AVIATION WEEK

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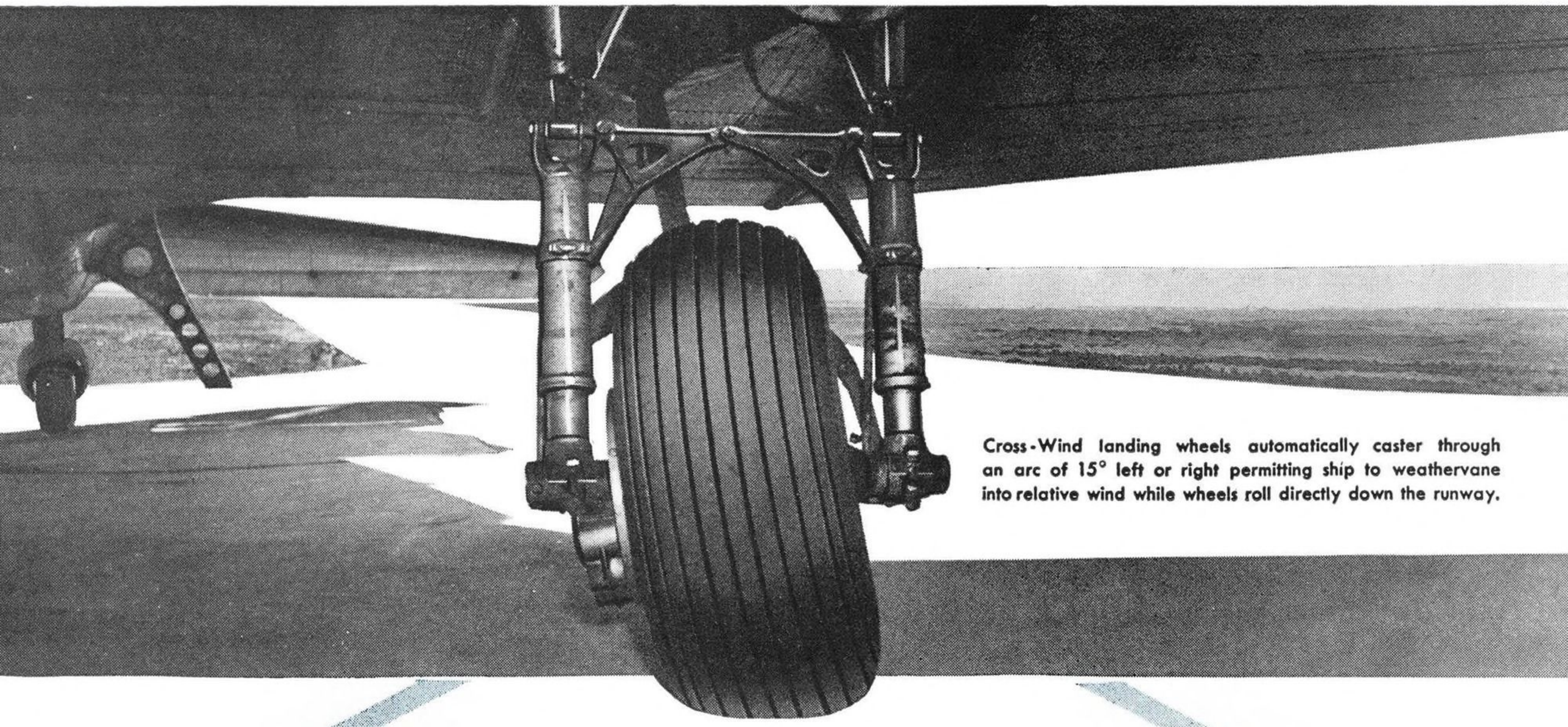

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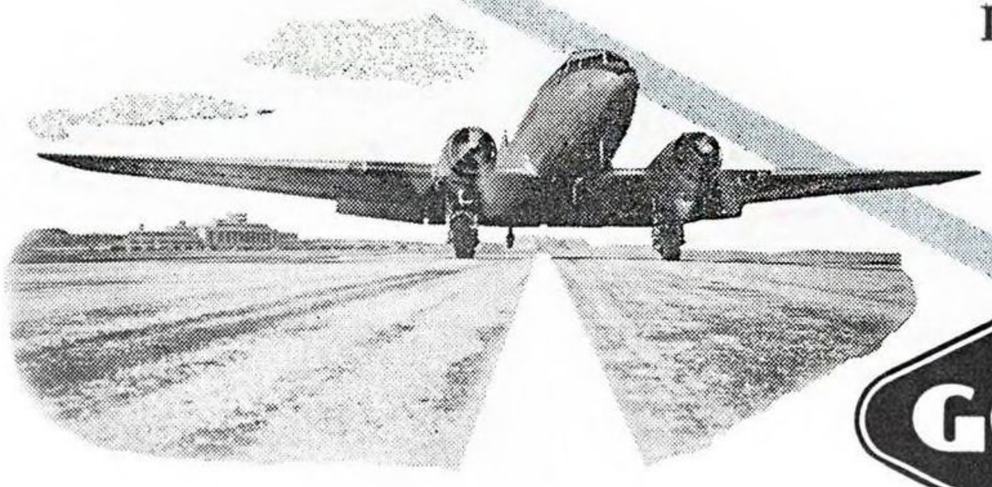

GOODYEAR
AVIATION
PRODUCTS

MORE AIRCRAFT LAND ON GOODYEAR TIRES THAN

AVIATION WEEK

Vol. 50, No. 22 — May 30, 1949

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NEWS SIDELIGHTS

More Secrets

How confidential and how secret can you get?

Acting on a policy of being as security-minded as possible, some manufacturers for the USAF are subjecting themselves to needlessly severe restriction on their projects listed as "classified." For example, in virtually every secret project, there are only certain components which are in secret status, while other ordinary parts connected with the project need not be considered in the special "hush-hush" department.

Similarly, plants with projects in confidential status need not feel obligated to turn away visitors. As long as the visitor stays away from the confidential projects and as long as they are not discussed with him, the manufacturer is free to admit him, subject to Air Materiel Command clearance. Oddly enough some USAF security officers go so far as to treat this information itself as "not for publication" although presumably every manufacturer must have it to comply with security regulations.

Engine Switch

Trans-Canada Airlines will shortly touch off a major political row when it carries out its plans to switch from British Rolls-Royce Merlin engines to Pratt & Whitney R-2800 engines on its DC-4M transports built by Canadair.

Canadian sources indicate the switch will be made shortly after the Canadian Federal election on June 27. Present plans call for Douglas Aircraft Corp. to furnish complete power eggs for the TCA DC-4M since it uses the same wing as the American-built DC-6.

Nonsked Squeeze

Ticket agents on the West Coast apparently are getting transcontinental nonscheduled operators into the same kind of squeeze that created dangerous conditions on the New York-Puerto Rico run last year. Some agents sell tickets to passengers who are not told on what line they will fly. When a sizable amount of business has been obtained, the agents contact the various independent operators to see who will fly the group at the cheapest rate per head.

The agents may make up to 40 percent commission on the deal, and the nonsked may barely break even as a result. On the San Juan run, such tactics drove the nonskeds' revenues so low there was a tendency to save on maintenance and to use pilots an excessive number of hours per month. CAB now has under consideration new regulations which will bring out into the open the sometimes shadowy relationships between the ticket agents and the nonskeds.

James V. Forrestal

It was late in the war, about the spring of 1945, at a news conference to welcome to office a new Assistant Secretary of Navy for Air. The new official told about taking the oath of office aboard the aircraft carrier Shangri-La in action off the Japanese Islands.

An inconspicuous man in the back of the room jumped up and said, "Mr. Secretary, it has not been announced that the Shangri-La has seen action."

The small, broken-nose, graying little man slouched in a chair nearby straightened up and squirmed in his seat. "Well, why shouldn't it be announced?" he asked the security officer. "It has been in action hasn't it?" he waved an impatient hand. "Go ahead and print it, that's not security," said Secretary of the Navy James Forrestal.

Last week, the man who led the greatest navy the world has ever seen and believed in giving the public the truth and a full dollar's worth of defense was dead—a victim of his own driving energy and zeal for perfection.

Former Secretary of the Navy and first Secretary of Defense James V. Forrestal leaped to his death from a window of the Naval Hospital at Bethesda, Md., worn out from the cares of nine years' continuous service to the nation. Official Washington classed him as a "war casualty." No one in industry or out who knew him or studied his service would disagree.

The staff of AVIATION WEEK mourns with the nation.

Jet Fuel Shift

Air Force shift in jet fuel from kerosene to gasoline was not due to any "shortage" of kerosene, but to solve the increasing problems of "hot starts" in jet fighter engines. At least one Air Force unit for more than a year has been using gasoline to start its jet engines after which the engines were switched to kerosene for operation. The higher vaporization of gasoline reduces its tendency to "pile up" in combustors before the start is made, whereas the comparatively heavy constituents of kerosene "lie" in the combustor until the flame reaches it resulting in rapid heat rise and consequent turbine damage.

The new AN-F-28 fuel is actually a combination of gasoline, kerosene and a variety of other hydrocarbons but contains lighter elements that aid vaporization. New fuel requires combustor changes and minor system modifications. AN-F-28 impairs the altitude performance of jet fighters about ten percent compared with regular aviation kerosene. Air Force is willing to take this loss in return for reduced hot start damage.

USAF Too Busy

Some aviation industry leaders raised eyebrows last week when Air Secretary W. Stuart Symington and Gen. Hoyt Vandenberg, USAF Chief of Staff, sent their regrets to the Aircraft Industries Assn.

They were unable to attend the annual AIA board of governors meeting at Williamsburg, Va., due to "press of other business." Their absence was interpreted by some as a slight to Admiral DeWitt C. Ramsey, new AIA president, because he was a Navy man.

Spokesman for Symington and Vandenberg told AVIATION WEEK the former had just returned to Washington from making a speech in Chicago (to the teen-age executives of Junior Achievement, Inc.) and was "too busy" to attend the Williamsburg meeting. Vandenberg had to attend a meeting of the Joint Chiefs of Staff. Lower echelon USAF generals attended the Williamsburg session.

Navaho Airlift

Aviation figures prominently in the administration's $90 million Navaho rehabilitation program.

The vast Navaho reservation of deep gullies in New Mexico, Arizona and Utah—approximately the size of West Virginia—does not lend itself to surface transportation. Interior Department plans to base the reservation's transportation system on air transport.

The contingent of doctors and nurses which Interior Department plans to inject into the filth- and disease-ridden reservation under the program will use air transportation almost exclusively.

AVIATION CALENDAR

May 31-June 4—AWA annual convention, Statler Hotel, Wash., D. C.

June 2-5—Mississippi Goodwill Air Tour, Jackson, Miss.

June 3—Annual reunion of Carroll Aeronautical Associates, Pulaski Hall, 1653 Hunting Park Ave., Philadelphia, Pa.

June 3-12—Sixth annual Michigan Aviation Week.

June 4-5—All-Woman Air Show, Amelia Earhart Field, Miami, Fla.

June 4-5—Fourth annual air fair and industrial exposition, Shawnee, Okla.

June 7—Third ICAO assembly, Montreal.

June 9-11—Institute of Navigation fifth annual meeting, Carvel Hall, Annapolis, Md.

June 13-15—15th national applied mechanics division conference, American Society of Mechanical Engineers, University of Michigan, Ann Arbor.

June 16-17—Mid-year meeting, Aviation Distributors and Manufacturers Assn., Broadmoor Hotel, Colorado Springs.

June 17-18—Annual Ohio aviation clinic, Bowling Green State University.

June 20-24—AIEE, summer general meeting, New Ocean House, Swampscott, Mass.

June 26-27—NAA 27th annual national convention, Akron, Ohio.

June 27-29—Formal dedication of Naval Ordnance Laboratory aeroballistics division, followed by five half-day technical sessions, White Oak, Silver Spring 19, Md.

June 27-July 1—1949 Semi-annual meeting, American Society of Mechanical Engineers, University of California, Extension Bldg., 540 Powell St., San Francisco, Calif.

July 1-4—Third annual national convention and reunion Air Force Assn., Stevens Hotel, Chicago, Ill.

July 2-10—National soaring contest, Harris Hill, Elmira, N. Y.

July 10-13—Annual meeting, Natl. Assn. of University Administrators of Aviation Education, Kent State University, Kent, Ohio.

July 21-22—IAS annual summer meeting, IAS Building, Los Angeles.

September 1-7—Annual conference Federation Aeronautique Internationale, Cleveland, Ohio.

Sept. 1-7—International conference of Federation Aeronautique Internationale, Wade-Park Manor, Cleveland, Ohio.

Sept. 3-5—1949 National Air Races, Cleveland.

Sept. 6-8—Annual spark plug and ignition conference, sponsored by Champion Spark Plug Co., Hotel Secor, Toledo, Ohio.

September 7-11—10th Society of British Aircraft Constructors flying display and exhibition, Franborough Airfield, Hampshire, England.

Sept. 12—IATA fifth annual general meeting, The Hague.

Nov. 9-11—Seventh annual meeting, Aviation Distributors and Manufacturers Assn., French Lick Springs Hotel, French Lick, Ind.

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NEWS DIGEST

DOMESTIC

Personal Aircraft exports for April by nine companies totaled 60 planes valued at $242,082, Aircraft Industries Assn. reports, compared with 45 and $222,924 by ten companies for March.

Cheney Award for 1948 went to First Lt. Gail S. Halvorsen, former Berlin airlift pilot who originated Operation "Little Vittles." Presentation was by Gen. Hoyt S. Vandenberg.

Marshall Mars, Navy flying boat, carried 301 passengers and seven crewmen on San Francisco-San Diego flight. Previous record was 269 passengers.

Southern Airways has bought three 21-passenger Douglas DC-3s from Continental Airlines for service Memphis-Jacksonville via Atlanta.

FINANCIAL

Bell Aircraft Corp. reports profit of $50,660 for quarter ended Mar. 31. Sales and income totaled $3,288,561, costs $3,237,901.

United Aircraft Corp. net for quarter ended Mar. 31 was $1,206,831 after taxes. Shipments for the quarter amounted to $54,829,228.

Electric Boat Co. annual report showed net earnings after taxes of $2,072,079 for 1948, a figure $1,473,234 over 1947. Net sales for 1948 were $54,558,099, with aircraft and submarine production amounting to about $20 million. Company is in strongest position it has ever attained, says President John Jay Hopkins.

