported by ball and roller thrust bearings.

Scavenge oil pump drive gear is bolted to the shaft just ahead of the lowspeed pinion cage.

• **Lowspeed gearing.** Propeller lowspeed reduction ratio is 0.354:1. Gearing is of the spur planetary type. The lowspeed reduction fixed gear is a spur ring with diagonal splines on its outside diameter. These mesh with splines machined into the rear of the front case.

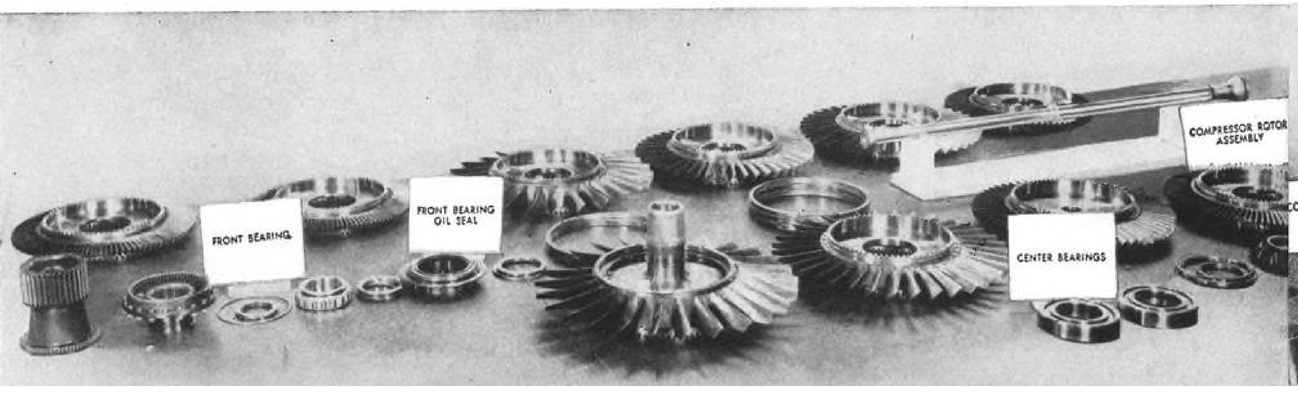
Fixed gear is held in the front case by the torquemeter piston riding on the rear face of the gear. A lowspeed drive gear, splined and locked to front end of the highspeed pinion cage, transmits power from the latter to the nine lowspeed reduction drive pinions. Each pinion is supported by a race and a pinion shaft and meshes with teeth on the inside diameter of the fixed gear.

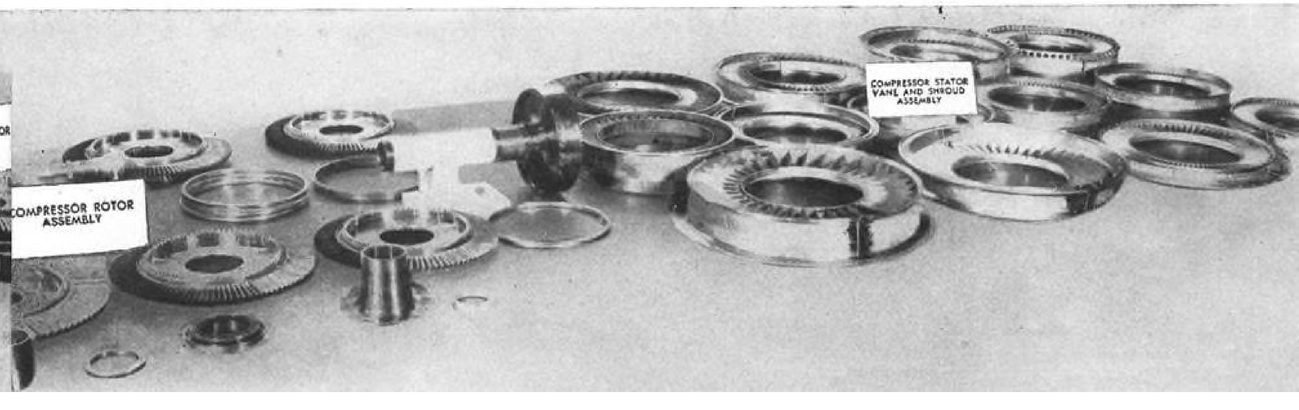
• **Highspeed gearing.** Propeller highspeed reduction ratio is 0.257:1. Highspeed reduction fixed gear is a spur ring unit bolted to the front of the compressor front bearing support. The highspeed drive gear is splined to a coupling bolted to the compressor shaft front coupling.

Teeth on the outside diameter of the drive gear mesh with five reduction drive pinions housed in the highspeed pinion cage. Each pinion is supported similarly to those in the lowspeed reduction gearing.

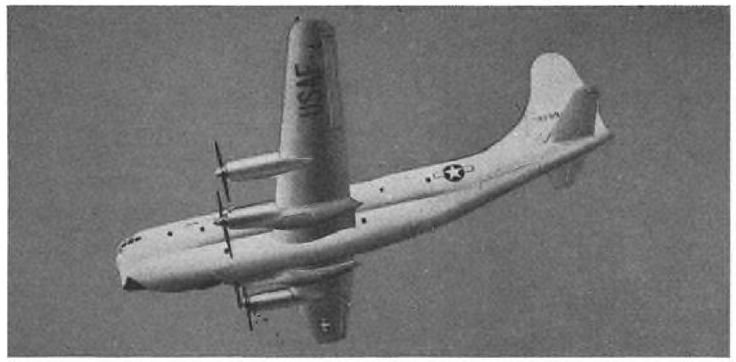
• **Gear bearing support.** The reduction gear bearing support houses the gear roller bearing, torquemeter piston and torquemeter bleed nozzle.

• **Prop shaft bearings.** Propeller shaft oil transfer bearing is mounted on the shaft in front of the scavenge pump drive gear. The oil transfer tube, connecting the bearing to the pressure oil inlet in the bottom of the front case, transmits engine pressure oil through the bearing into the cavity between the prop shaft and the shaft transfer liner.

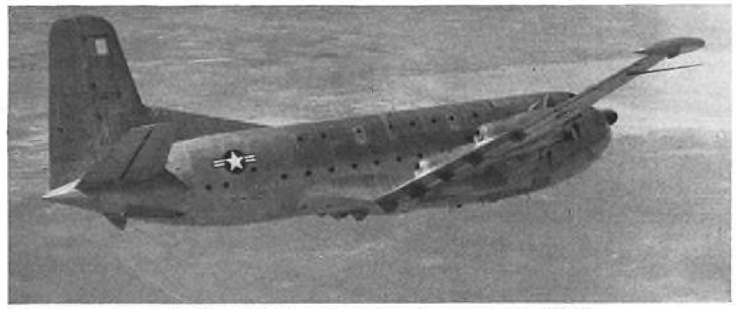




P&WA's T34 Provides the Horsepower



BOEING YC-97J, shown in artist's conception, is scheduled to fly this year.



DOUGLAS AIRCRAFT YC-124B giant transport is in service with USAF.

LOCKHEED R7V2 Super Constellation for Navy made first flight last month.

From there it travels through drilled passages in the high-and low-speed pinion cages to the reduction drive pinion assembly.

The thrust bearing consists of a roller unit and a ball bearing that has a split inner race. Ball bearing outer race fits on the front case liner and the rear half of the split inner race seats against a shoulder on the prop shaft. Thrust bearing cover retains the roller bearing outer race and the thrust bearing nut retains the inner race. The nut carries two oil seal rings contacting the liner in the bearing cover.

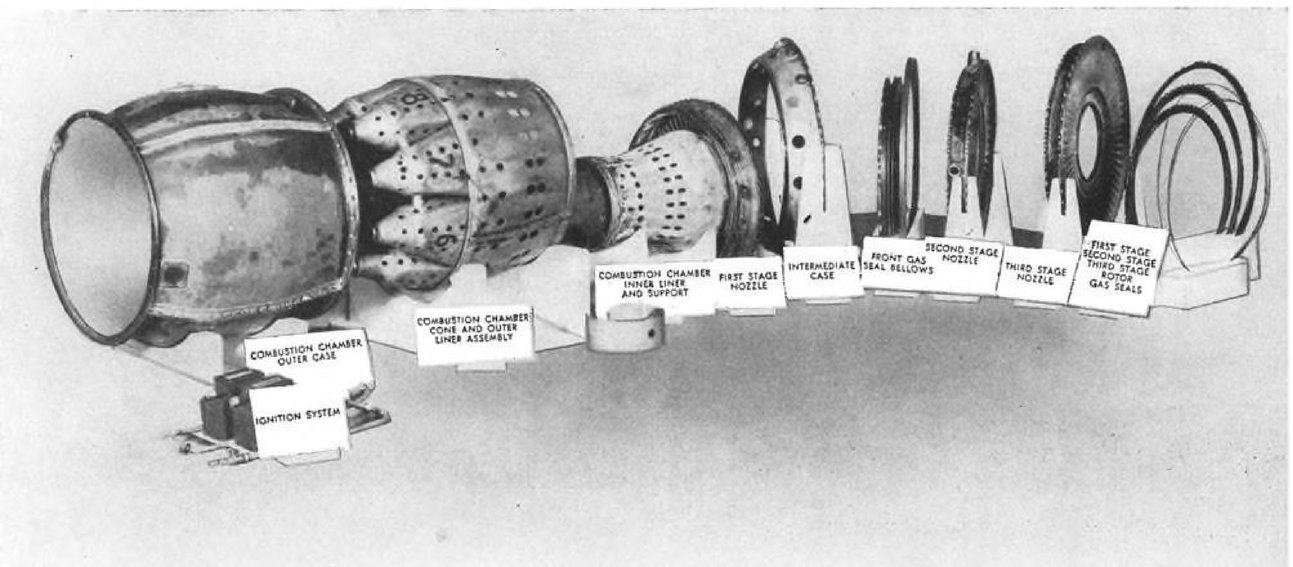
An oil slinger is held between the thrust bearing nut and the front face of the roller bearing inner race. The bearing supports the front of the prop shaft and transmits thrust from the shaft to the engine mounting bracket.

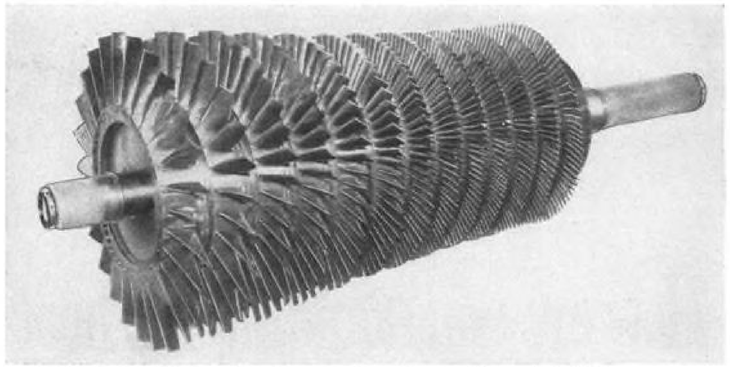
• **Torquemeter system.** As the reduction drive fixed gear moves rearward on the diagonal spline of its outside diameter in response to the torque applied to the prop shaft by the compressor rotor shaft through the reduction drive gears, the rearward thrust of the fixed gear is counterbalanced by pressure oil operating on the gear through the torquemeter piston.

The piston carries two oil seal rings. A shoulder on the forward outside diameter of the piston maintains contact with the fixed gear rear face. Engine oil from the pressure oil pump is carried through an external oil transfer tube and a cored passage to the torquemeter oil inlet connection on the lower right rear of the reduction gear bearing support.

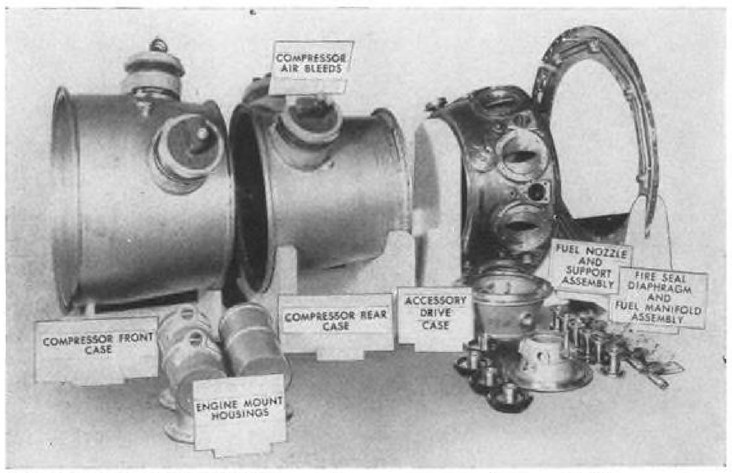
From the oil inlet connection, oil passes through the torquemeter valve to the rear of the piston. The valve maintains torquemeter oil pressure.

Pressure oil is received by the piston, which opens or closes the valve by its

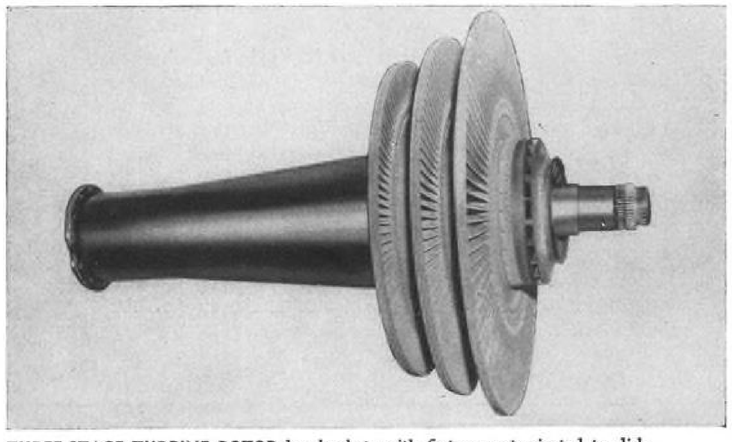




COMPRESSOR ROTOR has all-steel construction. Compression ratio is 6.7:1.



MID-SECTION HOUSINGS include cases for compressor, engine mount, drives.

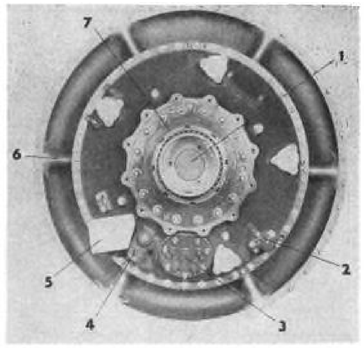


THREE-STAGE TURBINE ROTOR has buckets with fir-tree roots riveted to disk.

own movement—thus metering oil flow to itself in direct proportion to the load applied to the piston through the reduction drive fixed gear.

A torquemeter oil bleed nozzle on the upper rear side of the bearing support bleeds off any excess pressure. Thus, the reduction drive fixed gear always is balanced by oil pressure acting against the rear side of the piston.

Oil pressure acting through the torquementer transmitter adapter takes the pressure through tubing filled with air or a low-viscosity fluid to a pressure gage in the aircraft. By a calculation using oil pressure value acting on the



FRONT DETAILS: 1, prop shaft front plug; 2, torquemeter transmitter adapter; 3, scavenge pump; 4, shaft oil transfer bearing tube; 5, emergency negative torque control rod; 6, strut; 7, bearing nut.

torquemeter piston, the compressor rotor rpm. and a previously determined torque constant, the pilot can determine the horsepower being delivered to the propeller.

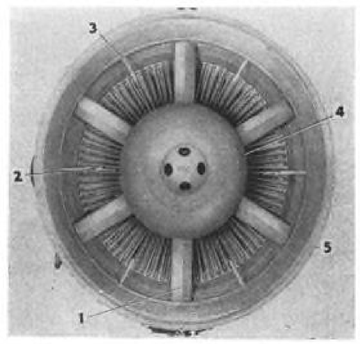
Compressor Section

• **Air inlet case.** Six hollow struts in the air inlet case connect the case outer rim with the hub. Compressor discharge air circulates through the four upper struts to prevent engine icing. Three of these struts contain breather passages. The two bottom struts are used as oil passages, one carrying pressure oil to the front case and torquemeter while oil from the front scavenge oil pump is carried in the other.

Bosses for mounting breather pad and anti-icing air outlet pad covers, thermocouples and optional instruments are located on the case's outside perimeter.

Compressor front bearing support, together with the high speed reduction drive fixed gear, is bolted to the inside of the case behind the hollow struts.

• **Front bearing support case.** Compressor front roller bearing is contained in a liner in the support case hub. The hollow inlet guide vanes (19) are sup-



REAR DETAILS: 1, turbine exhaust strut; 2, turbine discharge pressure brake; 3, temperature probe; 4, cone; 5, case.

T34 Turboprop Specifications

Number of burner cones.....8
Compressor stages 13
Turbine stages 3
Compressor ratio 06.7:1
Propeller reduction gear ratios:
  Low 0.354:1
  High 0.257:1
Propeller shaft spline size..SAE No. 70
Number of engine mounting bolts...4
Dry weight of engine.....2,564 lb.
Maximum diameter .....34.06 in.
Maximum length .....157.7 in.
Approximate center of gravity:
  Forward of rear face of accessory case on compressor shaft centerline .....12.3 in.

YT34-P-1 has emergency negative thrust control switch actuator pushrod extending ¼ in. beyond front case mount pad for use with Curtiss propeller. Engine embodies 2-joule capacitor type ignition system.

YT34-P-12 has emergency negative thrust control pushrod extending 3 in. beyond pad for use with Hamilton Standard propeller. This engine has 4-joule capacitor type ignition system.

YT34-P-12A is similar to the –12 engine, except that it has one-piece inner and outer combustion chamber liners and fuel control adapted for JP4 fuel, instead of 100/130 fuel.

ported between an inner and outer shroud, the former bolted to the rear of the support case hub.