Kaman Aircraft Corp. stockholders approved increase of 610,000 shares of capital stock to total of 910,000 shares to carry out helicopter leasing plan and increase production. Board of directors was increased from seven to nine.

FOREIGN

Australia's Civil Aviation Dept. hereafter will provide and own all airport buildings, some of which now are owned by commercial airlines. They will be leased to the operators. Airfields are all Commonwealth property.

Australia's 16 regular domestic airlines carried 1,350,236 passengers last year, an increase of 327,176 or 32 percent over 1947. Route mileage was up 26 percent to 49,321. Load factor increased to 67.7 percent from 63.3 percent a year earlier.

INDUSTRY OBSERVER

▶More special supersonic research planes will be built under the joint Air Force-Navy-NACA program that has already sponsored the X-1, X-2, X-3, X-4 and D-558 Mark I and II. Next on the list will be the X-5, to be built by Bell Aircraft Corp., and featuring a wing capable of varying its degree of sweepback in flight. Lockheed and Douglas will also probably figure in the new research plane program.

▶North American is trying to interest the Air Force in an interceptor version of the F-86 series. The interceptor would have a new type nose and air intake that differs considerably from both the F-86A and the F-93 (formerly F-86C). An attempt will probably be made to develop a night fighter version of the F-93 using the Hughes lightweight airborne radar now being used in the Lockheed F-94 night fighter.

▶Grumman's Panther (F9F) experienced tail hook troubles during its initial carrier landing attempts recently aboard the USS Franklin D. Roosevelt. McDonnell's Banshee (F2H) also made its first carrier landings on the FDR about the same time as the Panther.

▶Douglas Aircraft is trying to interest the Air Force in its new turboprop powered A2D now under development as a carrier-based attack plane for Navy. The A2D will be powered by an Allison T-40 turboprop and offers substantial improvements in speed and range over the AD series now in Navy carrier service.

▶Curtiss Propeller division is completing an addition to its Caldwell, N. J., plant for the construction of Dehmel type trainers for the Navy and Air Force. Navy order is for a jet fighter trainer.

▶TWA is taking a look at the Burnelli Loadmaster transport built by Cancargo Ltd. of Montreal. TWA evaluation pilots recently flew the Loadmaster at Dorval and wrote a company report on the project. The airline was interested in a 53-passenger version of the Loadmaster with a design cruising speed of 370 mph.

▶Minor modifications to British European Airways' Airspeed Ambassador include slotted flaps which will permit payload increase to 11,645 lb., increasing maximum seating capacity to 49 from 40. Takeoff distance at maximum 52,000 lb. gross has been reduced from 5100 ft. to 4200 ft.

▶The Wright T-35-1 turboprop engine utilizes a two-stage centrifugal compressor unit, the first of its design in the U. S. The T-35 develops 5500 hp. at 7000 rpm. and requires a 17-ft. wide-blade propeller to absorb this great power. Although a newer version, the XT-35-W-3 is undergoing development, Air Force has abandoned the unit for production. Wright is using a T-35 compressor unit as an air supply in its research laboratory for tests on turbine blading, combustion, etc.

▶Air Force has dropped development of the Wright XJ-51-W-1, which utilized a multi-stage, axial-flow compressor handling air at the near-sonic speed of 1060 ft./sec., at 20,250 rpm. However, Air Force and Wright are continuing development of the TJ-6, a 9000 lb. unit and the TJ-7, an axial-flow design of 12,000 lb. thrust.

▶Armstrong Siddeley Motors of England has concluded a patent agreement with Westinghouse for use of the Armstrong Siddeley vaporizing combustion system for turbojets in American built engines. This system is designed to maintain combustion efficiency at extremely high altitudes, one of the major problems in current jet fighter performance at altitudes where the B-36 operates.

▶De Havilland Drover, a trimotor feederline transport, has failed to pass initial certification tests by the Australian Department of Civilian Aviation. Plane will make another attempt at certification with fixed pitch propellers replacing the manually-controlled variable pitch propellers originally used.

▶TEMCO is seeking CAA approval of its 145 hp. Tandem trainer, originally designed for military competition and export.

Vol. 50, No. 22

AVIATION WEEK

May 30, 1949

Buying Probe Gets Support But No Action

Congressional Democrats seem ready to block proposed procurement investigation.

Strong and well publicized pressure was building up in Washington last week for an investigation of military aircraft procurement policies but indications were that key Democratic leaders would successfully block any attempts to get congressional sanction for the probe.

Washington has been abuzz with rumors of the impending investigation during the past two weeks. Several daily newspapers have carried lengthy "dope" stories forecasting the possible exposure of procurement irregularities.

Chief support for an aircraft procurement investigation appears to be coming from at least one aircraft manufacturer, disgruntled over military contract awards; Republican congressmen; and the Navy, still smarting over the cut in its fiscal 1950 aviation budget and the cancellation of its super-carrier by Defense Secretary Louis Johnson.

▶ **Convair Contracts**—Named as possible targets for the proposed investigation were: Consolidated Vultee Aircraft Corp; Air Secretary W. Stuart Symington; and Defense Secretary Louis Johnson. Criticism of present USAF procurement policy stems from the undisputed fact that Convair has received a large portion of fiscal 1949 aircraft contracts and is scheduled for an even larger share in the fiscal 1950 budget.

Convair now ranks second behind Boeing Airplane Co. of Seattle in backlog of military aircraft orders. Johnson was a director of Convair until he became Defense Secretary.

▶ **Procurement Concentrated**—Also under fire is the USAF policy of concentrating the bulk of its procurement funds on building up a long range striking force of Convair B-36 intercontinental bombers.

USAF now has 170 B-36 bombers on order and is scheduled to increase this number substantially out of the fiscal 1950 budget. Navy has been highly critical of the B-36 as a weapon particularly since cancellation of the super-carrier project by Johnson.

▶ **Policy on Mergers**—Also mentioned as a subject for probing by the proposed investigation are the maneuvers toward combining several aircraft manufacturing concerns and the alleged influence USAF official policy may have had on the merger proposals.

Symington has never made any secret of his belief that the present aircraft industry has too many companies to be supported by peace-time military procurement and that some amalgamations would be beneficial to the industrial base on which USAF and Naval Aviation are dependent.

▶ **Odlum Figures**—Since Convair and its board chairman, Floyd Bostwick Odlum, have figured in merger discussions with Northrop and Curtiss-Wright Corp., some USAF critics have coined the phrase "e pluribus Odlum" to describe the proposed mergers.

Rep. Clarence Brown (R., O.), who will head a joint committee to investigate lobbying activities on Capitol Hill, last week spoke on the House floor of the "cloak room whispers regarding aircraft procurement practices" and indicated that this subject might be included within the scope of his investigation.

▶ **No Probe Plans**—However leaders of the House and Senate Armed Services Committees indicated that they had no plans for any aircraft procurement investigations. The Senate Expenditures Committee, whose counsel, William Rogers, conducted the investigation into the Wright Field double dealings of former Maj. Gen. Bennett E. Meyers, indicated that aircraft procurement was not on its present agenda.

Capitol Hill observers pointed out that with the Democrats in control of Congress an investigation that might possibly reflect on the present Democratic administration would make little headway on an official basis. It is expected that some Republican congressmen may take the floor to air their views on the USAF procurement situation but the possibilities of a full scale Congressional investigation now seem remote.

▶ **Senate Review**—Senate Armed Services Committee meanwhile is considering methods of reviewing the USAF 70 group program. The committee is now considering the bill to establish authorization for a permanent Regular Air Force of 70 groups.

Committee Chairman Tydings has already indicated he favors a detailed review of the program by his committee (AVIATION WEEK May 23) and last week called for a survey by an impartial six-man group to be composed of three civilians, and a representative of the USAF, Navy and Army. This group would be asked to evaluate the strategic implications and cost of the 70 group program for the committee.

Defense Secretary Johnson, appearing before the Senate Armed Services Committee last week, told the group that the Joint Chiefs of Staff were now engaged in a routine "re-evaluation" of the 70 group program. Committee members indicated they would wait for the results of the JCS study before taking any action on the Tydings proposal.

Johnson is expected to present the JCS study in executive session next week.

FDOBIWTALAA

(McGraw-Hill World News)

LONDON—Britain's Royal Air Force launched a new secret weapon recently and it met with widespread approval by student pilots and instructors. The device is known as FDOBIWTALAA.

Translated, it means Falcon Dispersal Of Birds Interfering With Takeoffs And Landings At Airfields. Trained falconers do the job. The falcons go up in sorties and discourage birds from flocking near aerodromes.

Last year 13 accidents occurred in Britain and 17 more in other parts of the world, where aircraft tangled up with birds. Cost of one accident—if averted—would more than pay for the bird-chasing service.

Falcons are not covered in air regulations, and therefore do not draw flight pay.

McDonnell Banshee

Matching Them Up

BANSHEE	B-36D
Top speed.....630 mph. at 30,000 ft. 562 mph. at 40,000 ft.	372 mph. at 42,000 ft.
Mach limitation ..... .85	.68
Service ceiling.....48,000 ft.	47,500 ft.
Sea level rate of climb....9,000 fpm	700 fpm.
Gross weight.....14,000 lb.	358,000 lb.
Wing span.....41 ft. 6 in.	230 ft.
Length .....38 ft. 11 in.	162 ft.
Armament.....6 20mm cannon	16 20mm cannon
Power—Two Westinghouse J-34 turbojets..... (rated 3000 lb. static thrust)	Six Pratt & Whitney R-4360-41 (rated 3500 hp.) Four Allison J-35-19 turbojets (rated 4900 lb. static thrust)

USAF, Navy Square Off for Test

Navy sure its Banshee can intercept and shoot down a B-36 anywhere in bomber's operating range.

By Robert Hotz

U. S. Air Force and Navy were grooming their entries in the military aviation sweepstakes last week while awaiting word from Defense Secretary Louis Johnson on details of the proposed joust between the Convair B-36 bomber and the McDonnell Banshee (F2H-2) jet fighter.

The test between the Navy carrier-based fighter and the USAF intercontinental bomber was requested by the House Armed Services Committee headed by Rep. Carl A. Vinson (D., Ga.) in a resolution sent to Secretary Johnson.

The committee requested that after the test is completed Johnson appear again before the committee with W. Stuart Symington, Air Force Secretary, and Francis Matthews, Navy Secretary, to evaluate the results.

▶ **Bets on Test**—Johnson passed the buck to the Joint Chiefs of Staff asking their advice on conducting the Banshee vs. B-36 test proposed by the House group.

Meanwhile, feeling among the B-36 and Banshee partisans in the Pentagon and the aircraft industry was running high with considerable betting on the outcome of the test.

▶ **Navy Confident**—Navy's position on the Banshee's ability was officially stated by Undersecretary Dan Kimball who wrote Rep. James Van Zandt (R., Pa.) that the Navy was certain the Banshee could intercept and shoot down a B-36 anywhere within the bomber's operating range.

The Banshee is the latest Navy jet fighter that has been put in squadron service.

It recently made its first landings aboard a carrier at sea and has been put through an extensive flight test program at the Naval Air Test Center, Patuxent River, Md.

The Banshee that will probably be used in the B-36 test is the F2H-2, the latest production version that features considerable structural beef-up to take the speeds which the plane is able to attain.

The Banshee has demonstrated its ability to climb to 40,000 ft. from a high speed pass at sea level in about eight minutes.

▶ **Mach Limitation**—It has been flown and maneuvered at 43,000 ft. where its Mach limitation of .85 (562 mph.) was the upper limit on its speed. Navy test pilots reported the Banshee to be extremely maneuverable at altitude of 43,000 ft.

Turn radius is about two miles contrasted with the 6-to-8-mile turning radius of the F-86A reported by USAF pilots at that altitude.

Navy ran a practice maneuver recently off the Atlantic coast with two Banshees flying formation at 40,000 ft. to simulate a B-36 attacking an aircraft carrier.

Radar picket boats posted 80 miles from the carrier spotted the attack at a range of 180 miles from the carrier. Two other Banshees were catapulted from the carrier and made contact with the attackers about 80 miles from the target.

Since the attacking Banshee pair were considerably faster and smaller than a B-36, the Navy was well pleased with the results. The Banshee does not carry airborne radar and is armed with six 20-mm. cannon.

▶ **Pick Pod Plane**—USAF experts indicated that the B-36D prototype equipped with four jet engines in addition to the six Pratt & Whitney Wasp Major piston engines would be the best choice as the attacker since all B-36 bombers will eventually be equipped with the jet pods.

Performance of the B-36D prototype during test flights at Ft. Worth has been extremely satisfactory to Air Force to date.

B-36D has flown at altitude of 47,500 ft. and exhibited a marked speed increase over the 372 mph. top speed chalked up by the B-36B with only four piston engines.

Jet pods now on the B-36D each contain two Allison J-35-19 turbojets rated at 4900 lb. static thrust but now actually are delivering as high as 5200 lb. thrust.

B-36D production models will use the General Electric J-47 turbojet rated at 5000 lb.

B-36 armament consists of six retractable, remotely-controlled turrets each mounting twin 20mm. cannon with hemispheric sights; plus a radar-controlled tail stinger of twin 20mm. cannon and two 20mm. cannon in flexible nose mounts. Some B-36s also carry a 37mm. radar-controlled cannon in the tail.

NACA Reveals Transonic Progress

Scientist discloses that, if war comes, supersonic air force could be started in few months.

Important aeronautical research progress in the transonic speed zone was disclosed to aviation's top industry engineers and executives at the 1949 annual inspection of the NACA held this year at Langley Aeronautical Laboratory.

Leading industry engineers commented it was the most prolific display of aeronautical research results ever assembled.

▶**New Techniques**—New research techniques have developed a new mass of results, since the previous NACA industry inspection. At that time vast areas of the transonic range were still largely uncharted. Now enough fundamentals have been established to get a clear definition of basic problems involved and to point the way to their solutions.

NACA revealed that it had been operating one type of transonic wind tunnel for several years. This tunnel represents an early approach to eliminating the blind spot in conventional wind tunnels caused by the choking effect of shock waves between Mach .8 and Mach 1.3.

The early transonic tunnel was devised by John Stack, NACA scientist and 1948 Collier Trophy winner, by mounting a tiny scale model on the rim of a disc about five feet in diameter. The model rotating in a vertical plane attains sonic speed within its helix although the longitudinal velocity of the tunnel airstream remains subsonic.