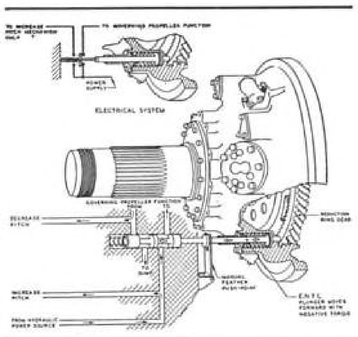
Four passages in the support case take anti-icing air from the guide vanes to the air inlet struts.

Located in the front of the roller bearing liner is a tube for transfer of pressure oil from a hollow passage in the support case to a passage in the liner. A plug in the liner inside shoulder meters a fine oil spray to the rear of the roller bearing.

Oil is prevented from entering the air system by a carbon seal in the rear of the front bearing liner.

• **Compressor assembly.** The 13-stage compressor is housed in a front case and a rear case. The rotor assembly consists of the 13 rotor disks, 13 spacers, a front shaft and a rear shaft. Vane stator and shroud split assemblies are located between the successive rotor stages, and the inner shroud forms a sealing ring for the two air seals on the outside diameter of each spacer. Outer vane shrouds are fitted with dowels in spacer assemblies.

Compressor front shaft is supported by a roller bearing in the front bear-



EMERGENCY negative torque control operation shown in schematic layout.

ing support liner. Two ball bearings support the rotor rear shaft and are secured in the bearing support in the accessory case, with an oil seal separating the bearing void from the compressor air system.

• **Compressor casings.** Compressor front and rear cases bolted together form a unit bolted at the front end to the air inlet case and at the rear to the accessory case. Located on the upper rear of the front case are two air bleed valves for taking air from the sixth stage and bleeding it overboard.

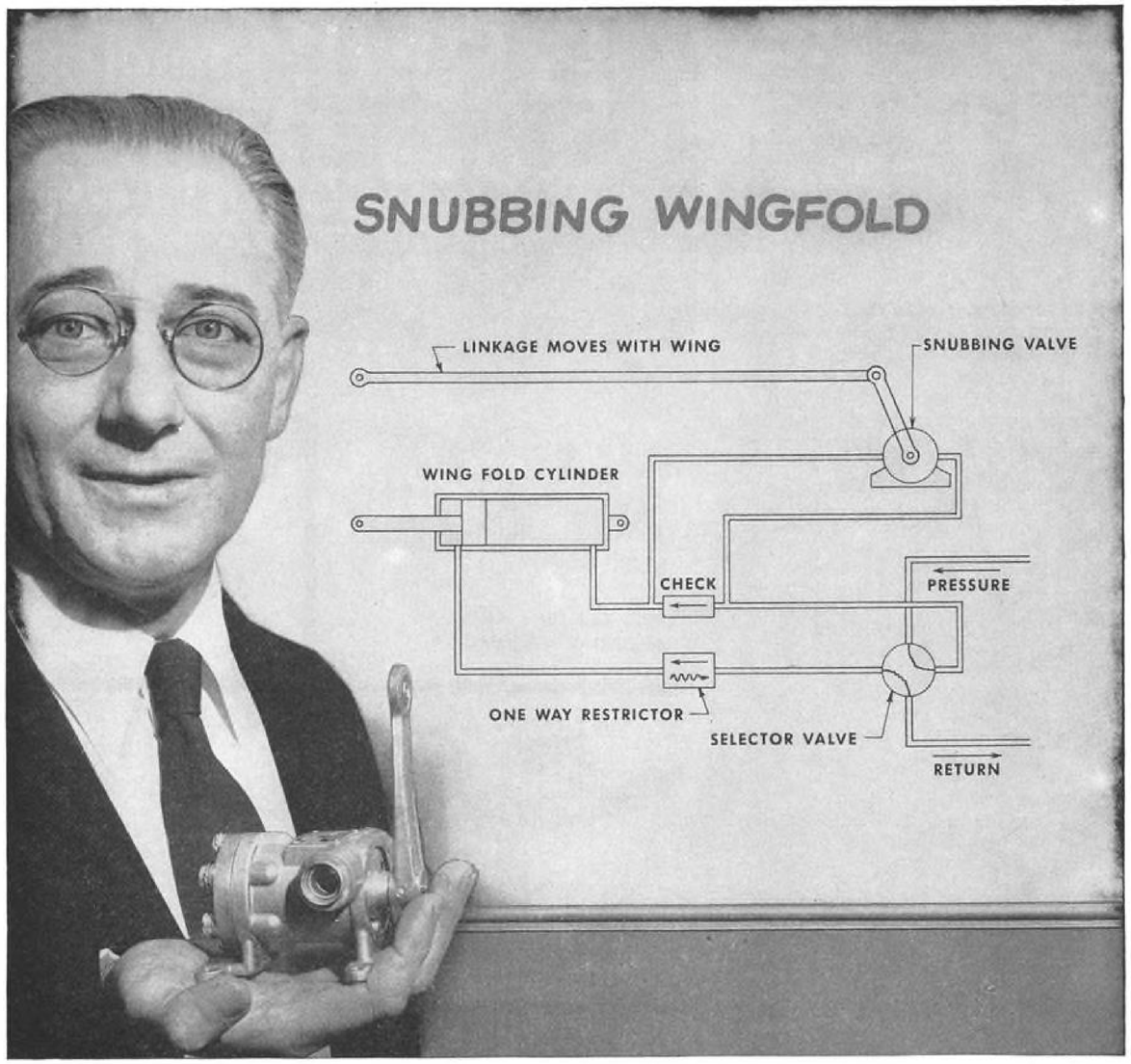
Two bleed valves located on the upper front of the rear case permit bleeding of seventh stage air overboard. Between the two front air bleed units is a mounting pad for bleed valve control brackets.

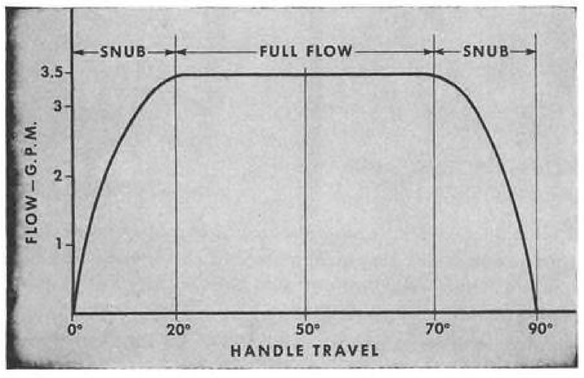
• **Accessory case.** This case is secured at the forward end to the compressor rear case and at the rear end to the combustion chamber outer cases. It houses the two rear compressor shaft roller bearings and liner assemblies. Metered and screened oil sprays the front face of the front roller bearing, and oil from a groove in the center of the bearing liner lubricates the front and rear bearing mating faces and the rear bearing.

Accessory drives are driven by the compressor rear hub accessory drive gear. Bolted to the accessory case are dual adapter elbows for generator and fluid pump drive and elbows for starter drive and the main accessory drive housing. Bosses are provided for anti-icing air, thermocouples and pressure probes. Eight other bosses at the rear outer diameter of the case accommodate fuel nozzle-and-support assemblies.

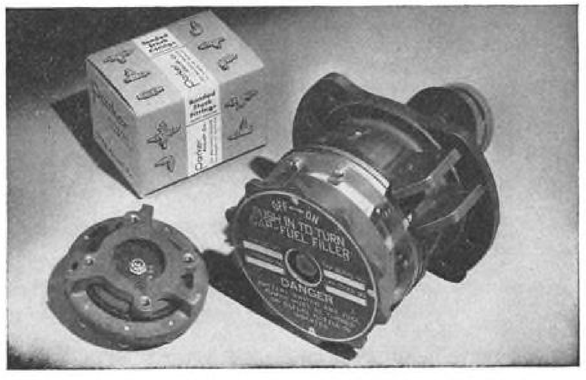
Combustion Section

• **Fireseal, manifold.** Fireseal ring is secured between the accessory case and combustion chamber outer cases. It supports the primary and secondary fuel manifold assembly on its forward face. This assembly consists of upper and lower primary and secondary manifold





Flow vs. handle travel at 60 psi. maximum pressure drop shows how new Parker shear-plate valves provide fine metering at each end of the plate travel.



What other Parker components for hydraulic and fuel systems interest you? Parker Aircraft Co. builds a wide variety of products for many different applications.

Adaptability of new Parker valve helps simplify hydraulic-system design

"Many hydraulic-system designs can now be simplified by using Parker's new line of shear-plate valves. One basic valve can easily be adapted for landing gear, bomb-bay doors, fairing doors, or wing folding," reports H. C. Trich, shown at left describing a wing-fold application. He is Staff Engineer—Hydraulic Systems, at Parker Aircraft Co.

"Parker's shear-plate valves are also intriguing to designers," he continues, "because they can provide the best snubbing available. This snubbing is the result of metering at each end of the plate travel . . . made possible by the tear-drop shape of the ports.

"These valves all have inherently low leakage because of the metal-to-metal seal between the plates. The plate surfaces are optically flat within two light bands. Because there is never any separation of the plates, contaminant cannot get between the surfaces to cause leaks. There is also no uncontrolled interflow between the ports.

"You can order shutoff, 3-way or 4-way Parker shear-plate valves for various applications and they're available for pressures up to 3000 psi., with either electrical or manual operation.

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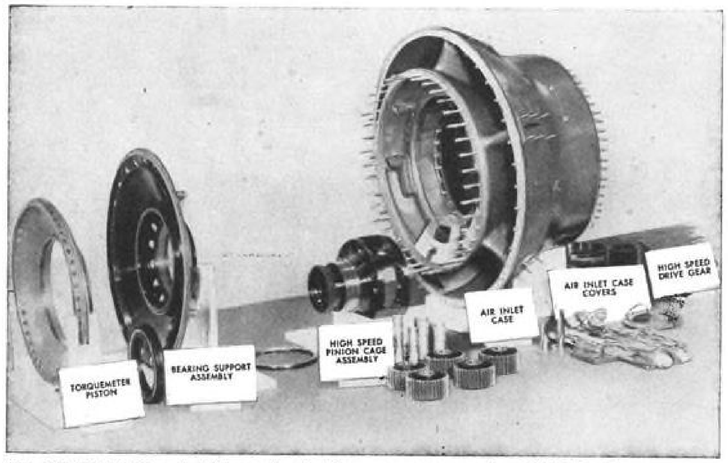


AIR INLET CASE and highspeed reduction gear components of T34 turboprop.

tubes and eight fuel manifold connectors.

Two tubes connect each fuel manifold connector with the corresponding fuel nozzle cover. The two bottom connectors also are attached to the primary and secondary fuel lines from the fuel pressurizing and dump valve.

• **Combustion chamber.** The two-piece combustion chamber outer case is secured to the accessory case at the forward end and to the turbine intermediate case at the rear end. The case contains eight radially located combustion chambers interconnected by welded projections. Forward face of each chamber is supported by the corresponding fuel nozzle. Cutouts for spark igniters are provided in two of the chambers.

The chambers are supported at the aft end by inner and outer burner liners. The chambers and liners are secured together and held to the combustion chamber support with a lockpin. A fuel drain valve is positioned at the bottom of the combustion chamber outer case.

Turbine Section

• **Turbine rotor assembly.** This assembly consists of the turbine shaft, three-stage turbine and rotor hub. Turbine disks and spacers together with the hub are secured to the turbine shaft with a tierod. Turbine buckets are fir-treed in the disks and secured by rivets. Turbine shaft is secured at the front end to the compressor shaft rear coupling with bolts and supported at the aft end by the turbine rear bearing.

Two air seals are riveted to each inner shroud of the turbine nozzle assemblies. Dual air seals separate the outer nozzle shrouds to form sealing rings with the turbine rotor buckets.

• **Turbine intermediate case.** This case is secured at its forward end to the combustion chamber outer cases and at the aft end to the turbine outer case. It houses the first stage nozzle vane and shroud assemblies and the turbine front gas seal bellows.

Bosses are provided on the rear of the case for thermocouple probes. Air holes on the front of the case introduce cooling air between the intermediate and turbine outer cases and the turbine case inner heat shields.

• **Turbine outer case.** Secured to the intermediate case on the forward end and to the turbine exhaust case at the rear end, the outer case contains the turbine bearing support and fixed struts. The latter are positioned around the bearing support locating sleeves installed over the support rods and the six turbine-strut rear support tubes. Top and bottom (diametrically opposed) sleeves serve, respectively, as the rear bearing's breather tube and oil drain tube. The bearing oil pressure tube is inside the drain tube.

Secured to the front of the bearing supports are the rear shaft gas seal and the exhaust cooling-air baffle. At the rear of the supports are the rear oil seal cover and the exhaust duct support. In the center bore of the support is the rear bearing seal housing, containing the bearing outer race.

The carbon seal housing is spring-loaded to provide constant pressure on the seal faceplate. The turbine bearing void is sealed from the air system by the carbon seal and rear oil seal housing cover.

Bosses for thermocouple and pressure probes are provided on the outside of the turbine outer case.

• **Exhaust outer case.** This is secured at its forward end to the turbine outer case and houses the turbine exhaust duct inner and outer extension. Two thermocouple bosses are located on the rear of the exhaust case at diametrically opposed positions.

Systems

• **Air bleed.** Compressor air bleed system helps starting and ensures compressor stability at low power conditions through four valves at the sixth and seventh stages of compression. These valves bleed air overboard during the engine starting cycle and during all operations below flight idle.

The system consists primarily of an air bleed control, a control governor and two front and two rear valves. The control and valves are mounted on the top section of the front and rear compressor cases. The governor, located on the bottom of the accessory case and driven at 0.578 engine speed, is a centrifugal-type unit transmitting motion to a shaft upon which are mounted two valve balls for restricting or permitting the flow of air piped from the bleed control.

The bleed control is composed of a housing containing two pistons and has connecting tubes to the governor and the bleed valves. Air from the sixth and seventh stage of compression is transmitted to separate compartments within the housing encircling the periphery at one end of each piston.

From here, the air flows through passages past small sleeves into compartments at opposite ends of the piston. The air then flows through external tubes to the governor.

When the governor operates below 8,000 rpm., the air passes overboard. When it operates in excess of 8,000 rpm., it restricts air flow. Pressure builds up on the piston in the bleed control so that the opposing spring force is overcome and the piston moves to a position permitting sixth or seventh stage air to pass through an external tube to its respective bleed valve. Air entering the valve forces the piston closed, thus preventing any further bleed from the compressor.

• **Anti-icing system.** High pressure compressor discharge air taken from the leading edge of the accessory case is piped forward through a regulator and air valve to a well formed in the air inlet case at the guide vane location.

From this well the air passes inward through the vanes into a space formed by inside diameter of vane inner shroud and rear outside diameter of compressor front bearing support.

From this chamber the air is forced forward through four passages in the support into the four upper air inlet struts. The two lower struts are not subject to icing, since oil circulates through them during engine operation. The air flow is discharged into the slipstream through ports at the outer ends

of the four struts in upper positions.

A regulator automatically controls the flow of anti-icing air with changing temperature. A bimetallic coil secured to a valve expands at increased temperature to move the valve toward the closed position and restricts the flow of air through the regulator.

At 70F, the slots in the valve are so aligned as to allow a maximum of air to pass. As the air temperature increases, the coil rotates the valve–causing the slot openings to decrease until, at 560F, the slots are so positioned to allow only a minimum of anti-icing air to pass.

• **Engine brake.** Mounted in conjunction with the starter drive gearing, a brake is used to prevent rotor and propeller rotation with an inoperative engine whether the aircraft is in flight or parked.

The brake is designed to provide enough static torque to counteract the varying input torque that results when a propeller is feathered at different air speeds.

But input torque of an unfeathered prop blade is far too great for the brake to overcome. Therefore, when the brake is used during flight to stop rotation of an inoperative engine, the propeller is feathered before and as long as the brake is applied. To help stop engine rotation after shutdown on the ground, the brake may be applied at any speed below 5,000 rpm. engine speed.

• **Lubrication system.** A single-section pressure oil pump furnishes oil to the propeller shaft bearing, reduction gear assemblies, torquemeter and main bearing location through fixed orifices, thus providing a constant flow of oil at all engine operating speeds.

The torquemeter oil system is a low pressure type not requiring a boost pump but utilizing high pressure oil directly from the engine pressure oil pump.

A three-section scavenge pump is arranged to afford proper scavenging at all points where oil is collected. The vent lines from the various oil cavities within the engine are connected to one of three, or all, breather pressurizing valves located on the upper half of the air inlet case.

• **Fuel system.** Determination of the fuel flow schedule for a propeller-turbine engine is approached very similarly to that of selecting a suitable fuel flow schedule for a reciprocating engine. Limiting turbine inlet temperature or compressor surge might be compared with detonation limits of a reciprocating engine.

From plots of fuel flow and power at various constant rpm. (held by a governing propeller), data is obtained as to the most desirable range of engine speed versus power to obtain the best possible combination of specific fuel consumption, engine durability, propeller performance and control function.

The optimum sfc. at any given power in the flight operating range is obtained by power calibration of the engine. The fuel control linkage is arranged so that the power lever movement is coordinated with propeller governor setting to achieve coordinated power control.

• **Ignition system.** A high energy capacitor ignition system is used. This provides a spark capable of blasting carbon deposits and vaporizing globules of fuel.

The high energy system makes possible starts with carbon-fouled spark igniters, also facilitates air starts at high altitude.

• **Torque control.** To prevent excessive asymmetric thrust on the aircraft and to provide for automatic reduction of windmilling drag to a tolerable value in the event of power loss, the engine is equipped with a device to provide a powerful mechanical signal if negative torque at the prop shaft exceeds a certain selected value.

Forward motion of the reduction ring gear provides the force to actuate an emergency negative torque control (ENTC). A slight movement is enough to give a positive signal. When the shaft has moved forward this distance, the ENTC signal is given and the propeller mechanism starts turning the blades toward the feathered position.

If at any time the negative thrust is reduced from the preselected value, springs overcome the forward movement of the ring gear and return it to its normal position. In this way, if the ENTC signal ceases, the prop pitch control is returned to the governing system.

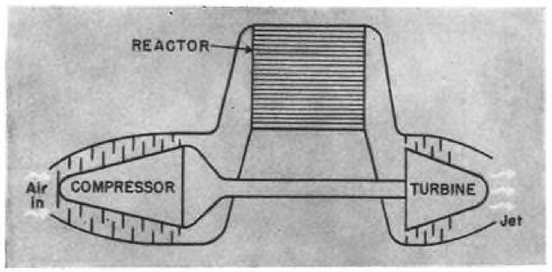
–Irving Stone

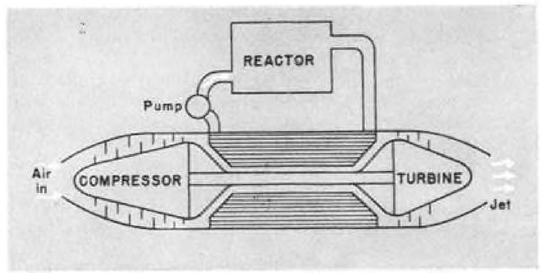
Prizes Spur Study Of Fuel Systems

An incentive award for engineering students judged to have contributed significantly to the design of improved fuel systems in aircraft or missiles has been announced by William H. Coleman, president of Aero Supply Manufacturing Co.

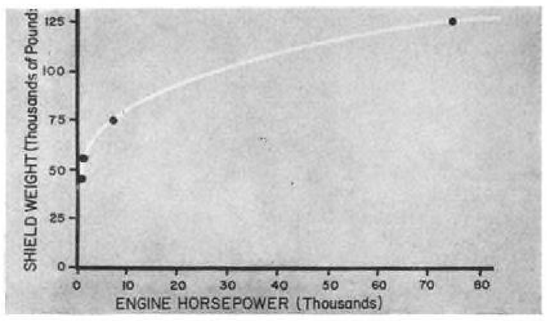
The Aero-Corry Research Award will give a first prize of $1,000, second of $500, third of $300 and two consolation prizes of $100 each. Judging will be done by a committee as yet unnamed, but representing a cross-section of the manufacturing industry and engineering schools.

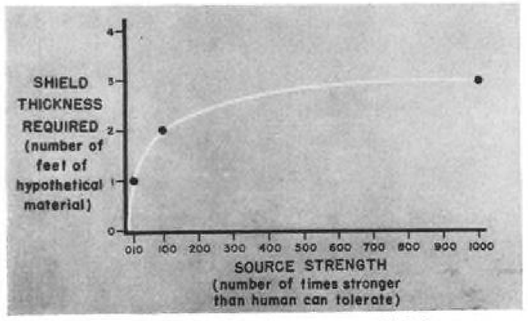
Coleman said that his firm is ". . . intensely aware of the need for improved basic research contributions to the nation's aircraft development. . . . There is still a serious shortcoming in the area of research. It is our hope that this competition will help overcome that shortcoming."





WHETHER ATOMIC REACTOR is direct-cycle, air-cooled type (l.), or indirect, liquid-cooled (r.), plane will be heavyweight.





HEAVY AND THICK SHIELDING will be needed to protect personnel against high radiation levels that will accompany high horsepowers.

Why Atom-Powered Planes Will Be Heavyweights

How big would an atomic-powered airplane be?

Something on the order of 200,000 lb. gross weight and requiring about a 30,000 hp. powerplant, says Kenneth Kasschau, manager of Atomic Energy Dept., American Locomotive Co. (AVIATION WEEK Sept. 27, p. 7).

In a talk before the Metropolitan Section of the Society of Automotive Engineers, Kasschau presented some "broad-brush" curves and estimated figures for weight and horsepower of atomic aircraft. "Although . . . grossly over-simplified," he said, "the results are at least in the right ball park. Their chief value, however, lies in the fact that they demonstrate quite clearly that the current state of the art restricts atomic powerplants to the larger size vehicles."

Technical observers compared Kasschau's estimates to the size and power of the current Convair B-36 series, grossing above 400,000 lb. and with installed horsepower varying between about 23,000 hp. for takeoff and about 40,000 hp. for maximum speed flight.

► **Reactor Size**—Kasschau said that the largest size for aircraft reactor is about five ft. in diameter. For high subsonic flight speeds, heat must be developed in that reactor at a rate of about 100,000 hp. in order to produce the 20,000 hp. or more required to propel a plane.

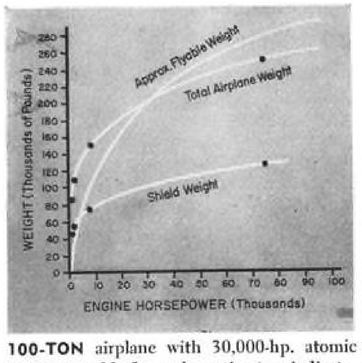
Radiation from such a reactor is about two to three percent of the power, or about 2,500 hp. This figure is about a million million times above the acceptable current level of radiation for healthy operating conditions.

Distance works in a favorable way, Kasschau pointed out. At a distance of 15 or 20 ft., the radiation level is only about 1/1,000 of the level at the reactor. Such a reduction still leaves a field that is a billion times too strong for the human anatomy.

► **Shielding Problems**—It is this radiation that makes shielding of the reactor a necessary evil. Fortunately, says Kasschau, shielding thickness is not proportional to the strength of the radiation source, but to its logarithm.

As an example, he cites a source which is 100 times too strong for a human to tolerate, and shields it with two feet of some material. If the source is increased to 1,000 times the human tolerance level, the thickness of the shielding only increases to three feet.

Applying this to a practical consideration of the shielding required around an aircraft powerplant, Kasschau assumes a double shield: lead to stop gamma radiation and water to stop the neutrons. For a 75-hp. powerplant, the shield weight would be 44,000 lb., and this, he says, is why there won't be any atomic-powered lightplanes.



100-TON airplane with 30,000-hp. atomic engine would fly early estimates indicate.

An increase of 1,000 times in the horsepower—to a level of 75,000—results in a shield weight which is estimated at 125,000 lb.

► **Airplane Parameters**—Kasschau assumes that the shield weight is equal to the fuel weight carried in some large airplanes; by implication, this assumes that the engines required to work with the reactor would not be appreciably heavier or lighter per horsepower than contemporary engines. Assuming also that fuel weight equals one-half the gross weight of the airplane for large craft, he says that the gross weight is twice the shielding weight.

Based on these crude assumptions, Kasschau estimated the curve labeled "approximate flying weight," which is simply a power-loading curve. The in-

tersection of that curve with the curve of total airplane weight occurs at about 200,000 lb. weight and 30,000 hp.

Thus any airplane weight and power combination to the right and below the "flyable weight" curve is a feasible airplane.

USAF Contracts

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

Advertising Displays, Inc., 418 Pike St., Covington, Ky., darkroom kit, spare parts, 24 ea., 34 ea., $61,536.

Aircooled Motors, Inc., Syracuse, N. Y., engines, 20 ea., $123,527; engines, spare parts and data, 21 ea., $73,500.

Allison Div., General Motors Corp., Indianapolis, special tools and GHE for aircraft engines, $3,467,840; facilities for overhaul program, $25,699; engine training parts, $30,000.

Beech Aircraft Corp., Wichita, spare parts for generator set, $420,061.

Bell Aircraft Corp., P. O. Box 482, Ft. Worth, Tex., spare parts, $56,002.

Bendix Products Div., Bendix Aviation Corp., South Bend 20, Ind., wheel assy., 114 ea., brake assy., 114 ea., $471,006.

Boeing Airplane Co., Wichita, engine installation, $370,000; trainer, bombing navigation system, $111,948.

Canadian Commercial Corp., Ottawa, Ontario, Canada, airplanes, 74 ea., spare parts, special tools, $739,124.

Coleman Motors Corp., Littleton, Colo., towing tractor spare parts, 18 ea., $373,836.

Convair, San Diego, Calif., facilities for the production of aircraft, $771,290.

Continental Aviation and Engr. Corp., 1500 Algonquin Ave., Detroit, engines, 12 ea., $663,376; engines, tools and training parts, 4 ea., $247,368.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., transmitter, rate of flow, $115,215; spare parts for Aerno 61-2446, $106,168.

Edward Pattern Works, Inc., 125 North East St., Indianapolis, photographic printer, 19 ea., tabulated list of parts, 20 ea., literature, $29,941.

Electrical Engr. and Mfg. Corp., 4612 W. Jefferson Blvd., Los Angeles, motor assy.-wing flap, 84 ea., 16 ea., $25,421.

Fairchild Aircraft Division, Fairchild Engine and Airplane Corp., Hagerstown, Md., airplanes, 163 ea., spare parts, special tools, $83,530.

Fairchild Camera & Instrument Corp., Robbins Lane, Syosset, L. I., N. Y., 24-in. lens cone for KA-1 camera, spare parts, 180 ea., 24-in. lens cone for K-17C camera, $1,206,988; lens for K-17C camera, 24 ea., $45,373; lens for aircraft camera, 726 ea., $268,612.

Fischer and Porter Co., Hatboro, Pa., fuel metering equipment, $49,224.

Ford Instrument Co., Sperry Corp., 31-10 Thomson Ave., Long Island City 1, N. Y., components of computer set, 311 ea., $6,782,524.

Gilfillan Bros., Inc., 1815 Venice Blvd., Los Angeles 6, radar trainers, 67 ea., maintenance spare parts, lot, $1,089,148; radar trainers, 36 ea., spare parts, $714,818.

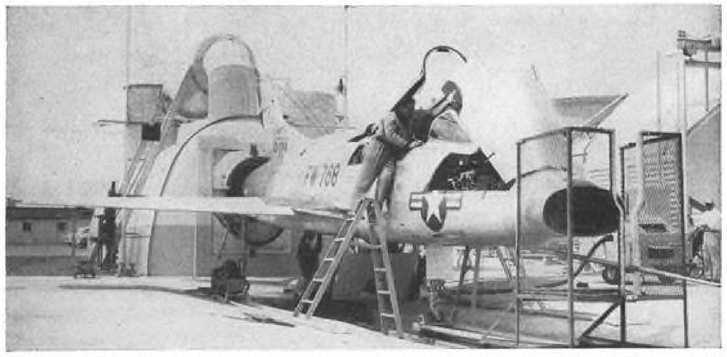
B. F. Goodrich Co., 803-4 Winters Bank Bldg., Dayton 2, wheel assys., 104 ea., 263 ea., 9 ea., $57,936.

Goodyear Tire and Rubber Co., Inc., 1144 E. Market St., Akron 16, wheel assy., 1,000 ea., brake assy., 2,156 ea., $90,553; brake assy., 139 ea., wheel, 144 ea., brake assy., 163 ea., $70,482.

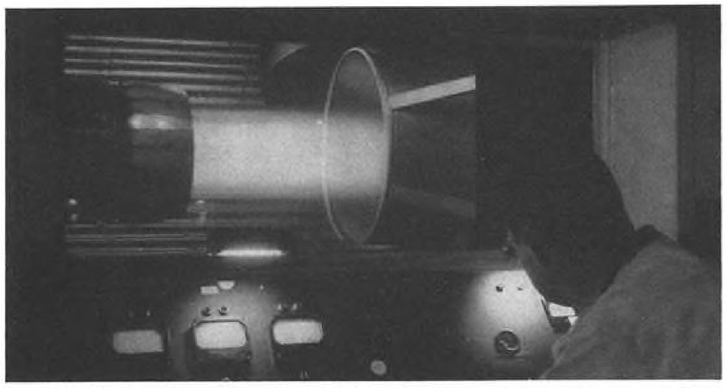
Gordon Enterprises, 5362 Cahuenga Blvd., North Hollywood, Calif., developer, 72 ea., $26,439.

Houston Fearless Corp., 11801 West Olympic Blvd., Los Angeles 64, magazine assy., photographic proc., handbooks, 288 ea., $62,420; spare parts for aerial camera magazine, $73,671.

Link Aviation, Inc., Binghamton, N. Y., trainers, 10 ea., spares, $59,944.



NORTH AMERICAN F-100 tailpipe fits in silencer unit during preflight check.



AFTERBURNER blasts away in sound-abatement chamber as NAA technician watches.

J57 Jet Roar Choked to a Whisper

The shriek and roar of a Pratt & Whitney J57 turbojet engine blasting at full power is choked to a whisper barely audible 250 ft. away by a new silencing chamber installed at North American Aviation's Los Angeles plant.

This chamber, for acceptance testing of J57s that are going into NAA's F-100s, is the largest of three new sound-abatement units at the plant.

► **Steel and Sand**—The chamber has walls 3 ft. thick—⅛-in.-thick corrugated steel plates separated by sand filling.

Only one other aircraft manufacturer in the U. S. is said to use similar construction for sound deadening.

Installed in the engine test unit is a device which automatically samples air in the chamber for critical mixtures of unburned fuel and oxygen. Another installation supplies water fog to combat fire.

A 45-ft. water-cooled muffler also reduces sound level. An automatic water ring sprays 480 gal. of the liquid into the pipe each minute.

► **Plane Units**—The other two new units in the NAA sound abatement facilities are for ground operations of the F-100, also use similar test chambers and silencing systems. Tailpipe of the plane fits into an opening in the unit and is surrounded by a nearly soundproof asbestos collar.

Each of the three new units can be dismantled, moved or modified with minimum time and expense, NAA reports.

Lycoming Div., Avco Mfg. Corp., 550 Main St., Stratford, Conn., engines, 227 ea., $5,756,720; engines, 161 ea., spare parts, tools, $5,405,050.

Magnavox Co., Ft. Wayne, Ind., radio compass, 4,000 ea., $3,945,889.

Glenn L. Martin Co., Baltimore, repair of B-57 airplanes, class coding of spare parts, storage of spare wings, 2 ea., $96,567.

Minneapolis-Honeywell Regulator Co., 2600 Ridgway Rd., Minneapolis, components of autopilot, $2,751,536.

North American Aviation, Inc., Los Angeles International Airport, Los Angeles 45, mobile training units, 2 sets, $720,000.

Piasecki Helicopter Corp., Morton, Pa., spare parts for overhaul of helicopters, $2,500,000.

Remler Co., Ltd., 2101 Bryant St., San Francisco, Calif., frequency modulation panels, 30 ea., voltage regulator panels, 180 ea., frequency modulation panels, 180 ea., $29,287.

Renwar, Inc., 50 Church St., New York 7, engineering and construction hankbooks, miscellaneous changes, $184,779.

Westrex Corp., 111 Eighth Ave., New York 11, sound recorders, 12 ea., $69,420.

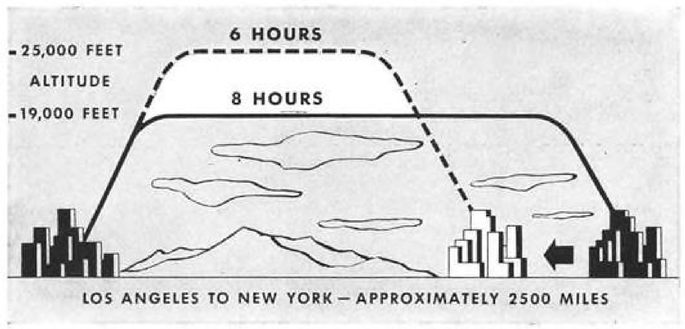
TOMORROW'S AIRCRAFT: *One step closer*

Jet pods give aircraft new speed and range ...greater utility

Westinghouse J34's—podded and slung under the wings—give the U. S. Navy "Neptune" extra speed and reduce the take-off run. On missions, they can give the extra margin of power to get on target faster and away quicker. Drag is less and performance even better than anticipated.

The record of the J34 shows it well fitted for such auxiliary use. It has been proved in tough operational service; has advanced to a 720-hour overhaul life; performed up to 56,000 feet; withstood severe battle damage; and is quick to install and easy to maintain. The J34 history shows progressive design changes and performance improvements to its present highly developed state giving the best specific fuel and weight characteristics available in its class.

Westinghouse aviation engineers are ready to give you a wealth of information on the use of J34's to achieve extra speed, range, and endurance for both military and commercial operational requirements—a ready-made opportunity to bring tomorrow's aircraft . . . One Step Closer. Westinghouse Electric Corporation, Aviation Gas Turbine Division, P. O. Box 288, Kansas City, Missouri. J-91017



Tomorrow's Aircraft Brings Cities One Step Closer. The dotted line shows how J34 pods can help aircraft reach optimum altitude faster, maintain more efficient cruise control, and retain extra margins of economy in time and distance. En route time can be drastically reduced; as, for example, the Los Angeles to New York run which might be cut as much as 25%. J34 auxiliaries can give these advantages to aircraft currently in use or planned for future requirements.

Jet Propulsion • Aircraft Electrical Systems and Motors • Airborne Electronics • Wind Tunnels to Plastics

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

Westinghouse

Navy Contracts

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

A.A.A. Engineering Co., Sawyerville, Ill., ordnance ground handling equipment, 325 ea., $40,105.

Aircraft Radio Corp., Boonton, N. J., signal generator, $176,386.

American Electrical Appliances Corp., 1060 Washington Ave., Bronx 56, N. Y., galley, $28,718.

American Pipe and Steel Corp., P. O. Box 191, Alhambra, Calif., buoy, seaplane mooring, spider assy., $44,897.

Breeze Corp., Inc., 700 Liberty Ave., Union, N. J., lead assy., $121,303.

Buffalo Arms, Inc., P. O. Box 1005, Station D, Buffalo 10, N. Y., hydraulic charger, 1,398 ea., $49,070.

Chicago Aerial Survey Co., 1980 Hawthorne Ave., Melrose Park, Ill., viewfinder assy., dehydrator assy., motor, $28,037.

J. A. Dubow Sporting Goods Corp., 1907 Milwaukee Ave., Chicago, aviator's leather jackets, 2,095 ea., $37,689.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., modification kit, 5,000 ea., $26,250.

Federal Mfg. and Eng. Corp., 199-217 Steuben St., Brooklyn 5, N. Y., signal generator, 90 ea., $104,573.