Angle of attack of model is varied by changing speed of the wind tunnel airstream. This is done by a single-stage fan located downstream from the model. Fan also draws the wake out of model's path. A pressure transfer device is used to conduct pressures from holes in the model to manometers in the tunnel control room.

The models used are extremely small and tests are conducted at low Reynolds numbers. Other techniques are now under study to permit transonic wind tunnel research on large scale models at high Reynolds numbers.

▶**"Aerodynamelasticity"**—Broad shift in research emphasis was indicated into the transonic speed regime and into the new field of aeroelasticity, which treats of dynamic loads on deflecting structures. It is now clear that the several major problems, formerly considered separate fields of special investigation, are undergoing combination into a single problem of several phases. As research moves into supersonics the difference between aerodynamic and structural problems is minimized. Soon may evolve a science of "aerodynamelasticity" containing all the separate elements of aeronautical engineering.

Among research results reviewed:

- **Rocket missile research** techniques have proved extremely fruitful with the method now extended to dynamic problems.
- **A new flush air inlet** for fuselage side installation indicates superiority over the divergent-wall type.
- **A supersonic nose inlet** using a single instead of multiple-shock compression indicates promise.
- **Swept wing aircraft stability** problem may be solved through the use of the rate-sensitive gyro autopilot.
- **NACA reaction supersonic compressor** has now been replaced by an impulse type which indicates even greater efficiency by placing compression in the stator rather than the rotor stage.
- **Propellers** may have useful application to supersonic aircraft.

On the basis of presently available research information, practical supersonic aircraft can now be designed and in the event of war the nation could begin production of a supersonic air force within a matter of months, according to Stack.

B-50 DEVELOPMENT ON NEW TRACK

Boeing Airplane Co. has completed taxi tests on the first track-tread landing gear experimentally installed on a B-50 bomber (Aviation Week, June 14, 1948). The B-50 gear has double tractor treads in place of the main gear wheels. The gear is completely retractable in flight. The tractor gear offers a landing "footprint" area nearly three times greater than that of the wheel gear. The main gear trucks and belts were designed by a special unit of the Boeing engineering division under Donald Finlay. The nose gear truck and tread were built under contract by Firestone Tire & Rubber Co. The tripod attached to the plane's nose holds motion picture camera equipment to record automatically the action of the nose gear during high-speed taxi tests.

U.S.-Canada Parley Negotiating Air Pact

The U. S. and Canada were jockeying for advantage last week in negotiation of a new bilateral agreement on commercial air rights, necessitated by the recent change in status of Newfoundland, site of important Gander Airport.

Official comment on the new pact was not expected before the close of the parley, which some of the negotiators hoped could be ended before the week was out. The U. S. State Dept. delegation of the conference, held in New York, was headed by CAB member Russell B. Adams. The Canadian group was led by Transport Minister Lionel Chevrier.

Main points at issue:

- Right of U. S. lines to continue to use Gander as a service and traffic stop on trans-Atlantic flights.
- Third and fourth freedom privileges for Canadian lines—respectively, their right to bring Canadian passengers to the U. S. and carry U. S. passengers to Canada.

The first of these—the Gander privilege—was considered by most observers to be Canada's best trade in long-expected attempts to obtain the right to pick up passengers:

- At Hawaii on Canadian routes to New Zealand and Australia and at Alaska on routes to Japan and the Orient;
- At Boston, Philadelphia or Baltimore on scheduled operation to Bermuda from Montreal and Toronto;
- At Jacksonville or Miami on a route from eastern Canada to Nassau, the Bahamas.

AFL Tells ALPA: Hands Off Engineers

The month-old Flight Engineers International Assn. went gunning for big game in its first jurisdictional battle—and bagged it. The executive council of the American Federation of Labor, on FEIA's complaint, ordered the old and powerful Air Line Pilots Assn. to stop organizing flight engineers.

Even before FEIA's first meeting in April, it had been granted an international charter by AFL and jurisdiction over all licensed flight engineers. ALPA also holds an AFL charter, and some time ago began working among flight engineers on domestic airlines (Aviation Week, Apr. 4).

▶**ALPA Moves In**—ALPA chartered the Air Carrier Flight Engineers Assn. International and American Airlines flight engineers voted 83-49 in a National Mediation Board election to let ALPA represent them. FEIA, claiming pilot pressure on flight engineers, protested to AFL.

Meeting at Cleveland, AFL's executive council directed ALPA to:

- Disband the Air Carrier Flight Engineers Assn.
- Withdraw from the Mediation Board proceeding for representation of flight engineers of American Airlines and United Air Lines.
- Respect the jurisdiction held by the FEIA.

At stake is representation of flight engineers on all domestic airlines. FEIA's strength now is chiefly among international carriers, TWA, AOA, PAA, although it also has Eastern's flight engineers. United Air Lines is training copilots in the duties of flight engineers.

FEIA insists that ALPA's move into its territory was to make possible a system under which copilots could shuttle back and forth between the righthand seat and the flight engineer's station, depending upon the airline's personnel needs of the moment.

Under the AFL ruling, a flight engineer must sign with FEIA, a copilot with ALPA, and seniority in one union will confer no rights in the other to the member.

New and De Luxe

Pan American Airways, rebuffed by the Civil Aeronautics Board on lowered trans-Atlantic fares (Aviation Week, May 9), will swing the other way next week in this one instance:

The de luxe extra fare New York-London flight it will inaugurate Friday, June 10, with Boeing Stratocruisers will vie with foreign airlines for the last word in sumptuous air service. Pan Am calls it the "most deluxe."

▶**"The President"**—The traveler will pay $10 more than the regular $350 each way when he flies on "The President."

Ticket will include Sleeperette (full reclining seat). More de luxe berths will cost him $25 extra. A most de luxe four-berth stateroom will be available at $25 per berth.

PAA's usual upper deck seating arrangement on the Stratocruiser, in its regular trans-Atlantic service starting June 2, calls for 53 seats, but the new interior on "President" planes will carry 39 Sleeperette seats, in addition to 17 berths.

Staterooms are berth combinations.

The airline will offer a selection in menus, with seven-course meals prepared at the passenger's pleasure by a flight chef, and served on tables instead of trays by a staff of four stewards and a stewardess.

The flight will leave New York for London each Friday at 4 pm. EDT and London for New York at 7 pm. London time.

The new luxury flight, says PAA, means no change in the carrier's thinking with regard to trans-Atlantic tourist fares.

It has an eye on the 130,000 travelers it says are expected to visit England during the 1949 tourist season.

Wright Production Changes Announced

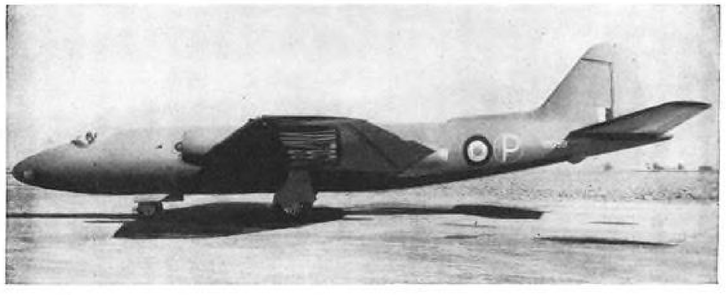
Wright Aeronautical Corp. has made production changes at its Wood-Ridge, N. J., plant that are expected to save approximately $1 million a month.

Chiefly involved is discontinuance of a "turbine-type" engine which is not identified by the company but which may be the T-35 turboprop. This engine originally was scheduled for installation in Boeing's B-52 but disclosure was made some time ago (Aviation Week, Mar. 14) that the Air Force had not ordered it into production.

Discontinuance of the turbine project eventually may involve the lay-off of about 450 employes.

Meanwhile, Wright is stressing production of components for General Electric's J-47 jet engine which is assembled at the recently-opened Lockland, O., plant.

While the production shifts at Wright will not immediately result in reversal of the "trend of losses," Paul V. Shields, new Curtiss-Wright chief, said they involve a long-term program aimed at establishing profitable operations. Wright Aeronautical holds more than one-half of C-W's backlog of $146 million.



Britain's First Jet Bomber: the A.1

(McGraw-Hill World News)

LONDON—Britain's first jet bomber to fly—the English Electric A.1—has been ordered into quantity production. The twin-jet medium range craft made its initial test flight earlier this month (Aviation Week, May 23).

The A.1 was flown from English Electric's airfield at Preston, Lancashire, by Wing Commander R. P. Beaumont, the firm's chief test pilot.

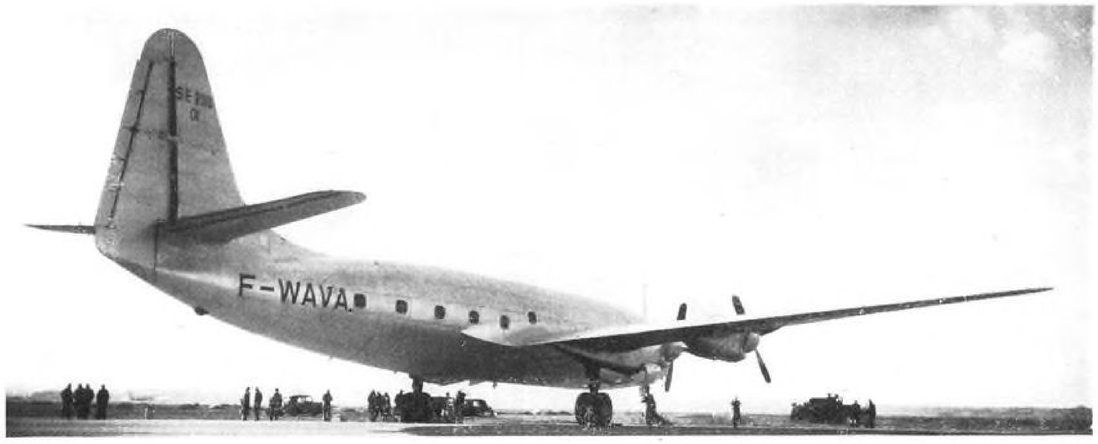
▶**Powered by Avons**—Power for the craft is provided by two Rolls-Royce Avon turbojets, most powerful British jet engine yet developed. Unofficially, it is understood the engine delivers around 6500 lb. thrust.

Configuration of the A.1 is conventional, with straight wing, tapered on both leading and trailing edges, and a single fin-and-rudder. Engines are mounted in the wing. Cockpit is placed well forward, actually in front of the nosewheel.

Craft is expected to exceed 500 mph., but performance, weight and dimensions are still on the secret list.

In his recent speech in the House of Commons, Arthur Henderson, Secretary of State for Air, revealed that the jet bomber was to go into quantity production, although he did not mention the English Electric Co. as the builder.

Initial order for the development of the plane may have been placed about the beginning of 1945, according to various statements pieced together from the Air Ministry and Ministry of Supply.



SE 2010

France Shows Its 94-Passenger Transport

SE 2010 in flight

SO 30P

SO 95

Variety of airline and personal plane types displayed at Paris.

By Boyd France

(McGraw-Hill World News)

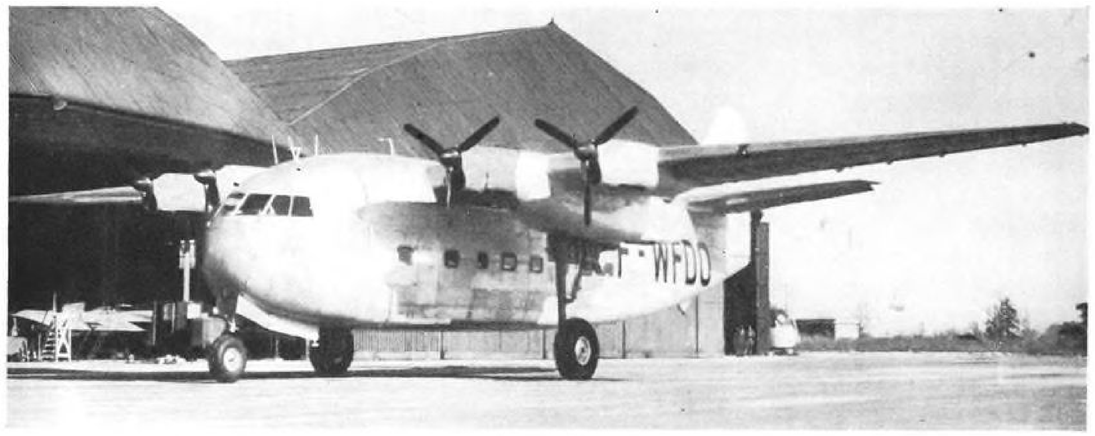
PARIS—Two behemoths—the U. S. Boeing Stratocruiser and France's even larger SE 2010 Armagnac—set the pace for transports at the 18th Paris Air Show. But they left visitors with the feeling that the race for size in commercial aircraft had just about ended.

The Stratocruiser, belonging to Pan American Airways, convinced some air experts that it comes too close for comfort to the point of diminishing returns. Airlines however, judging by their orders, seem to think otherwise. So do some manufacturers, both American and European, who seem to be pegging future plans on anticipated widespread use of huge transport aircraft.

➤ **Prototype Has Flown**—The Armagnac is the first long distance commercial plane of international class produced in France since the war. While only the prototype has flown, Air France has ordered 15 for its Paris-New York run. The Armagnac is the French counterpart of the Constellation—but much bigger.

Gross weight of the craft is 73 metric tons (about 161,000 lb.) and payload is eight metric tons (about 17,500 lb.). Span is 164 ft.; height, 44 ft.; length, 129 ft. It carries 94 passengers.

Cruising speed fully loaded at 18,000 ft. (at 1750 hp. per engine at 2375 rpm.) is 300 mph. Range is 2500 miles. Power is supplied by four Pratt & Whitney R-4630s, developing 2650 hp. at 2550 rpm. at 6000 ft., and 3200 hp. at 2700 rpm. at takeoff.



Breguet 892S

Cabin of the Armagnac is soundproofed and pressurized. Front and rear portions of the cabin are separated by a pantry and a bar.

• **Breguet 761**—Breguet has stuck to tried and true designing in its model 761, shunning innovations in order to get the ship into production as soon as possible. Both the Air Ministry and Air France have high hopes that the 761 will prove well fitted for French colonial runs.

The craft has a span of 136.5 ft.; length, 94.2 ft.; height, 27.2 ft. It is powered by four Gnome-Rhone 14Rs. Forward wing edge is heated by exhaust gases to prevent icing. Top speed of the 761 at 20,000 ft. is 275 mph. With a payload of 14 metric tons (about 30,800 lb.) the craft can carry 101 passengers sitting; 26 reclining.

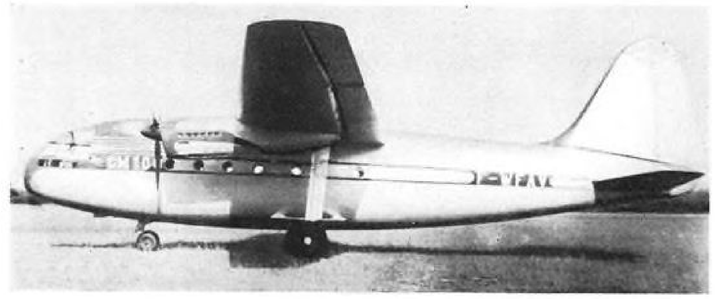
• **SO 30P**—Air France is counting on the SO 30P—the Bretagne—to replace DC-3s on its Continental runs. The carrier has ordered 25 of these light transports, and the Air Ministry has ordered 40. Another batch has been earmarked for export.

The Bretagne carries 37 passengers and is powered by two Pratt & Whitney R-2800 B-43 engines, developing 2030 hp. at 2700 rpm. at takeoff. Cruising speed at 20,000 ft. is 275 mph. Span is 88.2 ft.; length, 62.1 ft.; height, 13.4 ft. Gross weight is 18 metric tons (about 39,680 lb.).

• **SO 95**—The SO 95, designed for short commercial hops, has a range of 800 miles and carries six or seven passengers. Cruising speed at 3000 ft. is 200 mph. Gross weight is 12,000 lb. The craft is powered by two Renault 125s, developing 390 hp. at 3100 rpm., and 580 hp. at takeoff.

Span is 59 ft.; length, 40.7 ft.; height, 13.6 ft. The SO 95 is now in mass production.

• **Breguet 892S**—Breguet's 892S Mercure is a small, four-engine transport with a 23,000 lb. empty weight and a gross of 35,130 lb., including an 8000 lb. payload. It carries a three-man crew. The Renault engine develops 580 hp. at 3300 rpm. for takeoff.



Fouga CM-100

Breguet 761

• **Fouga CM-101**—The Fouga CM-101 is a twin-engine version of a troop glider design and embodies a combination metal and wood construction. The craft has a normal weight empty of 10,050 lb., and weighs 15,544 lb. fully loaded for a 6000-mi. flight with 12 passengers, a crew of two and a 1022 lb. cargo load. Span is 87 ft., length 58¾ ft., height 19 ft.

The Fouga cruises at 150 mph. at 6500 ft. on 375 hp. at 2900 rpm. from each engine.

➤ **Lightplanes**—The French launched a flock of lightplanes at the Air Show, but many carried pricetags that placed them slightly out-of-grasp for the average European.

• **Norecrin**—The Norecrin, perhaps the best known and best of the postwar lightplanes, sells for $7000. The craft is a four seater with retractable landing gear, and cruises at 135 mph. About 250 have been sold.

The SIPA 90, in the 75 hp. class, sells for $6000. About 200 have been ordered for aero clubs. The four-place Courlis sells at about $11,600.

• **SO 7060**—Sharp clean lines made the SO 7060 a standout among the French lightplanes. The craft has a range of 500 miles, top speed of 120 mph., cruising speed of 110 mph., and ceiling of 15,000 ft. The SO 7060 is

Interior view of the Grand Palais, showing lightplanes

Above and below, two views of the SO 7060

powered by a Walter 105 hp. engine, and is of all-metal construction.

The price, when production plans are finalized, will be about $6000.

While the French exhibit was by far the most extensive of any country represented, the Grand Palais and the sprawling Esplanade des Invalides, just across the river, also contained impressive exhibits of Italian and Czech aircraft.

▶ **Other Countries**—In the Italian display, Mreda presented a cross-section of its four-engined BZ 308, designed for trans-Atlantic service. Macchi exhibited its MB 308 touring plane, which is made in both a land and hydroplane version. Fiat displayed its G59 trainer; Piaggio, its twin engine amphibian; Ambrosini, its four seater S1001 Grifo touring plane.

The Czechs, in a lightplane fly-in, exhibited the four-place twin engine Aero 45, the Bonzo M3, and the two-place Skaut M2 and Zlin 22. Fokker, the Dutch aircraft manufacturer, exhibited the S 11 and S 12 trainers.

The U. S., which had no planes in the 1946 Air Show, had, in addition to the Stratocruiser, three versions of the Lockheed Shooting Star, a Convair-Liner, a Beech Bonanza and Mentor trainer, and several Douglas models.

▶ **British Vampire**—Britain's star contribution was the Vampire which recently flew from Paris to Cannes in 45 min. An impressive battery of British turboprops was also on display—Armstrong-Siddeley's Python, Mamba and Double Mamba, and the Bristol Proteus.

Belgium, which usually is represented at the Aeronautical Salons, was absent; Switzerland and Turkey, both of which were not counted on to exhibit, had aircraft on display this year. Sweden, which has been making known extensive export plans, failed to exhibit.

The Show was international in name (official title: 18th International Aeronautical Salon) but the bulk of displays belonged to France. The fact that few people were disappointed in the Salon may be considered no small tribute to France's efforts to re-evaluate and reaffirm its aircraft manufacturing prowess.

Cargo Lines Look to Financing

Certificated freight lines, encouraged by recent CAB decision, may present new field in public securities.

A new chapter in public financing may soon be written as the recently certificated cargo lines attempt to augment their capital resources. This may prove necessary as these carriers prepare for a full-scale expansion of their operations.

Indeed, the Civil Aeronautics Board majority decision is designed to facilitate such action. CAB said: ". . . The specific authority of fixed duration, provided by a certificate, should permit all-property carriers to establish more easily stable relationships with financial institutions for the provision of necessary capital."

While certificate duration is only five years, these franchises will unquestionably be advanced as intangible assets of inestimable value in any public security flotations.

► **Jones' Dissent**—CAB member Harold Jones, vigorously dissenting, implied that the awards to the cargo carriers imperiled certificated passenger airlines. His statement highlighted the importance attached to the Board's certificate of public convenience and necessity.

Jones declared: "In reliance on this covenant, the airlines, the investing public and government and private lending institutions, as of Sept. 30, 1948, have loaned or invested in excess of $350 million. Their protection was the promises contained in the Civil Aeronautics Act and the integrity of the quasi-judicial agency set up by Congress. . . The most important purpose of the Act was to assure security and stability. The provisions relating to the issuance of certificates of public convenience and necessity were believed to give us this assurance."

Despite the fundamental implications involved, the cargo lines appear here to stay—once CAB's tentative decision authorizing their operations is made final. This is expected in time to permit the all-cargo carriers to launch full-scale operations by June 24.

► **Speculator Bait**—Immediately after World War II, airline shares enjoyed immense speculative popularity. An aggressive underwriter who placed "airline" in the name of a newly-formed enterprise found little difficulty in selling shares to a gullible public. Only a few ventures survived, the others collapsing after brief flurries.

The sorry experiences of such financing ventures destroy investor confidence in legitimate enterprises of the industry.

Case histories of past public security flotations of nonscheduled category do not make pleasant reading. The hope usually was advanced that the company involved might survive until a certificate or franchise of some sort would be obtained from a government agency.

► **Profit Opportunity Lacking**—Few of these new stock flotations accorded the initial purchaser opportunity for profit. Most of these new nonscheduled ventures collapsed after a brief struggle, their securities virtually worthless. Repercussions of some of these deals are still heard.

Under Van Alstyne, Noel & Co. sponsorship, Expreso Aereo Inter-Americano issued 300,000 shares to the public in May, 1945, at $3 per share. These shares hit $10 per share in a very short time. All this was done without any record of past earnings by the company.

The carrier's operations, conducted at a mounting deficit, subsequently consumed its resources, resulting in a nominal quotation for its stock. The Van Alstyne firm is now being sued by a number of stockholders for misrepresentation.

► **California-Eastern**—Backers of California-Eastern Airlines did not fare much better. If this carrier had had sufficient financial resources, it would have stood a better chance of certification by CAB for all-cargo operations. The Board examiners had so recommended, but the carrier shortly thereafter sought the protection of the bankruptcy courts.

When California-Eastern was first formed, members or friends of Lehman Brothers reportedly purchased more than one-half of the 150,000-share issue at around $1 per share. The company started operations as a contract carrier in May, 1946. The line was merged with Mercury Transport Corp. in September, 1946.

Mercury was a paper corporation whose major asset consisted of an application filed with the CAB in May, 1946. The promoters of Mercury received California-Eastern stock with $52,000 par value and assumed dominant control of the company, becoming responsible for its operations until virtually all of its financial resources had been exhausted.

At the time of the airfreight case hearing, Andre de St. Phalle and Co., New York agreed to undertake private sale of an additional 495,000 shares for interim financing. This never was done but the record shows that public financing would be undertaken in the event of certification. California-Eastern stock is quoted currently around 12 cents a share.

► **Certificated Cargo Lines**—The three major all-cargo lines certificated by the Board have all done some form of public financing and managed to do considerably better than most of their contemporaries who fell by the wayside. Nevertheless, no investor in any of these three carriers can boast of any profits.

• **Slick Airways, Inc.**, among the investing public, has the cleanest financing record of the survivors. Last reports show about 176,000 shares of $10 par value common stock outstanding, owned almost entirely by the Slick oil interests. There also are more than $1,400,000 in 4 percent convertible income debentures owned by private eastern investors. These debentures are non-interest bearing until Mar. 1, 1950, and convertible into common stock up to that date only.

• **The Flying Tiger Line** started domestic cargo service as National Skyway Freight Corp. in July, 1945. In April, 1946, 500,000 shares of new common stock were marketed at $5 per share to the public, net proceeds to the company being $4.30. A total of 726,000 share currently is outstanding, with a market quotation of around $1.50 per share.

• **U.S. Airlines, Inc.**, began domestic services in December, 1945. In June, 1946, company sold 900,000 shares of new stock at $3.25 per share, realizing $2.75 per share after underwriting commissions. There now are 1,500,000 shares outstanding with a current market quotation of 50 cents per share. There also are 300,000 stock purchase warrants outstanding exercisable at $3.25 per share, originally issued to the underwriter and company sponsors.

Largely due to the pioneering nature of their activities, none of these three carriers can report a net profit from its cargo operations. Accordingly, any new financing that may be attempted must be predicated upon future prospects. This promises to invite a searching appraisal from any sophisticated investor in light of the past financing record.

There will be those observers, nevertheless, who will point to the initial failures of the forerunners of the presently-certificated passenger airlines and their past successful financing operations. It is this sort of atmosphere which will nurture any subsequent security flotations of the newly-certificated all-cargo lines.

—Selig Altschul

"Get-Ready" Cost: $20 Million

USAF will spend biggest part; $13 million will go for Phase III contract high production studies.

By Robert Hotz

Approximately $20 million will be spent during fiscal 1950 on industrial mobilization of the American aircraft industry.

USAF will spend the lion's share with $16 million earmarked in its fiscal 1950 budget for that purpose. This is exclusive of personal pay and travel costs.

The Navy has approximately $4 million for similar activity on aviation.

► **Contract Plum**—Biggest plum for the industry will be some $13 million to be spent for Phase III contracts with individual manufacturers for high volume production studies to be made of their products.

USAF will spend about $11.6 million on Phase III contracts with $1.4 million from the Navy.

USAF will aim its next batch of Phase III contracts at aircraft engine and components manufacturers in an effort to alleviate partially anticipated bottlenecks in those fields. USAF contracted for its high volume production studies on airframes with funds appropriated in 1947 and 1948. These contracts called for production studies on the following airframes:

Beech—C-45, T-7, T-11
Bell—H-12A, H-13
Boeing—B-50, B-54
Convair—B-36.
Fairchild—C-82, C-119, T-31
Lockheed—F-80
North American—T-6, F-86, F-51, F-82, B-45
Republic—F-84

Navy has conducted studies for USAF on the Grumman SA-16 amphibian rescue plane.

Largest slice of the fiscal 1950 USAF Phase III contracts will go to engine manufacturers. These contracts will go to:

• **General Electric** (and its subcontractors)—$825,000 for high volume production studies to be made on the J-47 turbojet.

This engine is used in production versions of the B-47 and B-45 bombers; the F-86 fighter; and as auxiliary power on the B-36 bomber.

• **Allison division** of General Motors—$1,350,000 for similar studies on the J-33 centrifugal flow turbojet and the J-35 axial flow turbojet. The J-33 is used on the F-80, F-94 and TF-80. The J-35 powers the F-84 fighter.

• **Pratt & Whitney**—$800,000 for production studies on the J-48 turbojet and $300,000 for studies on the R-4360 (Wasp Major) piston engine. The J-48 is a Pratt & Whitney version of the British Rolls Royce Tay turbojet and will power several of the new USAF fighters.

Wasp Major currently powers most of the USAF heavy transports and the B-36 bomber.

Total of $155,000 will be used for production studies of other engines to be used on USAF trainers.

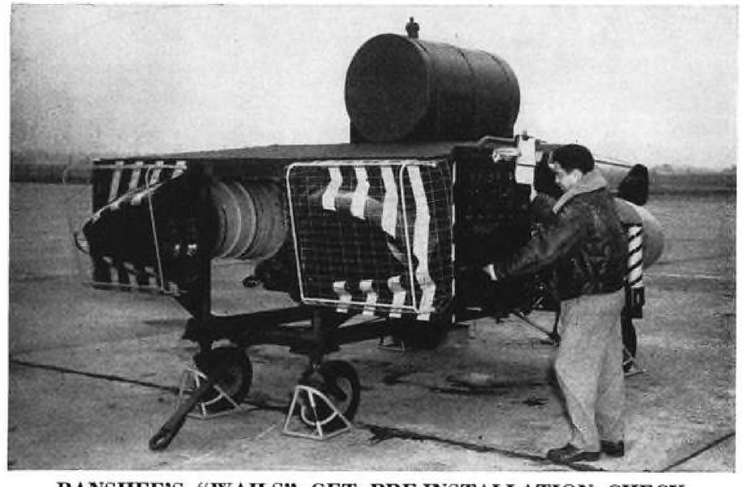
In addition Phase III contract funds will be allocated for the following studies:

Propellers—$1,219,619.
Fire Control Systems—$2,225,000.
Bombing Systems—$765,000.
Bomb Sights—$382,500.
Radio and Radar—$828,750.
Landing Gears—$433,500.
Turbo-Superchargers—$178,500.
Test Equipment—$76,500.
Auto-Pilots—$137,500.
Instruments—$114,750.
Ground Handling Equipment—$65,880.