General Electric Co., 1405 Locust St., Philadelphia 2, generator, regulator and voltage, $431,960; services and material for modification of aircraft generator drive equipment, 2 pr., $31,457.

Greer Hydraulics, Inc., 454 Eighteenth St., Brooklyn 15, N. Y., test stand heater, $192,125.

Grumman Aircraft Engr. Corp., Bethpage, L. I., N. Y., maintenance parts for aircraft, $208,127.

Hiller Helicopters, 1350 Willow Rd., Palo Alto, Calif., "life of type" spare parts for H-23 helicopter, $1,249,770; various kits, $125,848.

Industrial Hard Chrome Plating Corp., 1401 Park Ave., Emeryville, Calif., services and material necessary to chromium plate engine cylinders, 9,000 ea., $299,250.

Pacific Airmotive Corp., 2940 N. Hollywood Way, Burbank, Calif., test stand, aircraft fuel, $84,214.

Pacific Div., Bendix Aviation Corp., 11600 Sherman Way, N. Hollywood, Calif., accumulator, 342 ea., $48,299.

Palmer Mfg. Co., 3790 Ridge Rd., Cleveland, ordnance ground handling equipment, 50 ea., $64,450.

Rubbercraft Corp. of America, Inc., 151 Orange Ave., West Haven 16, Conn., raft, 685 ea., $137,575.

George Senn, Inc., 2200 E. Westmoreland St., Philadelphia 34,, thinner, 65,615 gal., $44,596; 73,615 gal., $51,255.

Skyline Clothing Corp., 424 Central Ave., Peekskill, N. Y., flying suit, 3,385 ea., $34,189.

Sprague Engr. and Sales Corp., 1144 W. 135th St., Gardena, Calif., calibrator; fuel, 1 ea., $41,600.

Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill., transmission and governor assy., $1,301,698.

Superdraulic Corp., Somerset, Ky., pressure switch, 1,285 ea., $38,550.

Thompson Products, Inc., 23555 Euclid Ave., Cleveland 17, fuel pump, 300 ea., $118,086.

Transomatic Corp. of America, Rte. 12, Flemington, N. J., link assy., 53,794 ea., $30,663.

Van Brode Milling Co., Inc., Clinton, Mass., accessory kit, $546,576.

Vickers, Inc., 1400 Oakman Blvd., Detroit 32, maintenance parts used on pumps, $30,653; hydraulic motor assy., 69 ea., $26,355; valve and diaphragms, $66,782.

Weston Hydraulics, Ltd., 10918 Burbank Blvd., North Hollywood, Calif., valve servo, 88 ea., $62,355.

Pacific Airmotive Corp., 2940 North Hollywood Way, Burbank, Calif., overhaul of regulators and valve assys., 141 ea., $42,000.

Fast Computer Handles Fluctuating Data

- **NBS digital unit solves 'real-time' problems.**
- **Two 40-ft. vans house Dyseac, power supply.**

A versatile new highspeed digital computer called Dyseac, developed by the National Bureau of Standards for the Defense Department, is designed to handle such "real-time" problems as the control of air traffic at an airport terminal. The new computer has been turned over to the Signal Corps for undisclosed use, possibly in connection with the Army's Nike missile installations.

The new computer is housed in a 40-ft. trailer, with a second 40-ft. trailer providing the required power supply and general storage and work area. When powered by a third mobile unit, containing two 50-kw. diesel generators, Dyseac can be operated in a completely isolated area.

▶**More Versatile Seac**—Dyseac employs basic circuit techniques similar to those used in Seac (National Bureau of Standards Eastern Automatic Computer), but is designed to handle dynamic real-time problems involving continuous communication with outside dynamic systems.

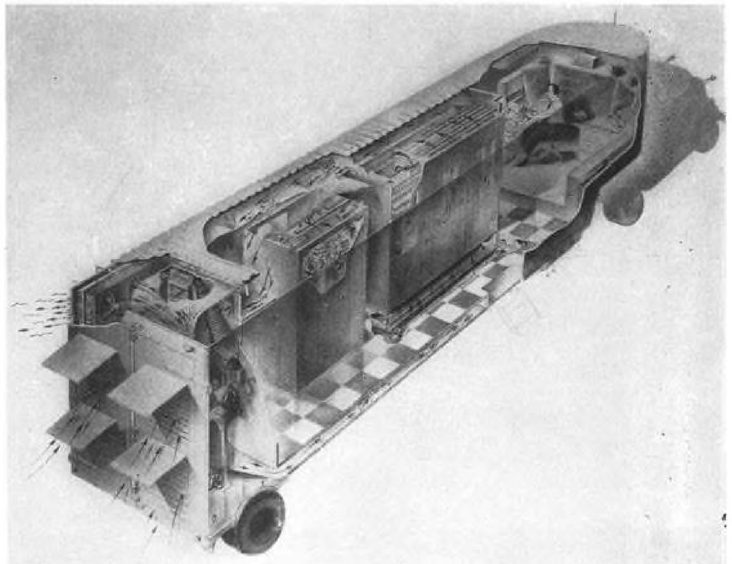
For instance, Dyseac can be used to control operations in an "automatic factory," serving as a control element in a generalized feedback loop. In one experimental run, Dyseac was connected up to Seac, so that the two machines cooperatively worked on the same problem. Seac did the preliminary data processing, then passed its results on to Dyseac which further processed the data. During the intervals when Dyseac was waiting for Seac to transmit additional data, it worked on an entirely different task, NBS reports.

▶**Logical Design Features**—NBS cites three general properties which endow Dyseac with its control versatility:

• **Concurrent operation.** The new computer can transfer information from its internal memory to and from external devices without interrupting its computing operations.

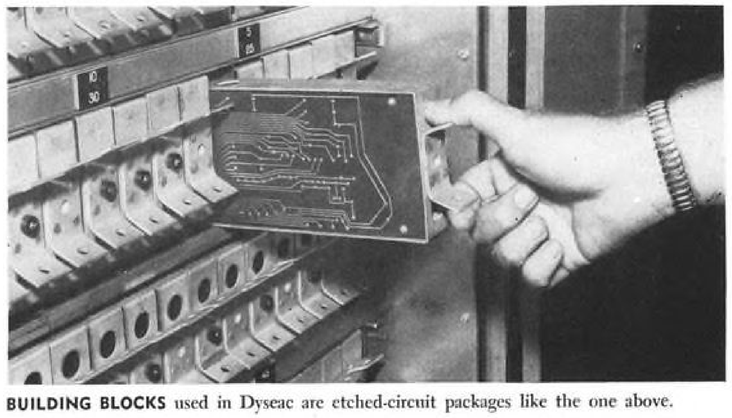
• **Self-regulation.** The machine automatically adjusts its working pace to the speed (possibly irregular) at which external operations that it is controlling are taking place.

• **Interruptibility.** The machine's work



TRAILER carries Dyseac digital computer developed by National Bureau of Standards.

OPERATOR AT CONSOLE may insert instructions into computer by teletypewriter.



BUILDING BLOCKS used in Dyseac are etched-circuit packages like the one above.

LEADERSHIP DEMANDS CONSTANT ACHIEVEMENT

Now Flying! World's Fastest Propeller-Driven Airliner

Lockheed's Turbo-prop Super Constellation

Nearly 100 miles an hour faster than any propeller airliner now in service. This powerful new Super Constellation, equipped with American-designed and built Pratt & Whitney T-34 turbo-propeller engines, is now flying for the U. S. Navy. Its tests promise new speed, new performance, and greater economy potentials in the transport aircraft field. This new transport, Model 1249, is another example of Lockheed transport leadership. Watch for important news about this turbo-prop Super Constellation.

Lockheed *Aircraft Corporation, Burbank, California, and Marietta, Georgia*

LOOK TO LOCKHEED FOR LEADERSHIP

program can be interrupted whenever necessary to permit a wide variety of special orders to be injected into the program either by the machine operator or by external devices.

► **Dyseac Characteristics**—Like Seac, the new machine operates at a basic repetition rate of 1 mc., operates in the binary system, serial fashion, using a 45-digit (including sign) word length. Other machine characteristics:

• **Instruction system:** Three address systems, which gives the location of two numbers to be operated upon, and tells where the result is to be stored.

• **Internal memory:** Acoustic delay lines, giving minimum capacity of 512 words, with maximum access time of 384 microseconds. By adding seven more cabinets of storage, 4,096-words capacity can be achieved. Machine provides for automatic parity-digit check of storage accuracy.

► **Machine Performance**—Here are performance rates which NBS gives for the new computer:

• **Addition-subtraction:** 0.9 milliseconds.

• **Multiplication-division:** 3.0 milliseconds.

• **Comparison:** 0.7 milliseconds.

► **Standardized Circuits**—In designing the new machine, NBS was able to reduce the number of basic circuits to only two types, which with minor modifications, are used throughout. These two basic circuits are built on etched-circuit plug-in packages.

The computer itself employs 524 tubes and 21,000 germanium diodes. Another 360 tubes and 3,100 diodes are used in the internal memory of the machine.

Four three-ton air conditioning units are installed in the trailer vans to dissipate computer heat.

—Philip Klass

Navigation Package

Lightplane VOR "Omniplexer," announced by Narco, converts its Simplexer (12-channel) VHF communications set into an omnirange navigation receiver. New VOR adaptor, which plugs into existing receptacle on the Simplexer, weighs 2.75 lb., costs $195. Omniplexer provides conventional left-right course indicator, which also serves as a "to-from" indicator at the flip of a switch. Address: National Aeronautical Radio Corp., Ambler, Pa.

Expansions Reported For Avionics Industry

Convair has announced plans to construct a $100,000 building at San Diego for electronic computer research, one of several recently disclosed avionics industry expansions. The new 5,200-sq. ft. Convair building, slated for completion early in 1955, will adjoin the company's new engineering building.

Other recent avionic industry moves include:

• **American Gyro Corp.,** Santa Monica, has moved to new enlarged quarters at 3030 Nebraska Ave. The new three-story building provides 20,000 sq. ft. of factory and office space.

• **Brush Electronics Co.,** division of Clevite Corp., has purchased the assets of the Digital Instrument Co., Coral Gables, Fla., manufacturer of electronic counters. Meryl C. Burns, former president of the Florida firm, will serve as manager of Brush's digital instrument department, with headquarters at 3405 Perkins Ave., Cleveland, Ohio.

• **Radio Receptor Co.,** Inc., New York, has changed the name of its Selectron & Germanium division to the "Semi-Conductor division," better to identify its expanded range of products.

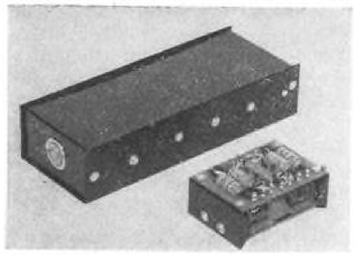
• **Cook Electric Co.'s** electronic systems division has moved to a larger plant at 2533 N. Ashland Ave., Chicago, which doubles previous working area.

Makers Report New Magnetic Amplifiers

Two new high-performance, 400-cycle push-pull magnetic amplifiers for use with proportional valves or servo motors that require three to 30 watts are among recently announced devices suitable for servo system use.

One of the new mag amplifiers, Model XEG52A, available from Minneapolis-Honeywell's Aeronautical Division, is rated at three watts, weighs eight oz. and occupies 10 cu. in. The other, Model XEG64B, rated at 30 watts, weighs two lb. and occupies a volume of 40 cu. in.

Either can be driven to full output from a one milliamp signal provided by a submin tube or transistor. The units



BIG AND SMALL: M-H mag amps.

can be cascaded for microwatt signal-level operation without a tube or transistor pre-amp. M-H quotes a delay constant of five milliseconds. Company address: 2600 Ridgway Road, Minneapolis 13, Minn.

Other new servo system components recently announced:

• **Miniature magnetic clutches** and brakes, with response time of six milliseconds, are available in three types: single clutch, double clutch and clutch brake. Units are designed for maximum torque of 16 oz. in. and for intermittent duty speeds to 1,000 rpm. through operating temperature range of —65 to 165F. Moment of inertia of input shaft is 0.30 oz. in.², for output shaft, 0.21 oz. in.². Single clutch weighs 0.8 lb., double clutch weighs 1.5 lb., and clutch brake weighs 1.2 lb. Manufacturer is Ford Instrument Co., 31-10 Thomson Ave., Long Island City 1, N. Y.

• **Frequency differential,** Type FC-15-A-1, designed to provide an output whose frequency is equal to the excitation frequency plus or minus the speed of the input shaft. The new size 15 frequency differential is designed for a primary excitation of 10 v., 1,000 to 5,000 cps., with a 1.6 transformation ratio between primary and secondary windings. With primary excitation of 2,000 cps., and a shaft speed of 100 rps., carrier suppression is greater than 34 db., according to manufacturer. Clifton Precision Products Co., Inc., Marple at Broadway, Clifton Heights, Pa.

• **Penny-size servo components,** including motors and synchros now are available in production from the Kearfott Co. Typical servo motor, measuring ¾ in. dia. x 1⅛ in. long, has no-load speed of 6,500 rpm., stall torque of 0.1 oz. in., weighs 1.2 oz. Penny-size synchro transmitters, control transformers and differentials, weighing 1.75 oz., have maximum error limits of 10 min. of arc, company says. Kearfott Co., Inc., 1378 Main Ave., Clifton, N. J.

• **Magnetic amplifier,** Type R6G10W1, for 60 cycle use, delivers 10 watts reversible phase output with reversible phase a.c. or reversible polarity d.c. input. For more information, write to Polytechnic Research & Development Co., Inc., 202 Tillary St., Brooklyn 1, N. Y.

FILTER CENTER

▶ DME Looking Up—Civil DME's chances for co-existence with the military Tacan system are looking up, according to observers close to the Vortac committee, set up to resolve the controversy.

▶ **Transistor Handles 5 Amp.**—New germanium junction transistor capable of handling up to 5 amp. (collector current) has been developed by Minneapolis-Honeywell. New P-N-P alloy-junction transistor, identified P-11, is expected to have a Class A power rating of 35 watts. Frequency response and gain are approximately the same as the lower-powered 2N57 transistor, M-H reports. Experimental quantities should be available within 90 days.

▶ **New Twist**—Improved model of Lear's electric servo (motor driven, magnetic clutches) will be used in a production guided missile, replacing previously used hydraulic actuators and reversing a recent trend to hydraulics. By using new techniques, Lear has been able to boost further the response of its fast-acting servo used in the F-5 autopilot on the F-84F, F-86D.

▶ **Poor-Man's GCA Booming**—Both Laboratory for Electronics and Gilfillan Bros. report the sale of undisclosed quantities of their new low-cost GCAs, with considerable interest evidenced by state and local civil aviation groups. (Because of keen competition, neither will yet identify purchasers.) Gilfillan says it expects to demonstrate its first unit in October.

▶ **New Pressure Ratio Indicator**—Boeing will equip its B-25s with a newly developed Minneapolis-Honeywell pressure-ratio indicator, designed to give pilot a cockpit indication of engine thrust. Device will measure engine inlet and tailpipe pressure, present a visual indication of the ratio. Observers say device is particularly important for aircraft using twin-spool engines where one compressor may be operating near stall conditions, and pilot unaware of it.

▶ **Ads Tell Tales**—Avionics industry people find display ads in the trade press and newspapers give good leads as to what the competition is planning. For instance, recent ads for engineers in New York papers indicate that:

• **Burroughs Corp.**, business machine manufacturer, plans to develop airborne digital computers for bombing, navigation, fire control, flight control, and automatic-landing and return-to-base systems, marking its first large-scale entry into the avionics field. The ad also indicates further expansion of the role of airborne digital computers.

• **Hughes Aircraft** is developing ground-based and mobile radar and computer systems, a new field for the company.

• **Link Aviation** is seeking digital computer engineers, suggesting that the company plans to develop a universal-type digital computer for its flight simulators which could be easily adapted to a wide-range of aircraft types.

▶ **Come and Get 'Em**—Texas Instruments, first producer of high-temperature silicon transistors, reports that production is currently running close to 500 per day and that it has removed earlier restrictions on maximum quantities to individual purchasers. By end of the year, company expects to be making 1,000 silicon transistors a day.

▶ **Talking VOR on Test**—Melpar's gross-error indicator—often called "talking VOR"—which gives an aural indication of airplane bearing to a VOR station accurate to within 5-10 degrees, is undergoing test at CAA's Technical Development Evaluation Center in Indianapolis. A second unit will soon be installed for evaluation in a Wilcox Electric TVOR in Kansas City. Although the device is intended primarily as a rough check on VOR receiver accuracy, it can provide navigation information to lightplanes equipped only with a VHF receiver.

▶ **Avco Forms Research Lab**—Avco, whose Crosley Division is heavily engaged in avionics, is reportedly setting up an avionics research lab in the Boston area to be headed by John Marchetti, former technical director of the AF Cambridge Research Center.

▶ **Carlton to Magnavox**—Barry Carlton, chairman of the Defense Dept.'s Advisory Group on Reliability of Electronic Equipment (AGREE), is leaving to become general manager of Magnavox's Government Products division in Ft. Wayne, Ind. —PK

Avionics Bulletins

New technical bulletins and booklets describing devices and techniques of interest to persons in the avionics field include:

• **Master air data computers**, which can be built up from standard units to provide a variety of input data for fire control systems, (8 pp.). Servomechanisms, Inc., Westbury, L. I., N. Y., or El Segundo, Calif.

• **Precision servo components**, including variety of amplifiers, gear boxes, for building-block type construction of servo systems, (Catalog). Link Aviation, Inc., Binghamton, N. Y.

• **Instrumentation** for a variety of measurement problems is described in new 24 page catalog available from Consolidated Engineering Corp., 300 No. Sierra Madre Villa, Pasadena 15, Calif.

FINANCIAL

Plane Sales Give NAL Record Net

Aircraft and equipment deals produce capital gains that push profit to peak despite operating cost rise.