Other USAF industrial mobilization allocations include: $435,000 to continue existing preparedness contracts; $750,000 for resource requirement data on manpower, machine tools, etc.; $150,000 for purchase of basic studies on expansibility of industry, planning factors, etc.; $55,000 for protection of industry in wartime; $400,000 for purchase of engineering and technical services on studies of new industrial techniques, analysis of planning data and development of new manufacturing equipment, $1,625,000 for maintenance of stand-by plants; and $2,521,000 for acquisition of reserve machinery and equipment.

► **Navy Studies**—Navy spent $1,002,359 out of fiscal 1949 funds for a high volume production study on the Lockheed P2V patrol bomber series and $1,733,641 for a similar study on the Westinghouse J-34 turbojet engine series. In fiscal 1950, Navy plans to spend $1,436,000 for Phase III contracts on a new airframe (probably the McDonnell Banshee or the Grumman Panther) and another turbojet engine (probably the Westinghouse J-40).

Balance of the Navy allocation will be spent for: stand-by plants, $120,000; machine tools and production equipment reserve, $1,146,000; plant utilization studies, $354,000; and industrial resources studies, $844,000.



BANSHEE'S "WAILS" GET PRE-INSTALLATION CHECK

This portable test stand for checking jet engines prior to installation in airframe of F2H-1 Banshee was constructed by McDonnell Aircraft Corp. technicians to speed production schedules. Use of device cuts 6-8 hr. from time required for readying plane for flight, obviates necessity of tying up craft while tests are conducted. Stand mounts two Westinghouse J-34s and complete Banshee instrumentation. Special instruments indicate fuel pressure drop over filter elements and No. 1 bearing temperature—data not normally available from craft's standard instruments. Fuel supply is from 100-gal. gravity tank. Governor or fuel control difficulties are detected quickly.

AFF Will Bolster Lightplane Market

Important secondary market for personal aircraft will continue to be provided by the Army Field Forces through off-the-shelf purchases of commercial planes for military uses.

Maj. David G. Cogswell, AFF Air Division Development Section, Ft. Monroe, Va., recently outlined to personal aircraft engineers at the Institute of Aeronautical Sciences meeting at Wichita main requirements for light planes suitable for military use.

► **Specifications Given**—Requirements include:

- Dependability under all operating conditions.
- Good visibility, particularly forward and downward.
- Good safe short-field performance.
- Sufficient gross weight and space to carry required loads.

The AFF representative suggested periodic evaluation of commercial planes for military uses, to be held in early spring to allow manufacturers to prepare for slack winter season.

► **Service Test**—He recommended a program under which Army would service test two or three of each of the best models in the evaluation, then procure the best planes on a three year program: one year for interior Regular Army units, next year for overseas Regular Army units and the third year for National Guard and Reserve requirements. Geographical separation of models, to lessen spare parts problem was recommended.

Plan was also suggested to focus Army development funds on improving lightplane components, such as powerplants, lightweight starters, generators, batteries, adjustable or constant speed propellers, high lift and glidepath control devices and radio.

Main needs for improvement indicated by unsatisfactory service reports at Air Materiel Command, include: better and more efficient powerplants; improved flotation for takeoffs in sand and mud; more attention to ease of maintenance including such items as self-locking drain fittings, quick disconnects, ready access to engine compartments, fuel and oil re-fuelling points; improved ground handling characteristics; and provisions for quick dis-assembly and change of major assembly.

Canadian Chutes

Irving Air Chute Co. Inc., plans to construct a new addition to its plant in Ft. Erie, Ont. It will "nearly double" factory's present output, when completed. Addition to Ft. Erie factory is being erected in anticipation of more parachute orders from the Royal Canadian Air Force and Army.

Latest Air Force Bid Awards

Air Materiel Command procurement Division makes available to AVIATION WEEK the latest bid awards, shown on this page. Requests for further information should be addressed to Contracting Officer, AMC, Wright-Patterson AFB, Dayton, Ohio, attention: MCPPSX72, (AMC will resume in July the issuance of data on invitations for bids.)

Abstracts of Bid Awards

For cushioned head rests (49-1017):
Featherlike Pneumatic Co., Los Angeles, on a bid of $8763.51.

For 3007 lgth. hose (49-1134):
B. F. Goodrich Co., Akron, on a bid of $29,290.80.

For wax (49-1143):
Companies sharing—E. A. Bromund Co., New York, on a bid of $2361.60; Simoniz Co., Inc., New York, on a bid of $486; Stevenson Brothers & Co., Philadelphia, on a bid of $3786.43, and United Chromium, Inc., New York, on a bid of $3848.

For aircraft enamel (49-1361):
Companies sharing — Sherwin-Williams Co., Cleveland, on a bid of $85,772.52; Capitol Paint & Varnish Works, Inc., Brooklyn, on a bid of $6286.50, and Pittsburgh Plate Glass Co., Milwaukee, on a bid of $153.

For aluminum alloy tubing (49-1366):
Companies sharing—Williams & Co., Inc., Cincinnati, on a bid of $7222.39, and Revere Copper & Brass, Inc., Detroit, on a bid of $7096.71.

For 20,560 lb. wool, steel (49-1375):
Brillo Mfg., Co., Inc., Brooklyn, on a bid of $4947.60.

For cellulose thinner (49-1396):
Companies sharing—Atlas Powder Co., North Chicago, Ill., on a bid of $11,251.26; Commercial Chemical Co., Cincinnati, on a bid of $7354.16; George Senn, Inc., Philadelphia, on a bid of $52,768.36; Hydrosol, Inc., Cicero, Ill., on a bid of $63,443.52, and Indianapolis Varnish Co., Indianapolis, on a bid of $99,801.98.

For nuts, lock & nuts, plain (49-1420):
Companies sharing—Aero Bolt & Screw Co., New York, on a bid of $1402.99; Michigan Bolt & Nut Co., Inc., Detroit, on a bid of $2383.25; Factory & Yard Supply Co., New York, on a bid of $26.25; National Screw & Mfg., Co., Cleveland, on a bid of $280.90; Air Associates, Inc., Teterboro, N. J., on a bid of $329; Continental Screw Co., New Bedford, Mass., on a bid of $100, and Specialty Assembling & Packing Co., Brooklyn, on a bid of $165.

For self-locking nuts (49-1444):
Companies sharing—Elastic Stop Nut Corp., Union, N. J., on a bid of $28,731.18; Air Associates, Inc., Teterboro, N. J., on a bid of $850.40, and Tinnerman Products, Inc., Cleveland, on a bid of $125.11.

For 959 parachute assemblies (49-1446):
Irving Air Chute Co., Inc., Buffalo, on a bid of $130,088.35.

For photographic film paper (49-1449):
Companies sharing—Eastman Kodak Co., Rochester, N. Y., on a bid of $3960; E. I. DuPont de Nemours, & Co., Inc., Wilmington, on a bid of $4975.32; Haloid Co., Rochester, N. Y., on a bid of $10,070, and Anken Chemical & Film Corp., Newton, N. J., on a bid of $5281.30.

For luminous material (49-1452):
Canadian Radium & Uranium Corp., New York, on a bid of $33,419.

For lubricating pump (49-1465):
Lincoln Engineering Co., St. Louis, on a bid of $13,296.

For 130 lenses (49-1484):
Companies sharing—Eastman Kodak Co., Rochester, on a bid of $1198, and Buhl Optical Co., Pittsburgh, on a bid of $1458.50.

For 585 photographic safelights (49-1503):
Eastman Kodak Co., Rochester, N. Y., on a bid of $6206.85.

For 20 testers & technical data (49-1531):
Ram Meter Service, Ferndale, Mich., on a bid of $18,300.

For taxi reflectors (49-1545):
Minnesota Mining & Mfg., Co., St. Paul, on a bid of $22,512.

For ball bearings (49-1628):
Companies sharing—Barden Corp., Danbury, Conn., on a bid of $41,250, and General Motors Corp., Bristol, Conn., on a bid of $9125.

For polychloroprene (49-1684):
Companies sharing—General Cable Corp., Cincinnati, on a bid of $25,540; Collyer Insulated Wire Co., Pawtucket, R. I., on a bid of $17,300, and United States Rubber Co., Bristol, R. I., on a bid of $28,325.

For rubber sponge (49-1694):
Van Cleef Brothers, Inc., Chicago, on a bid of $3331.25.

For 629 domes (49-1699):
Companies sharing — Beech Aircraft Corp., Wichita, on a bid of $18,242.95, and Steiner Plastics Mfg., Co., Inc., Long Island, N. Y., on a bid of $8455.

For 1 oscillograph (49-1222):
Hathaway Instrument Co., Denver, on a bid of $7250.

For casing assemblies (49-1269):
Companies sharing—Apex Machine & Tool Co., Dayton, on a bid of $1575; Burke Mfg. Co., Cincinnati, on a bid of $1060; Deutsch Co., Los Angeles, on a bid of $830.24; Elastic Stop Nut Corp., Union, N. J., on a bid of $5255.50; Boots Aircraft Nut Corp., Stamford, Conn., on a bid of $1493.75; Irvin W. Masters, Inc., Burbank, on a bid of $952.50; Formica Co., Cincinnati, on a bid of $880; Gaveco Laboratories, Inc., New York, on a bid of $1210; American Chain & Cable Co., Inc., Detroit, on a bid of $1140, and Sanford Aircraft, Inc., Inglewood, Calif., on a bid of $133.90.

For 874 lamps & desks (49-1335):
Companies sharing—Herco Art Mfg., Co., Washington, D. C., on a bid of $3260, and Art Specialty Co., Chicago, on a bid of $576.70.

For chemicals (49-1347):
Companies sharing—Octagon Process, Inc., Brooklyn, on a bid of $1714.26; Mallinckrodt Chemical Works, St. Louis, on a bid of $18,008; Prepared Photochems Co., Orange, N. J., on a bid of $18,669.21, and Eastman Kodak Co., Rochester, on a bid of $4380.

For 68 test stands (49-1464):
Denison Engineering Co., Columbus, O., on a bid of $220,864.

For 1162 photographic equipment (49-1473):
Companies sharing—Wollensak Optical Co., Rochester, on a bid of $5800; G. Gennert Inc., New York,, on a bid of $2135.31, and Eastman Kodak Co., Rochester, on a bid of $1439.85.

For lens (49-1498):
Camera Equipment Co., New York, on a bid of $4095.

For hydrogen peroxide (49-1582):
Companies sharing—B. R. Elk & Co., Inc., Garfield, N. J., on a bid of $7880, and City Chemical Corp., New York, on a bid of $9150.

For polishing compound (49-1729):
Companies sharing—Lea Mfg., Co., Inc., Waterbury, Conn., on a bid of $315, and Engis Equipment Co., Chicago, on a bid of $2486.54.

For synthetic rubber sheet (49-1759):
Quaker Rubber Corp., Philadelphia, on a bid of $2526.65.

For 820 spotlight assemblies (49-1374):
Standard-Thomson Corp., Dayton, on a bid of $6043.40.

For 100,000 lb. strapping steel (49-1467):
Gerrard Steel Strapping Co., Chicago, on a bid of $9000.

For tape (49-1227):
Armstrong Cork Co., Lancaster, Pa., on a bid of $3567.50.

For 3787 chair cabinets (49-1020):
Companies sharing—McConnaughey Stationers Inc., Springfield, O., on a bid of $21,933; Roth Office Equipment Co., Dayton, on a bid of $34,450, and International Business Machines Corp., Dayton, on a bid of $3281.25.

Contracts Open to Renegotiation

National Military Establishment lists companies with AF and Navy orders subject to price redetermination.

National Military Establishment has compiled a list of all Air Force and Navy contracts let between May 21, 1948, and Dec. 31, 1948, that are specifically subject to the Renegotiation Act of 1948.

AVIATION WEEK is publishing the complete list, as issued, in installments, the first of which appeared last week. The second installment follows.

Final authority on whether a contract will or will not be subject to renegotiation will be the Military Renegotiation Policy and Review Board. Omission from the list of a contract subject to renegotiation will not exempt contractors from provisions of the act, nor will inclusion of a contract automatically make a contractor liable under the act.

Borg Warner Corp., Cleveland—Pesco Products division: N383S-8862, N383S-8865, N383S-9124, N383S-9447, N383S-9518, N383S- 9845, N383S-9860, N383S-1005, N383S-10124, N383S-10164, N383S-10713, N383S-11947, N383S-13264, N383S-13228, N383S-13893, N383S-10361, order (33-038) 49-886, order (33-038)49-939, order (33-038)49-354, order (33-038)49-423, order (33-038)49-769, W33-038 AC 22419, order (33-038)49-200.

Pesco Products division: N383S-8862, N383S-8865, N383S-9124, N383S-9447, N383S-9518, N383S-9845, N383S-9860, N383S-10605, N383S,10124, N383S-10164, N383S-10713, N383S-11947, N383S-13264, N383S-13228, N383S-13893, N383S-10361, order (33-038)49-886, order (33-038)49-939, order (33-038) 49-354, order (33-038)49-423, order (33-038)49-769, W33-038 AC 22419, order (33-038)49-200.

Marvel-Schebler Carb division: W33-038 AC 22598.

Bowser, Inc., Fort Wayne, Ind.: W33-038 AC 21381.

L. S. Brach Manufacturing Corp., Newark 4: Order (33-038)48-3752, order (33-038) 48-4166, W33-038 AC 22010, AF 33(308)-418.

Breeze Corporations, Inc., Newark: N383S-9057, N383S-13488, N383S-13555, order (33-038)48-4092.

Breslee Manufacturing Co., Inc., New York: N383S-13166.

Bruce Payne & Associates, Inc., Westport, Conn.: W33-038 AC 21656.

S. Buchsbaum & Co., Chicago: N383S-12131.

Camloc Fastener Corp., New York: Order (33-038)48-4208.

Cannon Electric Development Co., Los Angeles: W33-038 AC 22282, W33-038 AC 22510, AF 33(038)-163.

Capewell Manufacturing Co., Hartford, Conn.: N383S-12888, N383S-9387.

Castle Hills Corp., Piqua, Ohio: Order (33-038)49-1040.

Central Tool Co., Cranston, R. I.: N383S-13781.

Champion Spark Plug Co., Toledo, Ohio: N383S-13630.

Chapin, Charles E., Co., Inc., Rutherford, N. J.: N383S-13736.

Chicksan Co., Brea, Calif.: N383S-12698.

Clare, C. P. & Co., Chicago: Order (33-038)49-727.

Clark, David, Co., Inc., Worcester, Mass.: W33-038 AC 22234, order (33-038)48-4081.

Clark, W. L. M., Inc., St. Louis, Mo.: W33-038 AC 21372.

Cleveland Pneumatic Tool Co., Cleveland: N383S-8666, N383S-9914, N383S-11048, W33-038 AC 22258.

Collens Instrument Co., New York: N383S-11154.

Collins Radio Co., Cedar Rapids, Iowa: NOA(S) 9972, NOA(S) 10056, N383S-11929.

Columbus Engineering Co., Columbus, Ohio: N383S-10483, N383S-12414.

Comtor Co., Waltham, Mass.: N383S-10425.

Consolidated Vultee Corp., San Diego: NOA(S) 7222 amendment No. 30.

Continental Motors Corp., Detroit: Order (33-038)48-3961, order (33-038)48-4206, order (33-038)48-4267.

Control Instrument Co., Inc., Brooklyn, N. Y.: NOA(S) 10069.

Cornelius Co., Minneapolis, Minn.: N383S-10809, order (33-038)48-3956.

Cornell Aeronautical Laboratory of Cornell Research Foundation, Buffalo, N. Y.: NOA(S) 8289.

Crystal Products, Inc., Kansas City, Mo.: W33-038 AC 22186.

Clyne Manufacturing Co., Indianapolis, Ind.: AF 33(038)-142.

Curtiss-Wright Corp., Columbus, Ohio: NOA(S) 7988 amendment No. 14.

Airplane division: NOA(S) 8664, NAO(S) 9165.

Propeller division: N383S-9871, order (33-038)48-3814, W33-038 AC 21379, W33-038 AC 21694, W33-038 AC 22303.

Danbury-Knudsen, Inc., Danbury, Conn.: N156s-26567, Order (33-038)49-194.

Davis Plywood Corp., Cleveland, Ohio: Order (33-038)48-4170.

Dayton Aircraft Products Co., Dayton, Ohio: Order (33-038)48-3938.

De Jur Ansco Corp., Long Island City, N. Y.: Order (33-038)49-269; Order (33-038)49-417.

Delron Co., Inc., Order (33-038)49-2292.

De Mornay-Budd, Inc., New York, N. Y.: N383s-8503.

Detroit Gasket Manufacturing Co., Detroit, Mich.: AF 33(038)-220.

Dial Light Co. of America, Inc., New York, N. Y.: W33-038 ac 22181, W33-038 ac 22179, W33-038 ac 22497.

Dill Manufacturing Co., Cleveland, Ohio: W33-038 ac 22107.

Dorne & Margolin, Bethpage, Long Island, N. Y.; NOa(s) 10135.

Douglas Aircraft Co., Inc., Santa Monica, Calif.: NOa(s) 9027 Amendment No. 6-Letter of Intent, NOa(s) 6539, NOa(s) 7980 Amendment No. 2, NOa(s) 9989, N383s-9036, N383s-9114, N383s-9271, N383s-10366, N383s-12643, N383s-13955, N383-s-8173, Order (33-038)49-892, N383s-9919.

Dreis & Kump Manufacturing Co., Chicago, Ill.: W33-038 ac 21361.

Eagle Signal Corp., Moline, Ill.: N383s-13472.

Eastern Industries, Inc., New Haven, Conn.: N383s-8938.

Eastern Iron & Metal, Los Angeles, Calif.: W33-038 ac 22283.

Eastern Specialty Co., Philadelphia, Pa.: N383s-12535.

Eastman Kodak Co., Rochester, N. Y.: Order (33-038)49-1085.

Edo Corp., College Point, Long Island, N. Y.: NOa(s) 9760.

Edison, Thomas A., Inc., West Orange, N. J.: N383s-10263.

Eicor, Inc., Chicago, Ill.: N163s-226, W33-038 ac 21860, W33-038 ac 21863, W33-038 ac 22120.

Elastic Stop Nut Corp. of America, Union N. J.: AF 33(038)-46.

Electric Storage Battery Co., Philadelphia, Pa.: N8sa-3370.

Electrol, Inc., Kingston, N. Y.: N383s-9729, N383s-10360, N383s-10467, N383s-10760, N383s-13043, N383s-12450.

Electromac Associates, Richland, Wash.: Order (33-038)48-4031.

Elgin National Watch Co., Elgin, Ill.: Order (33-038)48-3794.

Emerson Electric Manufacturing Co., St. Louis, Mo.: NOa(s) 10117.

Engineering & Research Corp., Hyattsville, Md.: N383s-11433.

Essex Wire Corp., Fort Wayne, Ind.: W33-038 ac 22443.

Fairchild Camera & Instrument Co., Jamaica, N. Y.: Order (33-038)48-4318, Order (33-038)48-4331, W33-038 ac 21315, W33-038 ac 22092.

Fairchild Engine & Airplane Corp., Hagerstown, Md.: NOa(s) 6323.

Federal Communication Laboratory, Inc., Nutley, N. J.: W33-038 ac 21373.

Federal Telephone & Radio Corp., Clifton, N. J.: N383s-10949, W33-038 ac 22019.

Felsenthal, G & Sons, Inc., Chicago, Ill.: N383s-10502, N383s-10767, N383s-8342.

Fenwal, Inc., Ashland, Mass.: Order (33-038)49-506.

Firestone Industrial Products Co., Akron, Ohio: N383s-9508.

Firestone Tire & Rubber Co., Akron, Ohio: NOa(s) 10203, N383s-11343, ASO Order Number—10922, ASO Order Number—10922-1, ASO Order Number—10922-2, ASO Order Number 10922-4, ASO Order Number—10922-5, ASO Order Number—46102, ASO Order Number—46102-102.

First Industrial Corp., New York, N. Y. —Micro Switch Division: W33-038 c 22305.

Fly By Nite, Inc.: Order (33-038 49-1153.

G & O Manufacturing Co., New Haven, Conn.: N383s-12650.

Gabb Manufacturing Co., Inc., East Hartford, Conn.: N383s-9120, N383s-9169.

Garrett Corp., Los Angeles, Calif.—AiResearch Manufacturing Co., division: N383s-9759, N383s-10288, N383s-10516, N383s-10612, N383s-10681, N383s-10840, N383s-

10979, N383s-11448, Order (33-038)49-1170.

General Controls Co., Glendale, Calif.: N383s-9648, N383s-12054.

General Electric Co., Schenectady, N. Y.: NOa(s) 10160, NOa(s) 10201—Letter of Intent, NOa(s) 9817 Amendment No 1 to letter of Intent, NOa(s) 9951, NOa(s) 10211, N383s-8707, N383s-9429, N383s-9726, N383s-10696, N383s-11276, N383s-11308, N383s-11499, N383s-12515, N383s-13113, N383s-13466, N383s-13549, N383s-13550, Order (33-038)48-3790, Order (33-038)49-167, Order (33-038)49-1163, Order (33-038)49-436, Order (33-038)49-1077, W33-038 ac 22449.

General Motors Corp., Indianapolis, Ind.: NOa(s) 9349 Amendment No. 2, NOa(s) 10134, Order (33-038)49-35.

Allison division: NOa(s) 9697 Amendment No. 4, W33-038 ac 22220.

Aeroproducts division: N383s-9878, N383s-10098, W33-038 ac 22259.

Rochester Products division: N383s-10211, N383s-12110, N383s-12568.

Harrison Radio division: N383s-11481.

Packard Electric division: Order (33-038)49-231.

AC Spark Plug division: Order (33-038)48-4080, Order (33-038)49-494, W33-038 ac 21420.

General Tire & Rubber Co., Akron, Ohio: ASO Order Number—10923, ASO Order Number—10923-1, Order (33-038)48-4291, Order (33-038)48-4355, Order (33-038)49-71.

Giannini, G. M. & Co., Inc., Pasadena, Calif.: W33-038 ac 21428.

Gilfillan Bros., Inc., Los Angeles, Calif.: AF (33-038)-254.

Gill Electric Manufacturing Corp., Red Lands, Calif.: N8sa-3367, N8sa-3368.

Gladden Products Corp., Glendale, Calif.: N383s-9425.

Globe Corp., Chicago, Ill.: N383s-13048.

B. F. Goodrich Co., Akron, Ohio: N383s-8647, N383s-9136, N383s-9658, N383s-9712, N383s-9880, N383s-11047, N383s, 13556, N383s-9344, N383s-9485, ASO Order Number—10924, ASO Order Number—10924-1, ASO Order Number—10924-2, ASO Order Number—10924-3, ASO Order Number—10924-4, Order (33-038)49-13, Order (33-038)49-374, Order (33-038)49-1573, Order (33-038)49-544, W33-038 ac 22208, W33-038 ac 22252, W33-038 ac 22254.

Goodyear Aircraft Corp., Akron, Ohio: NOa(s) 10208—Letter of Intent, N383s-9699, N383s-10646, W33-038 ac 21302.

Goodyear Tire & Rubber Co., Inc., Akron, Ohio: N383s-10195, N383s-10700, N383s-11347, N383s-12001, N383s-12413, N383s-12421, ASO Order Number—10925, ASO Order Number—10925-1, ASO Order Number—10925-2, ASO Order Number—10925-3, ASO Order Number—10925-4, Order (33-038)48-3880, Order (33-038)49-451, Order (33-038)48-4108, Order (33-038)49-128, Order (33-038)49-749, Order (33-038)49-878, Order (33-038)49-426, Order (33-038)49-495, Order (33-038)49-614, W33-038 ac 21818, W-33-038 ac, 22008, W-33-038 ac 22191.

Graflex, Inc., Rochester, N. Y.; Order (33-038)49-773.

Grand Distributing Co., Detroit, Mich.: Order (33-038)49-179.

Green Machine Co., Inc., Manchester, Conn.: N383s-10837.

Greer Hydraulics, Inc., Brooklyn, N. Y.: N383s-13398.

Grimes Manufacturing Co., Urbana, Ohio: N383s-9475, Order (33-038)49-934.

Grumman Aircraft Engineering Corp., Bethpage, Long Island, N. Y.: NOa(s) 4946 Amendment No. 6, NOa(s) 8449 Amendment No. 19, NOa(s) 8449 Amendment No. 20, NOa(s) 8449 Amendment No. 24, NOa(s) 8449 Amendment No. 26, NOa(s) 9651, NOa(s) 4346, NOa(s) 8271, NOa(s) 8449 Amendment No. 17, NOa(s) 8663, NOa(s) 8663 Amendment No. 4, NOa(s) 9403, NOa(s) 9403, Amendment No. 2 to Letter of Intent, N383s-8524, N383s-8725, N383s-9044, N383s-9542, N383s-10053, N383s-10064, N383s-10290, N383s-10685, N383s-13159, N383s-14010.

Hallett Manufacturing Co., Inglewood, Calif.: N383s-9565, N383s-10938.

Hart, Fredrick & Co., Inc., Poughkeepsie, N. Y.: W33-038 ac 21864.

Hartman Electrical Manufacturing Co., Mansfield, Ohio: NOa(s) 9302 Amendment No. 3 Order (33-038)49-141, Order (33-038)49-242, NOa(s) 9974.

Hartzell Industries, Inc., Piqua, Ohio: Order (33-038)48-4082, Order (33-038)49-1041.

Heli-Coil Corp., Long Island, New York, N. Y.: N383s-9560.

Henry, Paul Co.: Order (33-038)48-3821.

Hetherington, Robert & Sons, Inc., Sharon Hill, Pa.: N156s-26469.

Hickok Electrical Instrument Co., Cleveland, Ohio: N383s-8986.

Houdaille-Hershey Corp., Buffalo, N. Y.: N383s-10838.

Hydro-Aire, Inc., Burbank, Calif.: N383s-9702, N383s-9789, N383s-9832, N383s-10551, N383s-10697, N383s-13797.

Hydro-Press, Inc., New York, N. Y.: W33-038 ac 21385.

Ideal Cold Heading Co., Belleville, Mich.: W33-038 ac 22453.

Imperial Brass Manufacturing Co., Chicago, Ill.: N383s-9138.

Independent Awning & Canvas Prod. Co.: AF 33(038)-456.

Indiana Steel Products Co., Chicago, Ill.: N383s-10133.

Industrial Contractors, Inc., Trenton, N. J.: N383s-11188.

Industrial Tool & Engineering Co., Chicago, Ill.: NOa(s) 10037.

Instruments Corp., Baltimore, Md.: N383s-13817.

International Aero Factors, Burbank, Calif.: Order (33-038)49-1284.

Interstate Engineering Corp., El Segundo, Calif.: N383s-9724, N383s-9864, Order (33-038)49-513, Order (33-038)49-1286.

Irving Air Chute Co., Inc., Buffalo, N. Y.: N383s-10630, N383s-11619.

Jack & Heintz Precision Industries, Inc., Cleveland, Ohio: NOa(s) 10044, N383s-12000, N383s-12055, N383s-13777, N383s-13776, N383s-13649, N156s-26523, Order (33-038)49-900, Order (33-038)49-429, Order (33-038)49-487, W33-038 ac 22543, W33-038 ac 22586.

Jackson & Heit Machine Co., Philadelphia, Pa.: N156s-26512.

Johns-Manville Sales Corp., New York, N. Y.: W33-038 ac 22140.

Junior Motors Co., Philadelphia, Pa.: N156s-26502.

Kalart Co., Inc., Stamford, Conn.: Order (33-038)49-774.

Keck, William, Sons, Joliet, Ill.: AF 33(038)-160.

Kell-Strom Tool Co., Inc., Hartford, Conn.: N383s-9086, N383s-9691, N383s-10402, N383s-12996, N383s-10682, N383s-13847.

Kenyon Instrument Co., Inc., New York, N. Y.: N383s-9996, N383s-10039, N383s-11505.

Kidde, Walter & Co., Inc., Belleville, N. J.: N383s-9728, N383s-10154, N383s-10189, N383s-10240, N383s-12663, N383s-13305, N383s-13413, Order (33-038)49-7, Order (33-038)49-187, Order (33-038)49-1100.

Kiekhaefer Corp., Cedarburg, Wis.: N383s-12064.

Kings Electronics Co., Brooklyn, N. Y.: Order (33-038)48-4093.

Kingston Products Corp., Kokomo, Ind.: Order (33-038)48-4017.