An interesting forerunner of 1954 air transport results may be afforded by National Airlines' recently released report of record annual profits. National and Delta-C&S are the only trunk airlines reporting on a fiscal year basis as of June 30. The official Delta-C&S report is not available as yet.

National's reported net profit of $4,465,743, or $4.42 per share, for the fiscal year ended June 30 set an all-time high in its history, comparing with $4,034,468, or $3.99 per share, in 1953.

▶ **Sale Profits**—The bulk of the carrier's profits for fiscal 1954 were realized from the sale of aircraft and other equipment.

Actually, current operating earnings were lower than for the 1953 period. This is indicated by net profit from operations of $1.4 million after provision for all taxes for fiscal 1954, compared with $2.1 million for 1953 and $1.5 million for 1952.

Capital gains from the sale of equipment aggregated nearly $3.1 million after taxes for 1954 and represented some 69% of the year's total net earnings. Capital gains also were important for 1953, amounting to $1,963,086 after taxes.

▶ **Less Taxes**—Conservative accounting in handling tax items reduced National's 1954 reported net income by $380,000, or 38 cents a share.

NAL, for income tax purposes, is amortizing its new airplanes at 80% of cost over a five-year period in keeping with its certificates of necessity. However, a seven-year period is being used for amortization purposes in stockholder and other public reports.

This has resulted in the provision for income taxes for the year of $1,906,500, substantially less than the net income before taxes would indicate. Accordingly, when the flight equipment has been amortized fully for tax purposes, the taxes will be larger than the net income before taxes will then indicate.

The provision of $380,000, made by a charge against income for the year ended June 30, 1954, will be used to reduce the provision for increased income taxes in future years after the flight equipment has been amortized fully for tax purposes but not fully depreciated on the records.

Of course, this reserve may not be required for tax purposes at some future time if, for example, further equipment expansion by National requires continuing high depreciation charges in subsequent years. In this respect, this reserve may be said to represent a surplus "cushion."

In any event, the stockholders' equity is best served by providing for such tax reserve until the contingency of its utilization is no longer present.

▶ **Lower Earnings**—Lower operating earnings indicated by the company are in keeping with the industry's trend thus far this year. Significantly, along with the industry experience, National has encountered lower operating earnings in the face of a new peak in revenues.

Operating revenues for fiscal 1954 were $38.8 million, a new high and an increase of 18% over 1953's $32.9 million. Passenger revenues accounted for $34.5 million, or 89% of the total. The big increase was generated by air coach, with revenues from this source up 61% while first-class revenue declined 2%.

Narrowing profit margins resulted from the increase in the volume of coach traffic as this served to reduce the overall yield per passenger-mile to 5.05 cents in 1954 from 5.14 cents in 1953.

Operating expenses reached $35.8 millions, up 23.6% from the previous year. The company attributes a substantial part of this increase to the nonrecurring costs of introducing its new DC-7s and Convair 340s but concedes "the rising cost trend remains the outstanding problem confronting the air transport industry."

▶ **Higher Book Value**—Considerable improvement in NAL's financial position also has been achieved during the past fiscal year. Book value increased 28.6% to $18 million, or $17.82 per share at July 30, 1954, from $14 million, or $13.85 a year earlier. Five years prior, on June 30, 1949, book value per share amounted to only $6.20, revealing an almost threefold increase in the interim.

Regular quarterly distributions of 15 cents per share were maintained throughout the fiscal 1954 period.

The re-equipment program during 1954 resulted in net cash expenditure of about $10.5 million. After giving effect to disposition of older equipment (from which the material capital gains were realized), the new equipment acquisitions resulted in increasing the net operating property account to more

than $26.1 million, compared with $15.8 million June 30.

The new equipment acquisition program resulted in a sharp reduction of working capital to $572,225 as of June 30, 1954, compared with $6,335,717 a year earlier. However, the most recent figure was after inclusion of current installments due on longterm debt. The next payment of $546,000 is not due until Mar. 31, 1955.

Moreover, management reports that depreciation generates about $350,000 in cash monthly. (The importance of airline cash generation from depreciation was indicated in AVIATION WEEK Aug. 30, p. 51.)

▶ **Reduced Debt**—Bank debt was reduced to $9,816,000 June 30 from its onetime peak of $12 million. A final payment of $534,000, scheduled for June 30, 1959, is slated to extinguish this longterm debt.

The increase in the net worth position and the reduction in book loans has served to bring the airline's debt ratio down to 35.2% on June 30, as contrasted with 53.5% Oct. 31, 1952—its highest point.

National completed its new equipment acquisition program. This was represented by the four DC-7s and eight Convair 340s. In August 1954 two other 340s were purchased and added to the fleet. This new equipment, plus new hangar and shop facilities occupied under long-term lease in New York and Miami, are expected by management to increase utilization and reduce costs. —Selig Altschul

Aviation Facilities Win Tax Writeoffs

The following firms have been issued certificates of necessity for accelerated tax amortization for new or expanded facilities by the Office of Defense Mobilization:

Bell Telephone Laboratories, Inc., Whippany, N. J., research and development of electronics, $168,833.

United Aircraft Corp., Hamilton Standard Division, Windsor Locks, Conn., research and development of aircraft components, $1,175,340.

Rem-Cru Titanium, Inc., Midland, Pa., titanium and titanium-alloy mill products, $12,775,000.

Hamilton Manufacturing Co., Hamden, Conn., aircraft parts, $100,000.

Western Electric Co., Winston Salem, N. C., military electronic equipment, $572,616.

Pittsburgh Plate Glass Co., Cumberland, Md., precision plate glass for military end items, $23,600,000.

Fairchild Engine & Airplane Corp., Fairchild Aircraft Division, Hagerstown, Md., military cargo airplanes and spare parts, $61,404.

Caval Tool & Machine Co., Newington, Conn., aircraft parts, $40,702.

Douglas Aircraft Co., El Segundo, Calif., aircraft and related parts, $40,059.

Croname, Inc., Chicago, electronic parts, $18,344.

United Aircraft Corp., Pratt & Whitney Aircraft Division, East Hartford, Conn., aircraft engines, $580,000.

AVIATION SAFETY

CAB Report on PAA 377 Incident Over Pacific

Prop Unbalance Tore Out Engine

THE ACCIDENT

The No. 4 engine and propeller of N 90947, a Pan American World Airways Boeing 377, tore from the aircraft after little warning at 1236,[1] Dec. 6, 1953. The flight was about halfway to Wake Island from Honolulu, T. H., cruising at its assigned altitude of 10,000 feet. Control was regained after losing considerable altitude and the flight diverted to Johnston Island. None of the 35 passengers and seven crew members was injured.

HISTORY OF THE FLIGHT

Flight One/05 departed San Francisco International Airport at 2048, Dec. 5, 1953, on a scheduled flight to Tokyo. The first intermediate stop was to be Honolulu, and the second Wake Island.

The flight arrived Honolulu at 0613, Dec. 6. No malfunctions of the aircraft were experienced between San Francisco and Honolulu. Except for routine servicing and inspections during the stop at Honolulu, no work was needed. Flight crews were changed.

The flight departed Honolulu International Airport at 0847 under an approved IFR-type flight plan but in Visual Flight Rules weather. There were 35 passengers and a crew consisting of Capt. E. G. Kelley, First Officer L. B. Newby, Second Officer F. M. Kelley, Flight Engineer W. J. Foster, Purser M. J. Finney, Stewardess P. Lux and Steward E. E. Moore. Gross weight of the aircraft at takeoff was 139,440 lb. (maximum allowable 144,900 lb.). The load was properly distributed with relation to center of gravity limits.

The flight was routine until 1235, three hours and 48 minutes after departure, when the crew felt an unusual vibration. At the time, the flight was in clear weather and smooth air. The vibration built up rapidly and within a minute culminated in an explosive noise and violent jolt. The aircraft went out of control in a right descending turn accompanied by violent buffeting. The flight was as 20.4° North Latitude and 174.4° West Longitude, almost exactly halfway between Honolulu and Wake. The nearest land was Johnston Island, about 350 nautical miles to the southeast.

Capt. Kelley had left the cockpit sometime earlier. First Officer Newby who was occupying the right seat noted the vibration. He immediately ordered all propeller spinners checked, disconnected the automatic pilot, and flew the aircraft manually. Control surface boosters were not turned on after the automatic pilot was disconnected.

The flight engineer and second officer (who was navigating) checked from B compartment, forward of the cabin, but did not observe any of the engines running roughly or propeller spinners wobbling. The flight engineer returned to his station and attempted to detect the trouble; none of the engine instruments showed abnormal readings and he was unable to isolate the source of the vibration.

At the first sign of abnormal operation the captain hurried back to the cockpit. As he reoccupied the left seat, he glanced over his shoulder at the flight engineer's panel to see if he could detect the trouble. No. 4 engine and propeller fell away at that moment; simultaneously, violent buffeting began.

The steward had come forward to report unusual vibration in the galley and saw a flash of fire as No. 4 engine left; he and the second officer called to the flight engineer that No. 4 was gone.

The buffeting continued during the diving turn to the right. The master fire warning light came on and the fire warning bell sounded; there was no further evidence of fire thereafter, so CO_2 was not used. Power was reduced on the left engines. Full left aileron and rudder tabs were rolled in. Wing flaps were extended about 15 degrees to reduce buffeting, but were found ineffective; they were therefore retracted. The combined efforts of both pilots were used to apply full left aileron and rudder, but the right wing would not come up. At this time, ditching appeared imminent.

In an effort to raise the right wing and bring the aircraft under control, the captain ordered fuel dumped from No. 4 tank. The aircraft continued to lose altitude while 2,500 lb. of fuel were dumped, and control was eventually regained. Altitude was temporarily stabilized at 3,700 feet, then the aircraft again settled slowly until the power and air speed combination was found which would arrest descent and still permit control with the least buffeting. Heading was controllable within 20 degrees at 145 knots indicated airspeed and descent was checked at 2,300 feet.

The first officer had been able to transmit a "Mayday" shortly after the engine and propeller tore out. A little later, before descent was arrested, he reported their position to Honolulu and advised the purser over interphone to prepare the passengers for a water landing. Steps had already been taken by the cabin attendants, in accordance with company emergency procedures, to assist passengers in preparation for ditching.

From time to time, Honolulu was advised of progress in coping with the emergency. At 1245 the flight advised Honolulu they were attempting to reach Johnston Island.

The Search and Rescue organization was immediately alerted after the "Mayday." Two aircraft were dispatched from Honolulu and an Air Force aircraft left Johnston Island. Interception was made at 1418 by the Air Force aircraft approximately 140 miles northwest of Johnston Island. Surface craft in the vicinity of Johnston Island were

[1] All times referred to herein are Greenwich Civil Time and based on the 24-hour clock.

alerted as the flight approached.

The flight was able to maintain 2,300 feet to Johnston Island and landed at 1532, two hours and 56 minutes after the engine and propeller fell free.

INVESTIGATION

Weather was not a factor in this accident. The forecast was for clear weather throughout, with scattered cumulus along the course well below flight level. The crew stated that no adverse weather was encountered, and turbulence was light.

Since there was a malfunction in the No. 4 power package, followed very quickly by failure which caused the engine and propeller to rip out, the investigation was centered on ascertaining the nature of the malfunction and reason for the failure.

Investigation by the Board and testimony given by engineers from Pan American, Boeing Airplane Co., and Hamilton Standard Propeller Div. disclosed that loss of the engine and propeller could have been caused by (1) failure of the engine mount, (2) sudden stoppage or seizure of the engine, (3) an unbalanced or otherwise defective propeller, or (4) a combination of these. Since the engine and propeller fell in deep water and could not be recovered, there was no opportunity to examine them.

During investigation of the first possibility above, it was found in examination of the No. 4 engine mount that the top portion of the engine mount ring was missing. Laboratory examination of the remainder of the ring, an attach fitting, and a portion of a buckled support tube did not reveal any evidence of fatigue failure. This study showed that all fractures apparently had been caused by loads in excess of the design strength. From examination of these pertinent parts and the engine mount in general, it appeared that separation of the engine from the aircraft was downward and to the right.

Loss of No. 4 engine exposed to the airstream the large flat plate area of the fire wall to which the oil cooler remained attached. This created drag and buffeting of such proportions that control could not be regained until dumping of fuel from the No. 4 wing tank made it possible to raise the wing.

The fuselage skin on the right side above the lounge door was damaged by a piece of engine cowling. The skin was abraded, with a slight amount of buckling. There was a triangular tear approximately 8 sq. in. in area at Station 806, just forward of the window above the door. Three circumferential members and three stringers in this area were damaged, but there was no structural failure. There were two small tears in the top skin of the right wing at Stations 213 and 219; the tears were $1\frac{1}{4}$ and $2\frac{3}{4}$ in. long.

Regarding the second possibility—that of sudden engine stoppage or seizure—investigation disclosed that there have been no known cases of this type aircraft in which an engine has torn from an aircraft, even at high rpm., as a result of sudden stoppage.

Investigation of the third possibility, that of propeller failure, revealed that the engine mount on this aircraft showed several points of similarity with another mount from which No. 1 engine was wrenched out in flight. In this comparative case, a B-377 of another carrier over Glenview, Ill., on

Jan. 25, 1950, the engine and propeller were recovered and it was found that a propeller blade failure had occurred, causing the engine to fall free.

In another case, a Pan American B-377 landed at New York International Airport on Mar. 29, 1951, after unusual vibration was experienced in flight. After landing the No. 1 engine was found drooped in the nacelle and No. 1 propeller had lost 12½ inches of one blade. There have been two other B-377 cases in which the engine and propeller were not recovered for study, but their engine mounts showed points of similarity with the mount in the Glenview incident.

Pan American officials stated that the hollow blade steel propeller, which has been installed on all B-377s, has given good service and their maintenance and inspection procedures have followed practices recommended by the manufacturer. From time to time, the propeller manufacturer and the carrier have felt it desirable to adopt more exacting inspection and blade rework procedures. Following this accident, in cooperation with Hamilton Standard, Pan American instituted more stringent procedures for operation, inspection, and maintenance of the hollow blade steel propellers installed on its B-377 aircraft.

The hollow blade steel propeller, by the nature of its construction, is susceptible to external damage and therefore requires exacting inspection and maintenance.

A nickel-plated hollow steel blade for B-377 aircraft, manufactured by Hamilton Standard, was certified by the CAA for air carrier operation on Sept. 14, 1953. This blade, while slightly heavier owing to the plating, has shown promise in being considerably less subject to damage by foreign objects such as stones and debris. It is of the same design as the unplated blade, but improvements have been incorporated in it to lessen or eliminate other difficulties, such as corrosion.

Presently, there is no solid-type propeller blade available for B-377 aircraft.

The company, the aircraft, and the crew

Learstar 'Haircut'

On 300-mph. Learstar twin-engine business planes, apertures between fixed and movable wing and tail surfaces are closed against drag-producing airflow by special nylon brushes. The company has found that the most practical way to trim these brushes to proper depth is by using a barber's electric hair clipper, as shown in the above photo.

of the plane were all currently certificated.

ANALYSIS

As the engine and propeller could not be recovered for study, it was not possible to determine beyond question the cause of malfunction and failure; however, investigation of previous accidents of this type and the evidence in this instance indicate strong possibility of propeller blade failure. This was based on the character and duration of vibration, study of the engine mount, and the probability that engine seizure or engine mount failure could be eliminated as causes.

It has previously been noted that Pan American adopted more stringent requirements following this accident for operation, inspection, and maintenance of the hollow blade steel propellers. In addition to this, the carrier decided to retire the unplated hollow steel blades in favor of replacement with the nickel-plated type, since it was felt that the new blade would give better service. This program of replacement started early in 1954, and the carrier anticipates that replacement on its B-377 fleet will be accomplished during 1955. In the meantime, the improved procedures relative to the hollow steel blades will remain in effect.

Pan American has also been testing several vibration pickup units, the purpose of which is to give early warning of excessive vibration in a powerplant. This permits the flight engineer or pilot to identify the malfunctioning engine or propeller and to take it out of operation by feathering the propeller before serious damage occurs. The results of this testing program have proved promising and the carrier plans early installation of such units on its aircraft. A similar unit to detect unusual amounts of vibration in the powerplant is being developed by Hamilton Standard.

The Board wishes to commend the crew for the efficient manner in which they handled a most difficult situation. The immediate transmittal of distress signals, the preparation of passengers for possible ditching, and the dumping of fuel, as needed, were all accomplished with praiseworthy precision.

FINDINGS

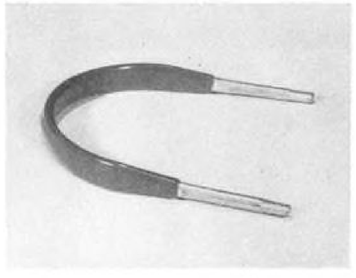
On the basis of all available evidence the Board finds that:

1. The carrier, the aircraft, and the crew were currently certificated.
2. The gross takeoff weight of the aircraft upon departure from Honolulu was less than the maximum allowable and the load was properly distributed.
3. Flight One/05 to Wake Island was routine until 1235, three hours and 48 minutes after departure from Honolulu, when an unusual vibration was noted.
4. Vibration built up rapidly and within the next minute, No. 4 engine and propeller tore from the aircraft while the flight was at its assigned altitude of 10,000 feet.
5. Control of the aircraft was temporarily lost during a right descending turn, accompanied by violent buffeting.
6. Dumping of fuel from No. 4 tank permitted control to be regained after losing 7,700 feet altitude.
7. The flight diverted to Johnston Island, landing at 1532, two hours and 56 minutes after loss of the engine and propeller.
8. Intercept aircraft were dispatched by the Search and Rescue organization and one escorted the flight into Johnston Island.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was a propeller blade failure resulting in an unbalanced condition which tore No. 4 engine from the mount.

By The Civil Aeronautics Board:
Chan Gurney
Harmar D. Denny
Oswald Ryan
Josh Lee
Joseph P. Adams



Clamp Resists Acid

Plastic coating gives this aircraft clamp resistance to acids and greases, the maker notes, also an ability to withstand heavy abuse. It is built to Boeing specifications. Quantity production of the new clamp is underway at Universal Metal Products, Inc., Alhambra, Calif.