Koehler Aircraft Products Co., Dayton, Ohio: N383s-12139, Order (33-038)49-107.

Kohler Company, Kohler, Wis.: N383s-10918, N383s-11780.

Kollmorgen Optical Corp., Brooklyn, N. Y.: NOa(s) 8309.

Koppers Co., Inc., Baltimore, Md., (Metal Products Division): N383s-9216, Order (33-038)49-199.

Kraissl Co., Inc., Hackensack, N. J.: N383s-11447.

Lamson & Sessions Co., Cleveland, Ohio: N383s-13125.

Lavoie Laboratory, Morganville, N. J.: Order (33-038)48-4290. W33-038 ac 21665.

Leach Relay Co., Los Angeles, Calif.: W-33-038 ac 22108.

Lear Inc., Grand Rapids, Mich.: N383s-10289, N383s-11768, N383s-12195, Romec Pump Co. division: N383s-9383, N383s-9448, N383s-9979, Order (33-038)49-424, W33-038 ac 22430.

Lewis Engineering Co., Naugatuck, Conn.: NOa(s) 9710, N383s-8991, N383s-9970, N383s-10063, N383s-10166, N383s-11401, N383s-12399, Order (33-038)49-201, Order (33-038)49-373.

Libby-Owens Ford Glass Co., Toledo, Ohio: Order (33-038)49-887.

Lincoln Industries, Inc., Marion, Va.: N383s-11790, N383s-10076.

Link Aviation, Inc., Binghamton, N. Y.: N383s-11814, N383s-12347, N383s-9109.

Link, L. & Co., Inc., New York, N. Y.: NOa(s) 10179.

Liquidometer Corp., Long Island, N. Y.: N383s-9122, N383s-9199, N383s-10498, N383s-10563, N383s-11124, N383s-12157, N383s-13540, N383s-13180, N383s-13399, Order (33-038)49-371, Order (33-038)49-372, Order (33-038)49-906, Order (33-038)49-1067, Order (33-038)49-940, W33-038 ac 22506.

Lockheed Aircraft Corp., Burbank, Calif.: NOa(s) 8524 Amendment No. 8 NOa(s) 10169, NOa(s) 375, NOa(s) 3297, NOa(s) 5247, N383s-9961, N383s-10344, N383s-12983, N383s-13074, Order (33-038)49-318, Order (33-038)49-486, Order (33-038)49-859, Order (33-038)49-909, W33-038 ac 21663.

Lockheed Aircraft Service, Inc., Burbank, Calif.: N383s-12980, N383s-8172.

Lord Manufacturing Co., Erie, Pa.: N383s-10678, Order (33-038)49-90.

WHAT'S DOING *at Pratt & Whitney Aircraft?*

ON the opposite page are two significant dates in aircraft engine history.

On the first, May 14, 1947, Pratt & Whitney Aircraft acquired an option to build its own version of the Rolls-Royce Nene jet engine.

The second, November 30, 1948, marks the date on which Pratt & Whitney delivered to the Navy the first production model of that engine—the JT-6 "Turbo-Wasp". It was installed in an F9F Grumman Panther.

In between those dates, there were 566 days. And nearly every one was a red-letter day in some department of Pratt & Whitney Aircraft. For, each one marked one more step in the completion of a task that may sound easy but actually took 18 months of the hardest kind of work by our organization.

Externally, the Turbo-Wasp looks pretty much like the original Nene engine. But there the resemblance ends. The redesign of many parts, the development of improved manufacturing processes to speed quantity production and, in some cases, the substitution of new materials represent only some of the problems encountered. All told, more than a million man-hours were spent in readying the Turbo-Wasp for production. That's equivalent to the full time of one man working a 40-hour week for 500 years!

Now, to all of this must be added the tooling-up that had to be done, shop rearrangement, actual production of the engine, testing and a host of other tasks requiring additional hundreds of thousands of man-hours—all accomplished within those 566 days. The opposite page will give you some of the highlights of this achievement.

The production of the Turbo-Wasp engine represents only one phase of Pratt & Whitney's continually expanding development program. Simultaneously, we are working on the even more difficult task of designing and developing from scratch, entirely new types of jet power plants. At the same time, we are continuing the refinement and development of the well-known Wasp line of reciprocating engines.

It keeps us pretty busy.

PRATT & WHITNEY AIRCRAFT

EAST HARTFORD, CONNECTICUT

ONE OF THE FOUR DIVISIONS OF UNITED AIRCRAFT CORPORATION

1,100 DRAWINGS

We received more than 1,100 different drawings of the original Nene engine. Every one of these had to be redrawn to conform to American drafting practice.

1,000 DESIGN CHANGES

The original engine had to be adapted to use American-built accessories, as well as to provide for the use of new materials or new processes suitable for quantity manufacture. We made more than 1,000 design changes to accomplish these objectives.

5,300 SPECIAL TOOLS

It takes all kinds of tools from a simple hand drill to a 400-ton hydraulic press to build an airplane engine. For the Turbo-Wasp we had to design 5,300 special tools. Counting changes, we made nearly 10,000 tool designs before we were ready to put the engine into production.

9,000 OPERATIONS SHEETS

Each step in the processing of each part of an engine has to be outlined in detail to give the shop all the information required to do the job. On the Turbo-Wasp our production engineers had to write up more than 9,000 such operations sheets. Many of these required the handling of new materials or the use of new processes previously unfamiliar to us.

225,000 SQ. FT. OF FLOOR SPACE

In order to build the engine, we had to have a place to do the work. We rearranged 225,000 sq. ft. of floor space (equivalent to 4 football fields) for manufacturing this one type of engine. This involved careful planning of production lines, and the installing or moving of thousands of hand tools, benches and other items of factory equipment as well as 259 machines.

35,000 MANUFACTURING OPERATIONS

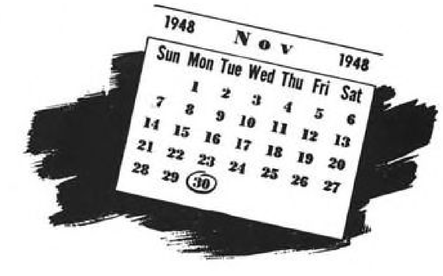
There are 1,088 *different kinds* of parts in a Turbo-Wasp — 7,022 pieces in all. Each goes through many operations before it is ready for assembly into the finished engine. About half the parts are built here, the rest by a specially trained team of 150 subcontractors. Approximately 35,000 manufacturing operations are done by us in our own plant in making parts for one Turbo-Wasp. To that can be added the tens of thousands performed by our subcontractors.

1,700 HOURS OF TESTING

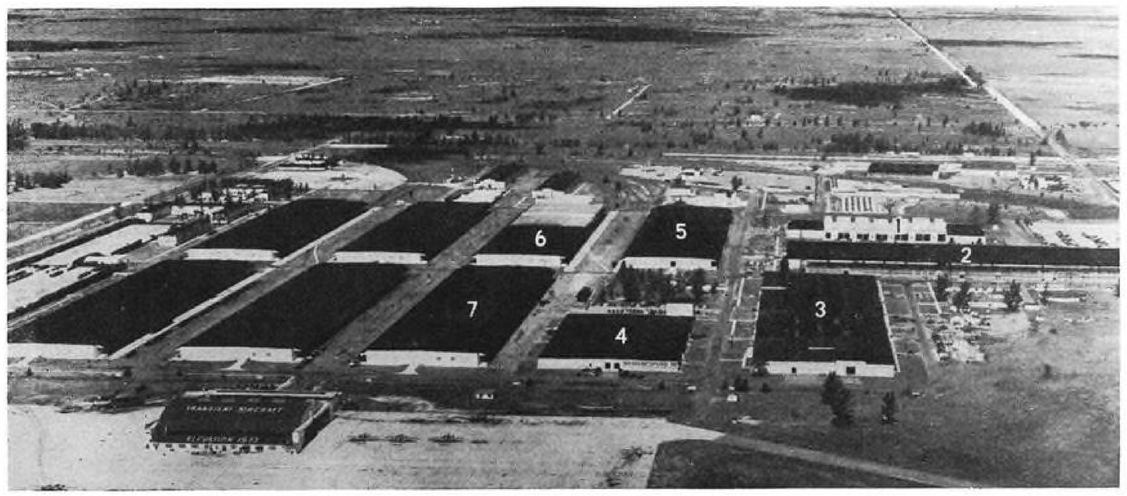
After a complete Turbo-Wasp was built, it had to go on a test stand and pass a rigorous 150-hour type-test. And that's only part of the story. Many sub-assemblies of this engine were tested for hours on end to make sure they would stand up in service. By the time the first engine was shipped, more than 1,700 hours had been spent in complete engine testing, exclusive of thousands of hours of component testing.

10,000,000 DOLLARS

From the time Pratt & Whitney Aircraft acquired its option to build the Turbo-Wasp engine until the first production model was delivered last November, we spent more than 10 million dollars on it. That's at the rate of more than 17 thousand dollars a day. This does not include many additional millions invested in new research and test facilities devoted to all types of jet engines.



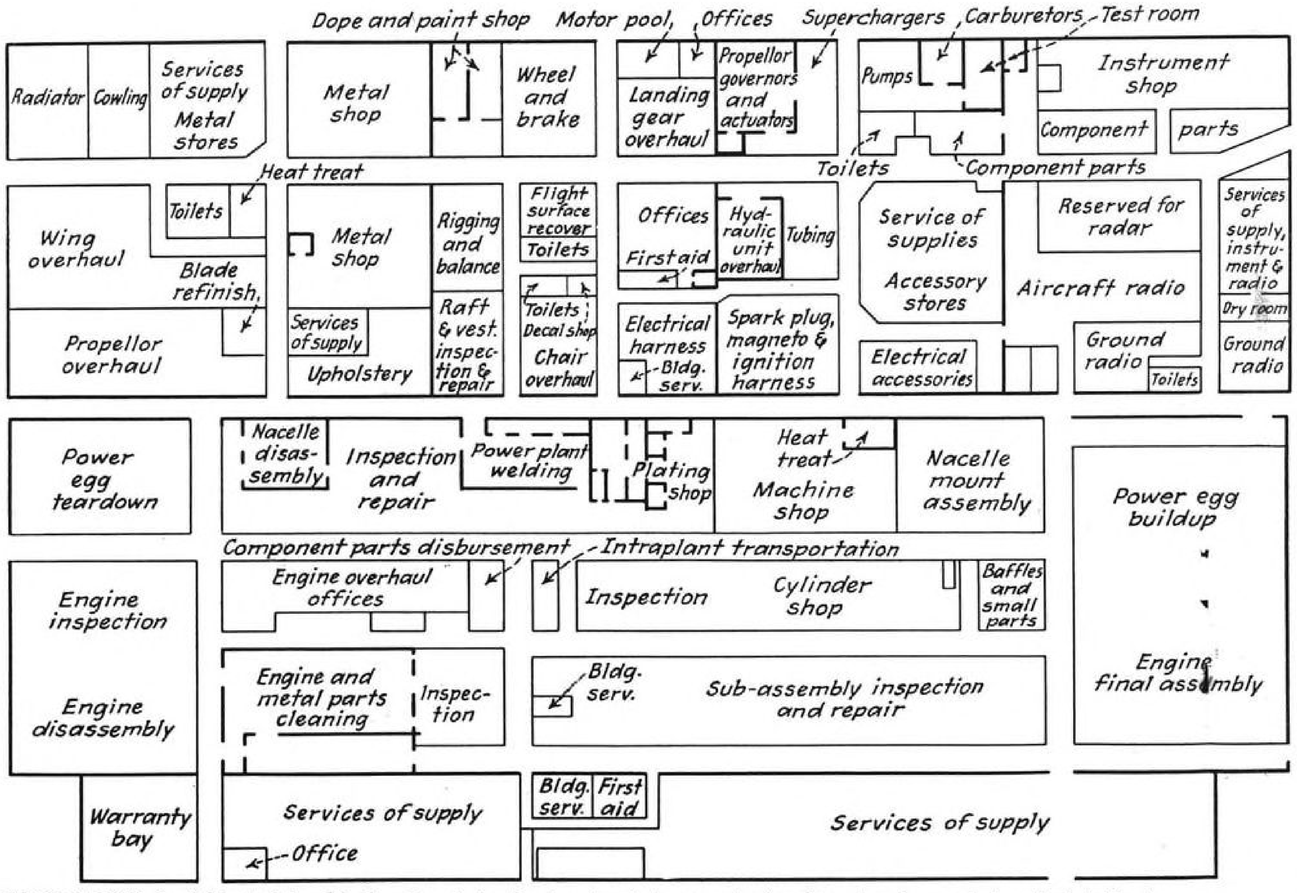
ENGINEERING



EXTENSIVE AREA of PAA components overhaul section accommodates (1) engine test; (2) engine overhaul; (3) accessory overhaul; (4) plant engineering, flight and ground training, and chemical lab; (5), (6) warehouses; and (7) general files storage and air freight.

HUGE NOSEDOCK is being readied for giant Stratocruiser. Structure will have electrical, drainage facilities "piped" in.

SEVEN-ACRE powerplant-reconditioning building, shown in part, houses production lines for engines of DC-4, DC-6, Convair-Liner, Constellation and the Stratocruiser.



WIDE RANGE of activities is disclosed in these layouts showing departments in accessories (top diagram) and powerplant overhaul (bottom).

Maintenance Goes on the Production Line

Proven techniques applied on large scale at PanAm's giant Miami overhaul base for aircraft, components.

By Irving Stone

Precision maintenance—backbone of airline efficiency—is getting large-scale, production-line treatment at Pan American Airways' Miami overhaul base.

In what is probably the world's largest airline overhaul facility, a closely controlled, mass-production maintenance plan has been instituted to cope with cost-consuming aspects of growing aircraft complexity, diversity of airplane types, and far-flung operations.