RESULTS OF AN INTELLECTUAL REVOLUTION . . .

"The Western Miracle" Continues . . . More Automatic Controls for Industry

Within recent weeks three new monthly technical magazines devoted to automatic control systems for industrial processes and machinery have offered the public their first issues. One of these is CONTROL ENGINEERING, a McGraw-Hill publication.

What has caused this surge of interest in the design and application of automatic control systems? What does it portend for the future of American industry? More important, what does it promise for the American standard of living, of which industry is and must be the servant? And what is the role of CONTROL ENGINEERING in this development? It is to those questions that this statement is addressed.

A New Intellectual Revolution

It is frequently asserted that we are now in the throes of a new industrial revolution. The revolution is described as the eliminating of wasteful applications of human labor to repetitive tasks through new technology which makes it possible to transfer those tasks to automatically controlled machinery.

It is perhaps more accurate, however, to say that we are the beneficiaries of a new intellectual revolution in the application of science to industry. This new intellectual revolution points the way toward giant strides in the continuing process of taking dull and laborious work off the backs and minds of men and transferring it to machines operating in large batteries under automatic control.

The practical engineering work required to convert this intellectual revolution into a full-scale industrial revolution, however, in large part still remains to be done. It is to this task that CONTROL ENGINEERING will be devoted. Its role is that of bridging the gap, in engineering and economic terms, between the new conceptions of automatic control of industrial processes and their practical workaday application. These conceptions run the full gamut from systems of control for automatic factories making heavy industrial products to highly personalized systems of automatic control to warn people when they are approaching the broiling point in sunning themselves at the beach or becoming too drowsy to drive their cars safely.

Enter the "Feed-Back" System

Enough work has been done to move these conceptions out of the realm of interesting dreams and into the realm of practical possibilities, and in some cases into the realm of practical realities. Crucial parts of this work were done during World War II when weapons were successfully equipped with "feed-back" systems

that automatically corrected mistakes made by the weapons in locating their targets.

The principle of the "feed-back" system is as ancient as the personal monitor that tells us not to run into each other as we walk along the street. It feeds back to our locomotion machinery the warning of a collision ahead. But the application of the principle to weapon control and then to more general machinery control required superlatively imaginative and skillful scientific development.

When a "feed-back" system that monitors an automatic process and keeps it lined up precisely is teamed up with a computing machine, capable of making lightning calculations that control both what goes into the process and what is done with the product, the horizons of automatic control become broad indeed. But in large part they still remain horizons. A vast range of practical engineering work remains to be done to realize anything like the full potential of automatic control of industrial processes and machinery.

More and Better Jobs

There are those who view the surge of interest in automatic control with alarm. They conjure up a situation in which automatic processes will at once expand the ranks of the unemployed and reduce many of those still working in industry to the status of robots or automatons.

A look at the record of the American economy — a record of amazing growth, steadily improving job opportunities and a constantly rising standard of living — demolishes the basis for such fears. The introduction of new and more efficient industrial machinery and processes obviously cannot be accomplished without creating some disturbance for some individuals and some companies. But consistently the longer range effect of such local and temporary disturbance has been more jobs and better jobs for Americans.

It is no accident that, while the proportion of industrial wage earners in our population is virtually the same as it was in 1920, the proportion of professional and salaried workers has doubled. The proportion of unskilled workers, furthermore, has dropped by half. This has been an essential part of a continuing process by which drudgery has been transferred to machines while the workers who formerly did the drudgery have been graduated to jobs calling for greater competence and providing better pay.

Higher Living Standard

A British historian, H. J. Hancock, has referred to this general process as "the Western miracle" — that of providing an ever higher and higher standard of living for more and more Americans. The key element in this miracle has been more and more reliance on power-driven machines to get the day's work done.

In the nature of the extremely complicated apparatus involved, full development of systems which have passed through the "think stage" into the status of practical possibilities will be a time-consuming process. It will also be a very exacting process, calling for a tremendous application of engineering skill and ingenuity. However, the engineers who are concentrating on this difficult, workaday phase of the development of apparatus for automatic control will be inspired by the knowledge that they are making a crucial contribution to technical progress which holds great promise of good for the American people.

This message is one of a series prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments that are of particular concern to the business and professional community served by our industrial and technical publications.

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Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

Loss of Comet Costs BOAC $1.4 Million

But British airline makes a net profit of $2.6 million for fiscal 1954, despite grounding of jet liner fleet.

London—Grounding of British Overseas Airways Corp.'s Comets in the last nine weeks of fiscal 1954, ended Mar. 31, cost the airline $1.4 million.

Total revenue loss due to the Comet grounding is estimated at $2.8 million, but this is offset by $1.4 million in operating costs not required during the grounding.

▶ **Serious Shortage**—Disclosing the fact that BOAC made a net profit of $2.6 million after interest and taxes on an operating profit of $5.6 million, Sir Miles Thomas, BOAC chairman, says his airline is facing a serious competitive situation due to the shortage of equipment.

Sir Miles reveals that the loss of the Comet cut the planned seat capacity in the current fiscal year by 21%.

"This situation is daily becoming more acute as international airlines competing with us take delivery of the latest longrange American-built aircraft," he says. "It is imperative that we should maintain our carrying capacity to keep routes open, thus assuring our commercial standing for ultimate reinstatement of the Comets and introduction of the Britannia."

Although it is necessary to acquire more U. S. piston engine planes to close the competitive gap, BOAC's chairman says he has not lost faith in the future of British transport aircraft.

▶ **DC-7C Competition**—In addition to Lockheed Constellations acquired in a swap with Capital Airlines and Boeing Stratocruisers purchased from United Air Lines and Pan American World Airways (AVIATION WEEK Sept. 6, p. 74), BOAC may be forced to buy the longrange Douglas DC-7C to meet PAA's competition in nonstop trans-Atlantic service.

The corporation now is committed to $140 million for British gas turbine transports.

BOAC already has paid $15 million for the Comet 1 fleet and, by the end of the fiscal year, had paid $13 million to de Havilland for Comet 2s and 3s under construction.

The bulk of BOAC's commitments is $67 million for turboprop Bristol Britannias, compared with a total plan of $42 million for Comets. A BOAC subsidiary bought four turboprop Vickers for West Indian service.

▶ **Comet Investigation**—Future of the Comet will be clear after the British public inquiry that is scheduled to open Oct. 19.

Supply Minister Duncan Sandys recently made a statement that the technical investigation made by the Royal Aircraft Establishment and de Havilland has yielded "clear and positive" results. This is a tip that the causes of the Comet crashes no longer are unknown.

Technicians here believe a structural beefup of the aircraft will be required, along with more stringent certification requirements for future turbine transports. Sandys indicated the Comet beefup will not involve fundamental redesign.

A modified Comet incorporating the changes will be tested soon at Farnborough.

▶ **Best Year**—Despite the Comet losses, which also are bound to affect seriously the fiscal 1955 financial picture, BOAC enjoyed the best year in its history. For the first time profits were sufficient to require payment of British income and profits taxes, both about $1 million.

In contrast to the general trend of rising costs for airline operations, BOAC cut operating costs while increasing gross revenue. The total revenue increased $6 million to $64 million, while operating costs were cut one cent per ton-mile.

Passenger traffic increase 4.9% to 304,000 persons averaging 3,000 mi. per flight, indicative of the British airline's longhaul operations.

Aircoach service accounted for the bulk of the passenger gain, increasing to 35% of the total of BOAC's business, compared with 13% last year.

▶ **64.5% Load Factor**—Reduction of operating costs enabled BOAC to reduce its break-even load factor from 66% to 63%. This year's load factor was 64.5%.

Before being grounded, the Comet was averaging a 79% load factor, compared with a 61% average for other BOAC aircraft.

BOAC showed an operating profit of $5.6 million compared with $288,000 last year.

▶ **No Subsidy**—Sir Miles says BOAC has met its capital interest charges and substantially reduced its deficit during the last three years.

The airline has not received a government exchequer-type of subsidy since 1952, although the Civil Aviation Act of 1946 envisioned subsidy through 1956.

BOAC is negotiating to dispose of its fleet of Handley Page Hermes transports and estimates a loss of nearly $6 million in this sale.

The British carrier for the first time notes a postwar pilot shortage and cites difficulties in recruiting pilots and engineering officers outside the corporation. —RBH

Rails Gird for All-Out Mail Fight

Battle to block new inroads by airlines may be carried before Congress, the courts and into CAB hearings.

By Katherine Johnsen

Railroads are launching a determined fight to block further inroads into the shipment of first-class mail by air. The outlook is for the battle to be carried to the courts and Congress, as well as to Civil Aeronautics Board.

▶ **Blow by Blow**—The latest developments in the air-rail fight for three-cent mail:

• CAB authorized over rail opposition a year's extension to Oct. 1, 1955, of the experimental program of shipping three-cent mail by air, when plane space is available, between New York, Chicago, Washington, D. C., and Florida.

Rates of 16.88 cents a ton-mile for service to and from New York and 20.04 cents for service to and from Washington and Chicago were continued.

• A formal proceeding to reconsider the rates was ordered by the Board. If new rates are determined as a result of the proceeding, says CAB, they are to become effective at the end of the extension period or "on such prior date as may be fixed."

• Seventy-two railroads will try to establish at the proceeding that the cost to the Post Office of the air service is substantially higher than rail service (AVIATION WEEK Sept. 20, p. 19).

Post Office takes the position that the overall cost of the two services is the same. Although the "transport" cost for air shipment is about double

that of rail shipment, Post Office maintains that its overhead cost is higher with the rail operation.

• An airline drive for higher rates—after Oct. 1, 1955—for air shipment of surface mail undoubtedly will be opposed by Post Office at the proceeding.

Present rates are less than half the 45 cents a ton-mile the carriers received for airmail shipped on the same flights with the surface mail.

• A court test on the legality of air shipment of surface mail is in prospect. The railroads will attempt to have their charge that air shipment of surface mail is in violation of both postal law and the 1938 Civil Aeronautics Act considered at the formal proceeding ordered by CAB.

The Board's order, however, appears to limit this proceeding strictly to the rate question. The railroads can be expected to turn to the only alternative, the courts.

▶ **Resolving the Issue**—Meanwhile, Commerce Undersecretary for Transportation Robert Murray is attempting to resolve the issue. A six-member panel of the Transportation Council, Commerce Department's industry advisory group, is completing a study of the effects of the shipment of first-class mail by air on the transportation industry.

Their findings and recommendations are scheduled for action by the 67-member council, headed by C. H. Beard, general traffic manager of Union Carbon and Carbide Corp., at a meeting on Oct. 14. The council reports to Murray.

It is doubtful that the panel, including both airline and railroad representatives, will reach any unanimous decisions. It is composed of: Dr. John Frederick, professor of transportation, University of Maryland, chairman; Myles Robinson, Air Transport Assn.; Herbert R. Brand, Association of American Railroads; A. B. Rosenbaum, American Trucking Assn.; L. H. Writso, Greyhound Corp., and A. G. Anderson, Socony-Vacuum.

▶ **Trucking Position**—Trucking interests can be counted on to support airlines in the fight over first-class mail business.

Large trucking firms, interested in the shipment of second, third-and fourth-class mail, raise the same argument as the airlines: they can give better service to Post Office and the public at comparable or cheaper rates.

A report made for American Trucking Assn. by John Redding, former Assistant Postmaster General, maintained that all longhaul first-class mail should go by air and all shorthaul first-class mail should move by truck.

▶ **Rail Contentions**—Railroads' case that shipment of first-class surface mail by air is illegal is based on three points:

• Postal law sets a rate of three cents an ounce for first-class surface mail and a six-cent rate for airmail; the Post Office Department has no authority to ship mail on which only the three-cent rate has been paid by air. CAB has abetted the Post Office in violating postal law, the railroads say.

• The Civil Aeronautics Act does not provide for voluntary transport of mail by air carriers, on a "take it or leave it" basis. If mail is to be shipped on a voluntary basis, it is argued, chaos could result.

• CAB set rates for the air shipment of surface mail without considering the standards laid down in the Civil Aeronautics Act for determining rates to be paid air carriers for mail shipment.

▶ **Congressional Arena**—The air-rail fight appears destined to erupt in Congress early next year.

Trans World Airlines' vice president Thomas Taylor has urged CAB and Post Office "to lend their support" to legislation authorizing the shipment of all first-class mail by air. With this backing, he anticipated, "Congress may well be receptive."

IATA Urges Navaid Coordination

Committee says airlines can help win government aid by keeping required ground systems to bare minimum.

By Frank Shea, Jr.

Paris—Governments will be inclined to look more kindly toward development of increased navigational facilities and services over the world's air route network if the airlines make a concentrated effort to keep required ground systems to a bare minimum consistent with safety and efficiency.

This prediction was made by the International Air Transport Assn.'s technical committee at the organization's recent general meeting here.

▶ **Uniform Transition**—To meet this challenge, the committee reports, IATA technical groups will make every effort to bring airlines into agreement on uniform operational requirements for airborne equipment on the basis of whole routes or regions and develop schedules of transition from old to new communications and navigational systems.

The committee emphasizes that in certain circumstances airlines stand to gain both technically and economically by purchasing modern airborne equipment as soon as possible.

Delay on the part of one airline in giving up an obsolete ground aid can pose serious problems for other carriers concerned, the group says, because governments seldom can afford to maintain two types of ground installations indefinitely on any given route.

▶ **Signs of 'Fruition'**—This kind of effort by the airlines already has helped greatly in implementing a continental system of controlled air routes and related navigational aids in Europe, as well as developing adequate air traffic control procedures for certain European airports, according to the report.

Other IATA efforts to bring about early introduction of VOR navigational aids in Europe and integrating them with existing MF aids are now showing signs of "fruition," the committee says.

It cites the number of VOR installations already in service, adding that several other countries have announced plans for installation of others.

But three long-standing problems of European operations still remain unsolved, despite long consideration, the technical group says. These are:

• More efficient radio telephony.

• Coordination of civil and military air operations.

• Standardization of altimeter setting procedures.

▶ **Growing Need**—The present high-frequency radio telephony system in the region is not adequate to fill the growing need as it comes into more widespread use by an increasing number of airlines and military units in Europe, it is reported.

IATA has recommended certain measures to alleviate "outstanding" difficulties, and these are being considered by International Civil Aviation Organization and individual governments. But the committee says a more extensive analysis of the whole regional system is a "must."

▶ **Perennial Problems**—More effective coordination of operations of civil airlines and those of military forces to prevent interference with each other is becoming an ever-increasing problem, the group reports.

ICAO and IATA have argued the seriousness of this requirement at highest possible levels, with "first indications, at long last, that the importance of the problem has been recognized and will be dealt with by military authorities."

The other "hardy perennial" problem, lack of agreement among European countries on uniformity of altimeter setting procedures for aircraft operations, may be getting somewhat closer to solution.

The committee says refusal of certain states to accept a system recommended by ICAO is the present bottle-

Trippe Looks Over Viscount, V-1000

LONDON—Juan T. Trippe, Pan American World Airways' president visited Vickers-Armstrongs, Ltd., on his recent trip to England to take a first-hand look at both the Viscount and the sweptwing V-1000 jet transport.

Belief is that he is weighing the possibility of introducing the turboprop Viscount over PAA's medium-haul Caribbean routes, presently served by Convair 240s and Douglas DC-6Bs.

Such a sale by Vickers to Pan American would be a severe blow to Convair especially, since it would represent a significant victory for Vickers in the competitive rivalry that has developed between the two companies since the Viscount was introduced.

Trippe's interest in the V-1000, however, is considered purely academic at this point, because first production models of the aircraft are slated for the Royal Air Force—with a commercial version not expected before 1958-1960.

It is considered indicative however, of PAA's intensive policy of keeping abreast of technical developments that might in any way influence the trans-Atlantic competitive picture.

Thus far, the U. S.-flag carrier has been keeping itself pretty well covered on jet transport developments with an order in for three de Havilland Comet 3s, a program of intensive evaluation on the Boeing 707, and now a study of the V-1000.

While full details of the V-1000 are classified, observers believe it will be a strong contender in the transport field if it lives up to its performance specifications.

Powered by four Rolls-Royce Conway bypass engines that deliver about 11,000 lb. thrust, it is expected to cruise in the 600-mph. range while carrying a 90-100 passenger load.

At present the sweptwing V-1000 mockup is undergoing completion.—FS

neck, with choice of altimeter setting procedures still left to individual countries.

▶**Turbine Fuel**—Turning to the airlines' search for an ideal turbine fuel for jet and turboprop aircraft, the technical committee reports that IATA's turbine fuel working group is receiving encouraging cooperation from all carriers, fuel companies and aircraft and engine manufacturers.

The "ideal" turbine fuel is defined as one "which would have the lowest possible cost consistent with other requirements, be no less safe than kerosene, be generally available at the airports of the world—preferably as a product already marketed for other users, insure reliable and economic engine operation under all conditions applicable to civil air operations and have as high a heat content per gallon as practicable."

▶**Future Needs**—"Up to now," the committee says, "manufacturers have been presenting us with high-performance aircraft and engines for which it was necessary to develop high grade and costly fuels.

"Looking into the future, we are endeavoring to present manufacturers with a specification for a cheap turbine fuel we desire to use—as a common user, not an exclusive customer to be highly taxed—so that manufacturers will design engines and aircraft for the fuel we want.

"Without this approach, jet engines would stand to consume an even higher proportion of your operating costs than piston engines have up to now."

▶**Proper Balance**—There are indications of a need for greater concentration in future on problems of airline pilots, the committee reports.

"The three vital elements of a flight operation can be referred to as the man, the machine and the environment; and a proper balance in the development of these components is proving essential for aviation progress," it is noted.

"Hence, our investigation of man should keep pace with our examination of technical and operational factors."

▶**Tailored to Fit**—While they were simple exploratory exchanges of views between airlines, without formal reports or recommendations, IATA discussions of pilot training during the technical conference at Barcelona last May revealed there is a high degree of uniformity in training standards. Differences in training practices seem to stem largely from government requirements, many of which demand that excessive time be spent "teaching people to pass government examinations, rather than in meeting the true practical standards required by the operation."

The IATA committee says these training programs must be tailored to fit the individual needs of each airline, the carriers can do themselves a most useful service in "opposing and attempting to curb excessive government regulations: Flexibility of training is essential to insure safety of operation, since changes occur so rapidly in aviation and excess government regulations can impede this flexibility, and hence, impede safety."

▶**Continuing Campaign**—Recommendations for new licensing rules for mechanics that may help reduce "the surfeit of licenses" required of airline personnel have been made to ICAO, the committee reports, as part of a continuing campaign to make better use of the ground engineering staff of the airlines.

The IATA proposals urge adoption of the idea that responsibility for proper maintenance and overhaul should be vested in the airline itself as a state-approved maintenance organization, without the need for licensing individual workers within the organization—except for those who actually will certify the aircraft for release from maintenance.

Stockholder, ALPA Fight Tiger Shutdown

Los Angeles—A Flying Tiger Line stockholder has filed suit to prevent the company from abandoning the airfreight business.

In Washington, D. C., meanwhile, Air Line Pilots Assn. is trying to intervene in Civil Aeronautics Board's consideration of Tigers' withdrawal in favor of Slick Airways, proposed after the two airlines failed to complete their merger (AVIATION WEEK Sept. 27, p. 14).

▶**Stock Investment**—Carev E. Bowles of New York, owner of 350 shares of Flying Tiger common stock, filed the injunction suit in the U. S. District Court, Southern District of California, shortly after the airline announced its intention to go into the plane-leasing business.

Bowles charges that thousands of stockholders have invested in FTL on the understanding that the company's business was development of the immense potential of airfreight. Abandonment of valuable good will, name and of the increasing potential airfreight business will cause a substantial decrease in the value of large portions of FTL's fixed assets, he says.

▶**'Drastic Change'**—Bowles' complaint says FTL's threatened withdrawal relinquishes a valuable right and asset of the company because of the fact that it leaves Slick as the major airfreight line in the U. S.

It further states that Tigers' plan to lease its aircraft to Slick "constitutes a drastic change in the purpose for which said aircraft were acquired and are held and utilized by the company."

The stockholder also claims FTL officers and directors permitted Tigers and Slick, "without prior Board approval and in violation of the Civil Aeronautics Act, to pool and exchange large volumes of traffic and airfreight—resulting in the giving of a large net volume of business by FTL to Slick . . . which is believed to be in excess of $5 million worth of airfreight business."

He asked the court to hold the Tiger officers personally accountable for the alleged loss of assets and income.

▶**Pilot Protest**—In Washington, ALPA petitioned CAB for the right to intervene to protest the interests of pilots of the two airlines.

"To approve the agreement between the two air carriers without adequate provision for the preservation of the right of pilots and co-pilots will foment labor disturbances," the union says.

Tigers and Slick broke off their merger because the labor provisions of the consolidation agreement might cost as high as $6 million and would result in bankruptcy. Neither ALPA nor the Slick union, Slick Independent Airways Assn., would agree to relief from this provision.

SYMBOLIC of JAL's spreading wings is new DC-6B handed over to Yoshita Kojima (second from left) vice president-American Division, by Leo A. Carter, Douglas official.

JAL Plans Tokyo-Brazil Flights

Japan Air Lines took delivery on its fourth DC-6B last week and immediately made plans to start service from Tokyo to Sao Paulo, Brazil, via San Francisco and New Orleans.

M. Araki, director of civil aviation bureau of the Japanese Ministry of Transportation, told AVIATION WEEK there have been delays in setting final plans for the service because of the political situation in Brazil, but that it is hoped scheduled operations can start next April.

▶**New Routes?**—Araki, who spent two weeks in Washington discussing another JAL project—extension of service from San Francisco to Los Angeles, says that as soon as the fifth DC-6B is delivered, the airline may start looking in directions other than the Pacific.

An inaugural flight to Brazil is scheduled this week—a good will mission to honor the 400th anniversary of the founding of Sao Paulo. Katsuo Okazaki, Japanese Foreign Minister, will head a group of dignitaries on the initial flight.

▶**Traffic Goal**—The Japanese airline, now two-thirds owned by the government and one-third by private interests as a result of increasing capitalization from $5.5 million to $9.1 million, had a load factor of 62.5 for the three months June-July-August. This compares with 20% for February, the first month of operations.

Araki says the company needs a 70% load factor to break even, since it receives no government subsidy. He hopes this figure will be reached in the next fiscal year beginning Apr. 1.

The Japanese aviation official, whose position is equivalent to that of both the Civil Aeronautics Administrator and Civil Aeronautics Board chairman, says the big increase in traffic since February indicates the goal is in sight.

To stress his optimism, he points out that JAL booked 110 passengers from the New York area in August, 150 during the first three weeks of September.

Domestically, JAL has had an almost constant load factor of 80%.

▶**Comet 3s**—Araki says JAL hopes to convert its order for two de Havilland Comet 2s to the Mark 3—for Tokyo-London service, via India.

However, the Japanese official says the airline is more interested at present in making its Pacific service pay off. The company started flying three trips weekly Tokyo-San Francisco with the addition of its fourth DC-6B.

Japan hopes to take over air traffic control from Far East Air Forces within two years, but Araki says he is having quite a problem training personnel. Controllers must use both English and Japanese, because FEAF will continue to use the airways system.

On helicopter service, a natural for Japan, he is not certain. There already is a copter airline, but it has no helicopters. Japan Helicopter Co. is flying a fleet of de Havilland Herons.

AVIATION CALENDAR

Oct. 5-7—Champion Spark Plug Co., 10th annual Aircraft Spark Plug and Ignition Conference, Secor Hotel, Toledo, Ohio.

Oct. 5-9—Society of Automotive Engineers, National Aeronautics Meeting, Aircraft Production Forum and Aircraft Engineering Display, Hotel Statler, Los Angeles.

Oct. 11-12—Aircraft Industries Assn., symposium on titanium parts, Cleveland.

Oct. 13-14—American Assn. of Airport Executives, 1954 conference on airport management and operations, University of Oklahoma, Norman, Okla.

Oct. 14-15—Illinois Institute of Technology and Armour Research Foundation, National Conference on Industrial Hydraulics, Sheraton Hotel, Chicago.

Oct. 14-15—Institute of the Aeronautical Sciences and Canadian Aeronautical Institute, joint meeting, Montreal.

Oct. 17-22—International Union of Aviation Insurers, annual meeting, New York.

Oct. 18-19—American Society of Mechanical Engineers and American Society of Lubrication Engineers, lubrication conference, Lord Baltimore Hotel, Baltimore.

Oct. 18-22—National Safety Council, Aeronautical Section, Conrad Hilton, Chicago.

Oct. 19-20—Seventh annual New York State Airport Development and Operation Conference, Syracuse, N. Y.

Oct. 21-23—American Society for Quality Control, eighth New England conference, Ten Eyck Hotel, Albany, N. Y.

Oct. 23—Airmail Pioneers, division reunion, VFW Club, Elmhurst, Ill.

Oct. 27-29—National Business Aircraft Assn., seventh annual meeting and forum, Hotel Adolphus, Dallas.

Oct. 28-29—Aircraft Electrical Society, 11th annual display meeting, Pan Pacific Auditorium, Los Angeles.

Nov. 1-5—American Welding Society, fall meeting, Sherman Hotel, Chicago.

Nov. 2-19—American University eighth Air Transportation Institute, Washington, D. C.

Nov. 4-5—Airborne and Navigational Electronics, East Coast conference, Sheraton-Belvedere Hotel, Baltimore.

Nov. 8-9—National Aviation Trades Assn., annual convention and meeting, Biltmore Terrace Hotel, Miami Beach, Fla.

Nov. 8-10—Air Industries & Transport Assn. of Canada, annual meeting, Chateau Frontenac, Quebec City.

Nov. 9-12—Air Line Pilots Assn., convention, Sheraton Hotel, Chicago.

Nov. 11-12—Airmail Pioneers, division reunion, Hollywood Roosevelt Hotel, Los Angeles.

Nov. 12-13—National Symposium on Quality Control and Reliability in Electronics, Statler Hotel, New York.

Nov. 14-17—Aviation Distributors and Manufacturers Assn., 12th annual meeting, Mayflower Hotel, Washington, D. C.

Nov. 17-19—California Assn. of Airport Executives, semi-annual meeting, Sainte Claire Hotel, San Jose, Calif.

Nov. 29-Dec. 3—American Society of Mechanical Engineers, Aviation Division, annual meeting, New York.

Dec. 17—Wright Day Dinner, Statler Hotel, Washington, D. C.

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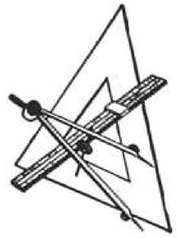

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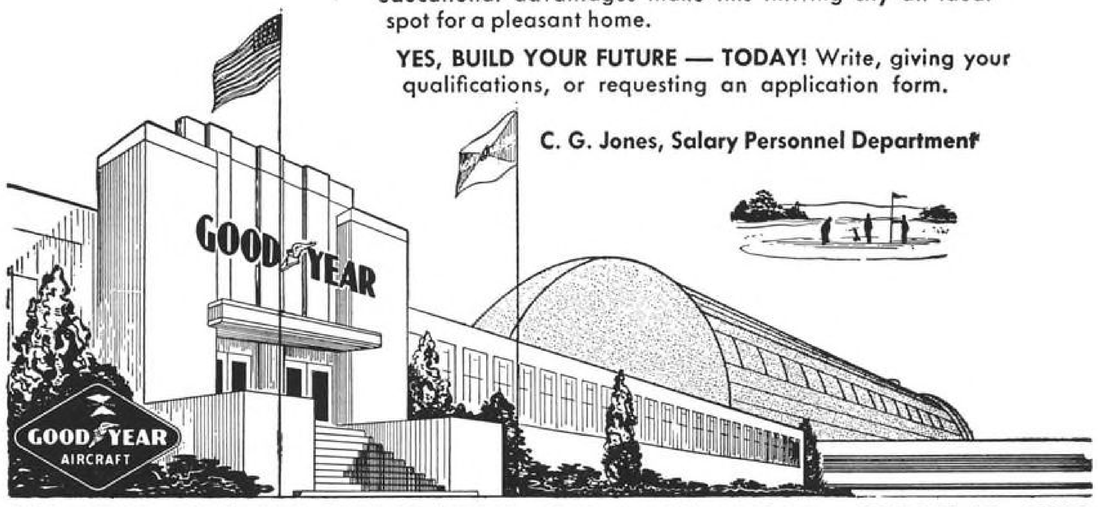

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SALES ENGINEER — Adhesives. Nationally known manufacturer seeks experienced salesman for expanded West Coast activities. Must have sales experience to aircraft industry or equivalent. Permanent. Exceptional opportunity. Please give complete details in first letter. SW-3914, Aviation Week.

POSITIONS WANTED

EXECUTIVE PILOT position desired airline transport rating five years executive flying engineering background mechanics license DC3 Convair 240-340 C46 6000 hrs. Mel 1500 Sel complete resume on request. PW-3825, Aviation Week.

AVAILABLE YOUNG capable power plant engineer and pilot proven ability to solve unusual problems quickly 12 yrs. Aero exp. in design, development, test and procurement. Master of Science Aero. Eng. in power plants. Desires staff position with challenging future. Resume on request. PW-4024, Aviation Week.

CONTRACTS EXPERT desires to make change. B.S. & M.B.A. 14 years experience in aviation, 10 years same company. Have handled all phases of contract negotiation & administration including original cost estimating, writing proposals and brochures, negotiating contract terms & prices, contract follow and financial control, etc. Only Eastern location will be considered. Resume on request. PW-4053, Aviation Week.

SALES ENGINEER—Well qualified and well known in the NW. Formerly a district mgr. for a major manufacturer of aircraft electrical and hydraulic equip. PW-4063, Aviation Week.

NAVY PILOT, 2800 hrs., desires posit. with future. 7 yrs. exp. comm. single, multi-eng instrument ratings. Age 26. 2 yrs college. Married. PW-4068, Aviation Week.

SELLING OPPORTUNITY WANTED

SEASONED SALES executive offers 25 years excellent background in all phases sales & sales management. Ability to develop sales. Capable of organizing or reorganizing present staff. Looking for position with aircraft parts manufacturer or with Airline where top selling ability is required. Five figures salary plus desired. SA-4001, Aviation Week.

FOR SALE

Executive Transport Aircraft. For complete market report of available multi-engine aircraft, including Beech, Convair, Curtis, Douglas, Grumman and Lockheeld manufacture, write or call William C. Wold Associates, 516 Fifth Avenue, New York 36, N. Y. Telephone MUrray Hill 7-2050.

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PW-4030, Aviation Week
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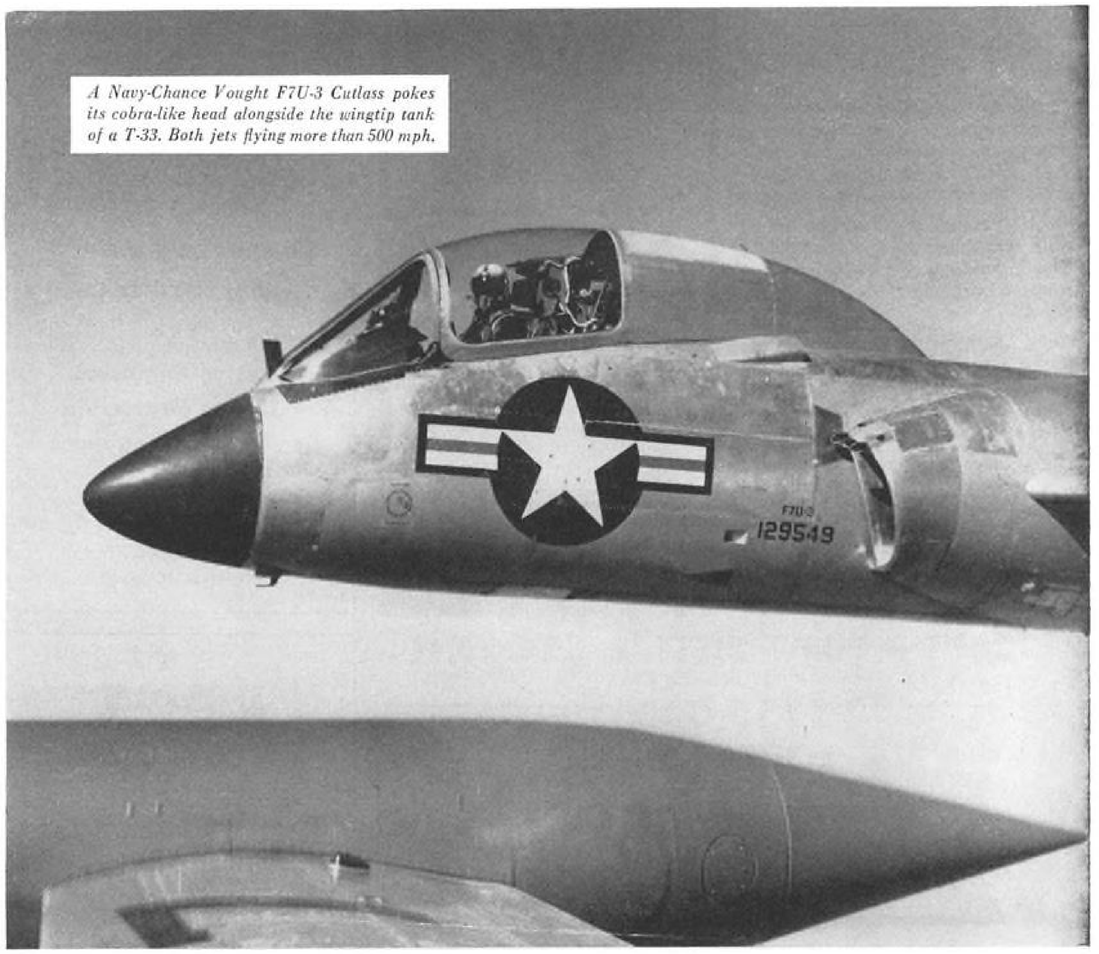

A Navy-Chance Vought F7U-3 Cutlass pokes its cobra-like head alongside the wingtip tank of a T-33. Both jets flying more than 500 mph.

Aerodynamicists have little margin for error

In close formation flying at jet speeds the pilot must depend upon the performance and flying qualities that aerodynamicists have designed into the craft. The more stringent requirements of higher speeds have placed an even greater burden on aerodynamicists in the research and development of an optimum design for the desired level of performance.

The design of the F7U-3 Cutlass shown above, the XF8U-1 Navy Day Fighter, the Regulus guided missile and other advanced projects have created exceptional openings for Aerodynamicists in:

Supersonic missile stability and control
Viscous flow and heat transfer problems
Supervision of aerodynamic field activity

We also have openings for aerodynamicists in control and stabilization systems analysis, performance prediction, high-speed wind tunnel analysis, wind tunnel test engineering, stability and air loads problems, and flying qualities analysis.

Personal interviews will be arranged for qualified personnel. Aerodynamicists interested in these assignments should submit resumes outlining education and experience to:

ENGINEERING PERSONNEL SECTION

CHANCE VOUGHT AIRCRAFT

INCORPORATED

P. O. Box 5907 — Dallas, Texas

COST SUPERVISOR

Must have extensive experience in all phases of metal fabrication costs, preferably in the aircraft industry, and must be a graduate accountant.

Ability to supervise and coordinate work of others important. Starting salary will be based on demonstrated ability in this field.

Qualified applicants are invited to write, including a detailed experience resume—and a small photo if available—to:

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MC DONNELL AIRCRAFT CORPORATION
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Research Engineers
Engineering Designers
Systems Analysts
Electronic Engineers
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Replies to Administrative Engineer will be held in strict confidence

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Excellent opportunity with an established multi-plant organization in the midwest, a pioneer in the jet engine field.

The position requires an ME degree and the ability to carry on advanced design work in the area of fuel augmentation and combustion. Will develop through qualification tests components for new fuel augmentation systems, investigate combustion problems, and design and develop combustion components and systems.

Those engineers looking for a permanent, interesting career in this field should submit complete resumes, including salary desired. All replies held confidential.

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We are not brokers

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Surplus or used aircraft sparkplugs wanted. Highest prices paid for R.B. 19R, 485S2, 5/2, 5/3, 5/4, 5/5, 23R, 27-R, 23, 212S2, 312S2; R.P. 43S; LE 44, 45; L.S. 48; A.C. 181, 281; R.S. 19-2R, 14-1R; R.C. 9R; R2-14-R; R-214; R.N. 5/3; 590S2, 613S2, 63S*, 64S.

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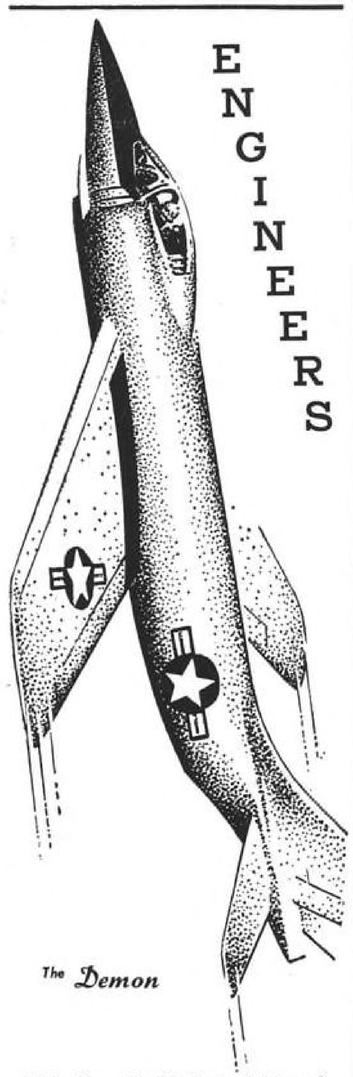
With cargo modifications including heavy floor and cargo door, or modified C-47 with provisions for passengers and cargo. Must be CAA certified and all A.D.'s complied with. Submit complete specs, location and price to

W-3869, Aviation Week
1111 Wilshire Blvd., Los Angeles 17, California

WANTED—Surplus Aircraft Parts
or termination inventories.
Get our cash offer by return mail.
Send lists to:
COLLINS ENGINEERING COMPANY
9050 Washington Blvd. Culver City, Calif.



The Demon

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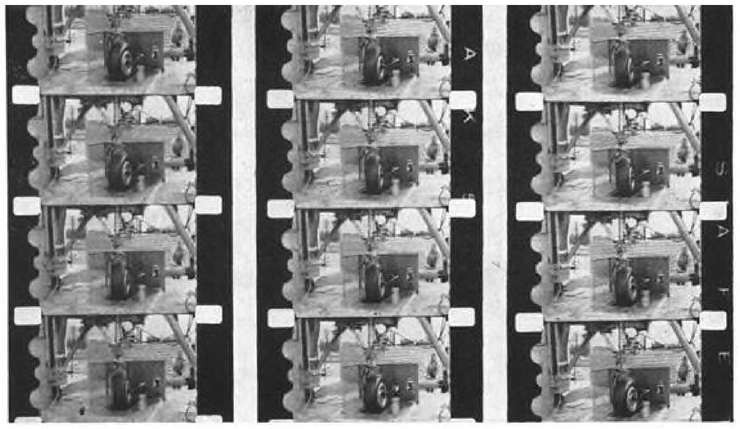


Experimental nose gear is tested on Shimmy Tower. The tower has drum speeds equivalent to 150 mph, frequencies up to 25 cycles per second, shimmy amplitudes up to 10 degrees and handles loads up to 60,000 lbs.

Shimmy Tower speeds Lockheed structures development

Structures Engineers at Lockheed solve shimmy and brake chatter problems in pre-flight testing stages on their unique shimmy tower. The only one of its kind in private industry, the shimmy tower was designed to meet a constantly increasing volume of structures research and development at Lockheed.

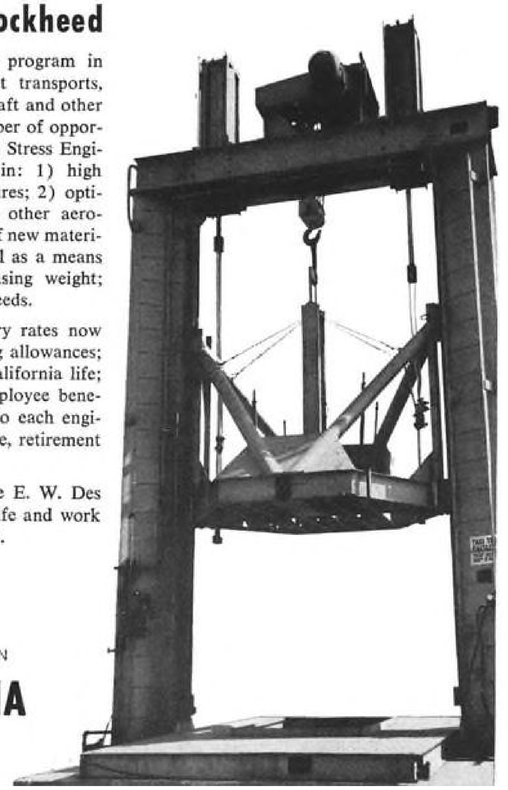
Along with Lockheed's 500,000 lb. force fatigue machine, drop test tower and other static and dynamic test machines, it provides Structures Department Engineers with unmatched research and testing facilities.

Career Openings at Lockheed

Lockheed's diversified development program in nuclear energy, turbo-prop and jet transports, radar search planes, supersonic aircraft and other classified projects has created a number of opportunities for Structures Engineers and Stress Engineers to perform important work in: 1) high temperature and its effect on structures; 2) optimization of thin wing designs and other aeroelastic problems; 3) the application of new materials such as ultra-high heat treat steel as a means of increasing strength while decreasing weight; 4) panel instability at supersonic speeds.

Lockheed offers you increased salary rates now in effect; generous travel and moving allowances; an opportunity to enjoy Southern California life; and an extremely wide range of employee benefits which add approximately 14% to each engineer's salary in the form of insurance, retirement pension, sick leave with pay, etc.

Those interested are invited to write E. W. Des Lauriers for a brochure describing life and work at Lockheed and an application form.



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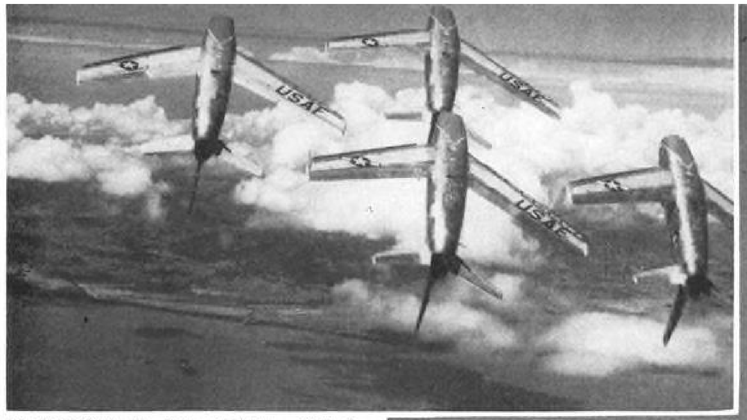


STUNT TEAM, the Sabre Knights, pull their North American F-86Ds over the top of a loop in tight diamond formation.

AF Jet Pilots Try Their Skill On New Planes

FICON TEAM (right) in action: A Republic Thunderstreak fighter scoots low over the ground after dropping from bomb-bay of Convair GRB-36 mother plane.

CONVAIR F-102 production model (below) is towed across Edwards AFB (Calif.) dry lake bed, whose expanse provides a high degree of safety for test operations.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—OCTOBER 4, 1954

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

LETTERS

Praise

I would like to commend you for your courageous editorial stand in the Aug. 9 issue on the American Airlines strike.

It seems to me the Air Line Pilots Assn. in its impatience completely disregarded orderly procedure. In so doing, it showed financial irresponsibility towards its members and callous indifference to the best interests of the flying public. Not only did this irresponsibility inflict much damage on the company, but it has brought the loss of substantial income to the striking pilots themselves. Ironically, many of the pilots are stockholders; as such they suffered further by the harm to their investment.

Moreover, the employment of several thousand of other American Airlines people has been disrupted because of the temporary layoff resulting from the strike. To the aggregation of losses should be added the assessments by the union against the pilots of other lines for so-called strike benefits.

Technological advances have created many new employment opportunities and will continue to do so unless artificial barriers are arbitrarily imposed.

The airline industry has constantly attempted to broaden the market. Nonstop coast-to-coast flights are an outstanding example of giving the public what it wants and thereby increasing air travel. This has been possible within the framework of working conditions as prescribed by responsible government agencies. If management is hampered by short-sighted union practices, the creative genius which has been so prominent in the past will be emasculated.

For the American Airlines management to have acted otherwise would have been an abdication of its duties and responsibilities to the public, all of its employes, and stockholders. For that reason, your editorial recognizing these implications was timely and well put.

A. H. Gordon
Kidder, Peabody & Co.
17 Wall St.
New York 5, N. Y.

He Can't Tolerate It!

Please discontinue my subscription to Aviation Week effective immediately. Needless to say I do not wish to continue to subscribe to a magazine that is completely at odds with the AA pilots.

It is your privilege to think the way you do on the subject, but am greatly disappointed that you would put same in print for all 14,000 of your subscribers to read. Especially when you are so wrong.

William E. Irving, AA
444 East Ave.
La Grange, Ill.

(We are not "completely at odds" with AA pilots; the editorial expressed the opinion that there must have been alternatives to the calling of a strike. We can't believe that Mr. Irving's opinion, refusing to brook any other point of view but his own, is typical of the members of ALPA. Our paid circulation, incidentally, is not 14,000, but approximately 50,000.—Ed.)

World-Wide Deliveries

Our company has accomplished several projects, which we feel might be of interest to your readers. Jack Ford, president of our firm, delivered a de Havilland Otter across the North Atlantic from Toronto to Oslo via Goose Bay, Labrador, BW-1, Greenland, Keflavik, Iceland, and Prestwick, Scotland. Of course, this was not the first single-engine aircraft to cross the Atlantic; however, it was the first from the standpoint of this type of aircraft, as well as a commercial delivery flight.

Another project which we are just in the process of completing is the delivery of eight Convair 340 aircraft from San Diego to Djakarta, Indonesia, for Garuda Airlines. It it interesting to note that the route flown is the long way around: San Diego, New York, London, Cyprus, Sharjah, Colombo, and Djakarta. Even though this route is longer, it is felt that it is more economical and expedient. On this particular flight contract, one crew has made five round-the-world trips in 3 months, the fastest trip being made in 8¼ days from Los Angeles back to Los Angeles.

This is an interesting feat when you consider that as a passenger you can travel around the world today in less time than any previous record round-the-world flight made prior to World War II.

We have delivered two de Havilland Heron aircraft to Canada and expect soon to deliver the first Heron demonstrator with retractable gear to this country. At this moment we are under contract to deliver four B-17G aircraft to Paris for the French Air Ministry.

Frank D. Oergel, Jr.
Director of Operations
Fleetway, Inc.
3022 North Hollywood Way
Lockheed Air Terminal
Burbank, Calif.

No Loss for CAL

Certain members of my management take exception to your lead in the story Aug. 30, "TWA, Braniff, Delta-C&S and Continental lose some points to be served by Ozark and Lake Central." Bartlesville was added to the service between Kansas City and Tulsa. This is in addition to our routes, not a loss.

Stewart Faulkner
Continental Air Lines, Inc.
Stapleton Airfield
Denver 7, Colo.

More on AMC Issue

The issue is another hit for Aviation Week and another great service to the Air Force.

A. A. Arnhym, Colonel, USAF
Special Assistant to the Commander
Air Research and Development Command
Baltimore 3, Md.

Congratulations on the excellence and thoroughness of your special AMC issue. In fact, General McNarney has made it required reading for some of our people, and to that end it is necessary that we acquire some additional copies.

Can you pass this on to the appropriate department with the request that 20 additional copies, and billing for same, be mailed to my attention?

Again, congratulations for a job very well done.

Edward F. Jones
Assistant to the President
Convair
San Diego 12, Calif.

I should like to express my sincere appreciation for the wonderful manner in which you portrayed the activities of the Air Materiel Command.

Narce Whitaker
Colonel, USAF
Commander
Wilkins Air Force Depot
Shelby, Ohio

This will be a fine reference book and I am glad to have a copy of it.

M. P. Ferguson, President
Bendix Aviation Corp.
Fisher Building
Detroit 2, Mich.

It is a welcome addition to our office and will be in frequent demand as a handy reference. . . .

Richard S. Boutelle, President
Fairchild Engine and Airplane Corp.
Hagerstown, Md.

It was very thoughtful of you to send me one of the first copies of Aviation Week's August 16 AMC edition, and I appreciate it. I have found it very interesting.

Fred A. Seaton
Assistant Secretary of Defense
Legislative and Public Affairs
Washington 25, D. C.

Warmest compliments on your "Air Materiel Command Edition," an outstanding issue from every point of view.

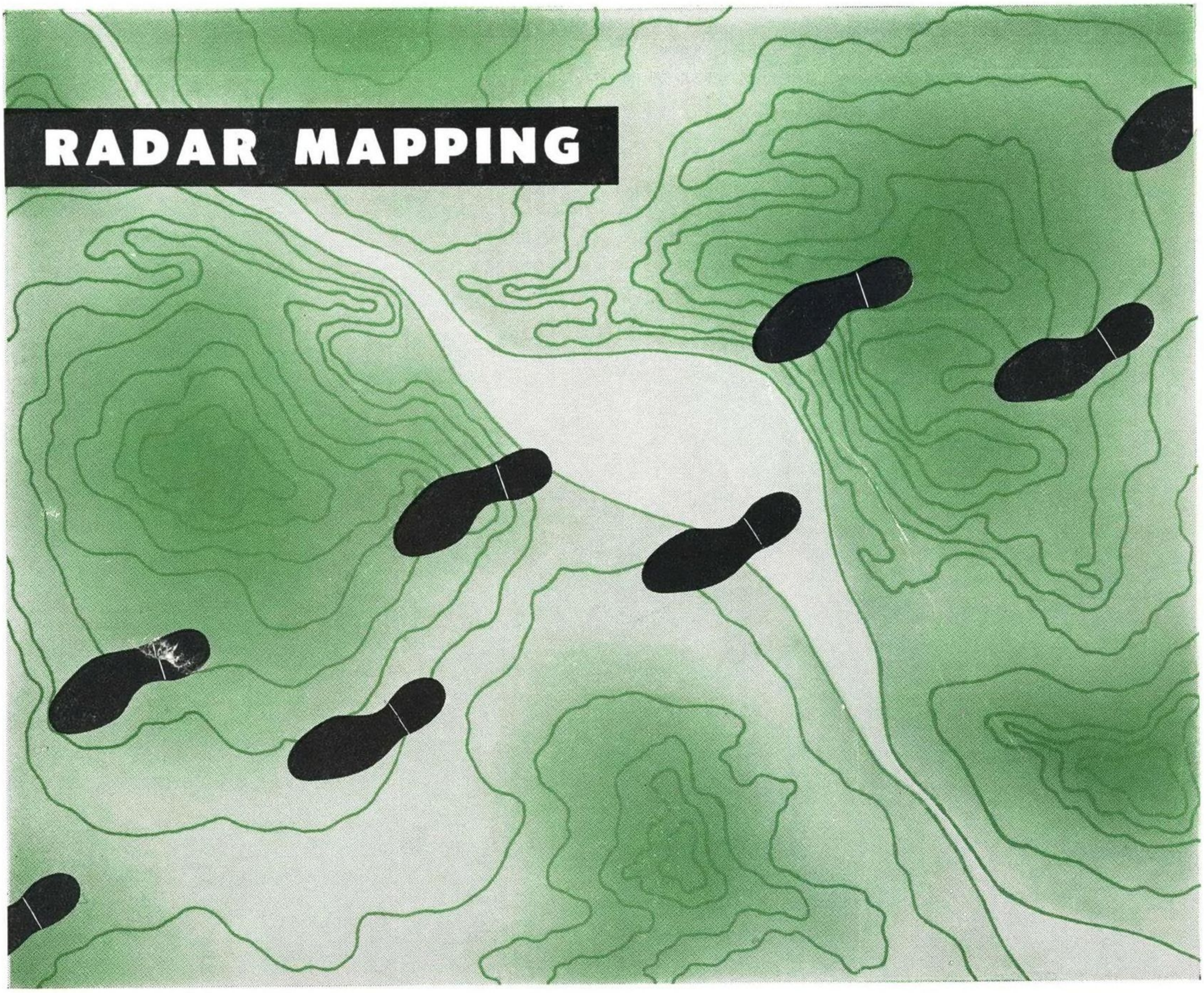
If I were a PIO in the USAF or the AMC, I would bring the edition to the attention of the editors of the Reader's Digest with the suggestion that a treatment drawn from the magazine would give Digest readers an interesting and instructive view of what probably is the most important enterprise in their lives today.

Further, if I were Bob Hotz (and my boss permitted), I would do a thousand-word memo on my contribution, "AMC Streamlines Management Pattern" and use it as a lead to sell the Saturday Evening Post on a Hotz by-liner.

Bert W. Holloway
Director, Advertising
Lockheed Aircraft Corp.
Burbank, Calif.

You and your staff deserve all praise for the issue featuring Air Materiel Command. This is really an outstanding job. . . .

Don Richards, Executive Secretary
Aviation Distributors and
Manufacturers Assn.
1900 Arch Street
Philadelphia 3, Pa.



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