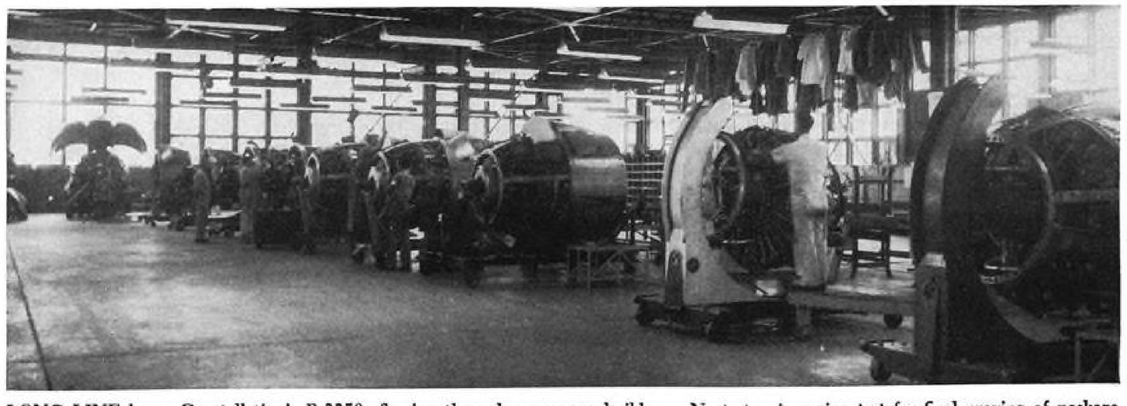
▶ **Overhaul Centralized**—Basic objective of the activity is to reduce maintenance cost of aircraft per flight hour through centralization of equipment and overhaul facilities for a high volume of work. This eliminates duplication of similar setups at PAA's Atlantic and Latin American divisions and makes for most efficient full-time use of tools. The Pacific division is not yet included in the plan because of the ferrying time involved.

Activated in May, 1948, and beginning full operations last September, the base is now servicing almost 100 craft —5 DC-6s, 18 Constellations, 20 Convair-Liners, and 50 DC-4s. And 11 Stratocruisers are scheduled for take-in, the first expected in August.

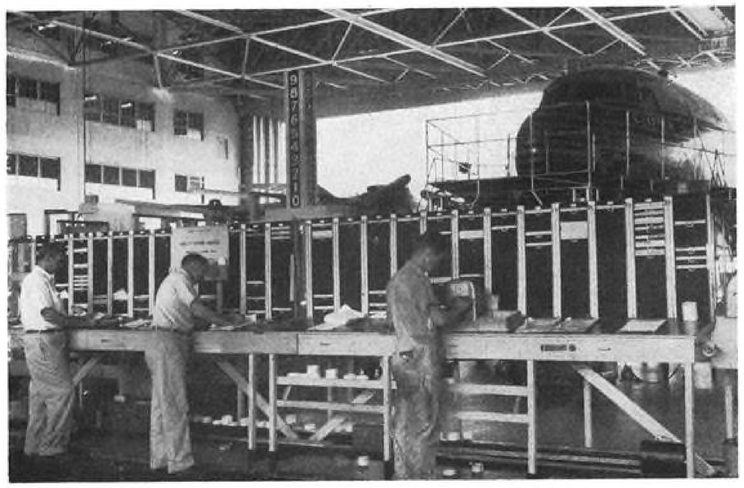
Presently, at least one Constellation and two DC-4s are ferried each week to Miami from the Atlantic division base at La Guardia. The Connies are brought in for engine change and overhaul every 1000 hr. DC-4s get heavy service (260 hr. and above) and overhaul.

Craft from the Latin American division are brought in on regular operating schedule.

Facilities at the base could accommodate work for other operators, but no maintenance arrangements with other



LONG LINE keeps Constellation's R-3350s flowing through power-egg buildup. Next step is engine test for final proving of package.



WORK ASSIGNMENT board is provided for service and overhaul on each craft for quick check on progress. Numbers on column light up to signal specialist to plane.

lines have been made to date.

▶ **Production Control**—Except for some few instances of highly specialized parts reconditioning which cannot be done without voiding the engine guarantee, all work is performed for complete overhaul of the craft.

The various overhaul operations are coordinated through a production control unit. This group lays out a maintenance schedule for the specific aircraft 24 months in advance. From this, the rate at which services will be performed is determined.

A repeating pattern schedules the arrival of aircraft for work and may mean taking in as many as 5 planes in a 24-hr. period. This planning permits assignment of crews for day-by-day work phases.

The long-range maintenance schedule is translated into an overhaul schedule for each type of component—engines, props, carburetors, etc.—taking into consideration the program requirements plus arbitrary increases to take care of failures and line station needs. The overhaul shops are then loaded in accordance with the schedule and manpower requirements determined.

▶ **Material Check**—Material planning is closely controlled and determines what raw stores and parts will be needed, when they will be used and in what quantities. For analysis, each major section of the aircraft and each compoent is resolved into piece parts and the wear or rejection rates are then approximated.

Stores are notified of the expected use-rate for each piece part and, by code number, where it will be used. Parts are issued against the code number and summary reports are made showing actual usage of piece parts against the code.

As the rate of activity changes, stores are advised of the change in use-rate via six-month forecasts made every three months.

Each shop has a Remington Rand Sched-U-Graph, showing total quantity of a component on hand (off the airplane); number requiring overhaul; those scheduled for overhaul in a given period of time; and number completed.

▶ **Aircraft, Components Setup**—The overall activity is divided into two sections—the aircraft servicing facility (for line maintenance through aircraft overhaul) and the components overhaul base.

Aircraft service employs approximately 830 mechanics (including cleaners and tool crib personnel) and 145 supervisors on a 3-shift basis, 7 days per week.

Component overhaul has 750 mechanics and 50 supervisors on a single shift basis, 5 days per week.

For both activities there are about 425 engineers and other technical, production control, and clerical personnel. These are concerned with basic modifications, time and motion studies, preparation of manuals, tool and equipment requirements, and other planning details.

▶ **Plane Taken In**—When an airplane comes in for overhaul, it is moved into its special-type receiving dock in aircraft service so that components can be removed quickly (for shipment to the components overhaul base across the field) and reconditioned units on hand then installed to permit rapid craft-turnabout.

For example, the Constellation dock, largely a sectional arrangement, has a platform for underwing work, with elevated sections fore and aft for access to the trailing edge, leading edge and wing top. An additional platform is for work on deicer boots. Other sections for tail access are moved into place after the ship is positioned.

To cut down sheet-metal damage, special castered cowling stands fitted to receive individual sections are stationed at each engine location. High cost of these cowling parts, close to $2000 for one section alone, necessitates careful handling.

PanAm constantly boosts its dock efficiency through modifications and additions. Latest of these is an adjustable work platform to ease engine servicing. Located between opposite, side-access engine-stands, the platform may be raised or lowered to suit the individual mechanic for work on the lower part of the engine or on the firewall with engine removed.

▶ **Readying for Big One**—The Stratocruiser service dock, now under construction, is designed to insure fast maintenance on this huge craft. The nose section—a three-tier structure—is already completed. At its top level will be extension platforms running the length of the craft to facilitate cleaning and repair of fuselage top, access to transparent enclosures, antennas, and other hard-to-get-at details.

To make the dock a self-contained servicing unit, electricity and other facilities (interphones, cleaning fluid, etc.) will be "piped" in. A drainage system will be included for the normally messy job of handling aircraft liquids.

▶ **Aircraft Work Scheduling**—To insure efficient utilization of mechanics in aircraft service or aircraft overhaul, a work assignment board is set up before each craft.

This schedules hour-to-hour jobs on the particular plane and serves as a quick visual check of work progress.

The board is divided vertically timewise, and horizontally divided man-wise in groups of specialties.

An overall layout of work load for all aircraft in for service is shown on a work schedule board.

This is divided vertically into shifts for a seven-day period, and horizontally into stations which receive colored metal strips indicating the specific planes assigned to the various locations.

Each color represents an airplane type, and each craft is designated by its license number.

Small tags over the metal strips show number of men assigned to the plane, for that shift, according to mechanic specialty. And total men assigned to all airplanes as against total men available can quickly be determined.

A red marker adjacent to the airplane color strip indicates that the craft has remained in its position beyond its scheduled time.

This board, not yet officially adopted, is now under study for further refinement.

▶ **Engine Line**—Activities of the components overhaul base are accommodated in three large buildings. These house engine overhaul, engine test, and components (accessories) overhaul.

The huge engine overhaul structure covers about 7 acres. It accommodates four production lines complemented by other engine-parts servicing facilities.

The activity is so mechanized and coordinated that one gets the impression it is a factory line rather than an adjunct to an airline operation. Engines are completely dismantled and parts reconditioned or replaced for final assembly into complete power eggs.

Individual lines handle the P&W R-2000 for the DC-4; P&W R-2800 for the DC-6 and Convair-Liner; and two distinct models of the Wright R-3350 for the L-49 Constellation and the L-749 (Gold Plate) version.

A separate line has been readied for the Stratocruiser's P&W R-4360. About 50 of these huge piston engines are on hand as spares and for familiarization.

▶ **Engine Man-Hours**—Currently, about 400 man-hours are being expended per overhaul for the R-2000 power egg (includes all parts—engine plus accessories). Goal for this power package, based on time studies, is about 345 man-hours.

Spread between these values is small because of long-time experience with this engine.

For the R-2800 power egg, man-hours per overhaul is 750. Goal is 400.

Overhaul time for the R-3350 is 850 manhours, 500 the aim.

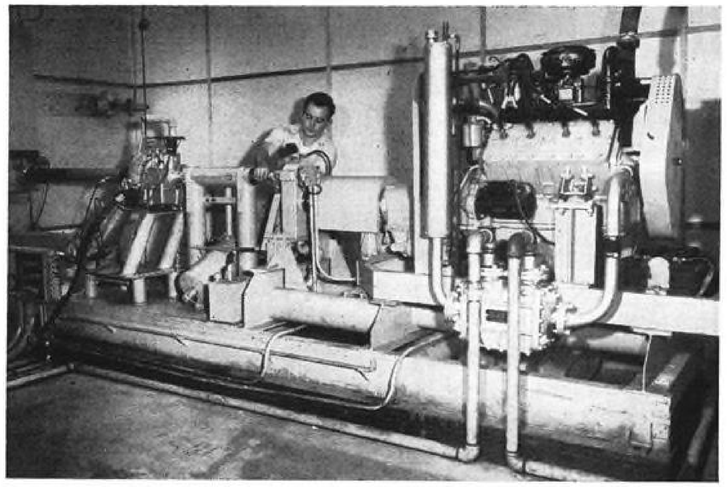
Preliminary studies for the R-4360 indicates that the goal will be about twice that of the R-2000—almost 700 man-hours—forcefully pointing out the need for production-line operations to economically overhaul modern equipment.

Presently, about 100 power packages per month are turned out. Studies indicate that the output can be stepped up to about 400, if necessary. And additional space would present no problem—there's plenty of room for expansion in all shops.

A major activity in conjunction with engine overhaul is the plating shop. Here, hard chrome plating for subsequent machining to size is done on expensive parts which otherwise would have to be junked. Other plating includes lead-indium for bearings, cadmium, copper, silver and zinc.

▶ **Power Package Tested**—In the engine test structure there are 24 cells, 10 presently utilized. PAA depends on engine test as final proof of overhaul.

The engine is run in the nacelle (as complete power package) with all accessories operating. This allows minimum time to be spent on power egg checkout after it is installed in the aircraft.



LARGE TEST RIG is used for checking supercharger (left). Cadillac engine (right) is coupled to hydromatic transmission. Supercharger test consumes about 4 hr.

Test-cell proving is done with clubs made from flight props rather than with fixed-pitch test clubs. This permits checking of the prop control mechanism and simulation of flight power conditions.

The fuel and oil consumption are also checked on the stand.

▶ **Accessories Shops**—The 225,000-sq. ft. components overhaul building houses the myriad of services for reconditioning and test of the various accessories. Here, also, kits are made up for any modification of an aircraft or a component, and bring together everything needed by the mechanic for the change. Before release, kits are made ready to accommodate an entire fleet of craft.

The components activity includes shops for radiators, cowling, wings, props, wheels and brakes, landing gear, governors, pumps, carburetors, upholstery, chairs, rafts, vests, fabric covering, electrical equipment, radios, painted parts, hydraulic units, and many other overhaul facilities.

▶ **Service Examples**—There is dynamic balancing equipment for engine and cabin supercharger impellers and other high-speed rotating parts, such as armatures, crankshafts.

A supercharger test stand, constructed from a basic design by Douglas Aircraft and modified to accommodate the DC-6, Convair-Liner and Connie units, uses a Cadillac tank engine and hydromatic transmission. It is used to check supercharger output and the automatic control mechanism.

Shrunken and warped elements of single disk brakes are quickly reconditioned.

A tapered die is employed to expand the disk in a hydraulic press which also does the straightening. The disk is then faced off on a grinder for finishing.

A metal manufacturing shop fabricates parts, for modification jobs and inventory, which are designed at the base or are hard to get in the open market.

Machines include the usual metal-working equipment. A heat-treat oven is included for conditioning special parts.

Chair overhaul and the sewing room are good examples of detail operations. Chairs are built up completely from the metal chassis. All upholstery is cut and sewn.

Also made are safety belts, control surface fabric covering, seat covers and kick pads, and carpeting is cut from rolls and finished.

▶ **Centralized Research**—The PAA system chemical laboratory—an unusual research and test activity—is also located at the overhaul base. This service functions for all divisions, reports to the maintenance manager and the chief engineer in New York.

The lab investigates qualities of fuel and lubricant samples forwarded from the various divisions.

It checks all types of materials used on or for aircraft—metals, fabrics, synthetics, carpeting—for establishment of material standards.

Part failures are examined for structural details to determine whether breakdown was the result of a flaw, fatigue, or a poor manufacturing technique.

All in all, the Miami overhaul base is a startling and encouraging note on the self-sufficiency to which civilian aircraft maintenance has progressed. This type of operation could be a tremendous asset in wartime emergency.

Aeroelasticity: A New Science

Once separate studies of aerodynamics and structure design combined in work on high-speed aircraft.

By Robert McLarren

The growing complexity of high-speed aircraft design rapidly is generating an entirely new science: aeroelasticity.

Already this new science promises an eventual revolution in aeronautical engineering because it combines the once separate studies of aerodynamics and structural design into a single field. The subject is so new, and probably so huge that even its boundaries are not yet clearly defined.

What is certain, though, is that the field embraces the major problems of transonic and supersonic speed. Attainment of these speeds, more than any other factor, has made necessary this new field of technical effort.

▶ **What It Is**—Aeroelasticity, simply, treats of airplanes in motion and the interplay between external and internal forces created by that motion. The subject embraces the interreaction between aerodynamic (aircraft shape), elastic (structural design) and inertia (dynamic) forces acting on an airplane in flight.

Heretofore, the aircraft structure has been treated as a rigid body, and dynamic forces have been reduced to static forces by assuming a momentary condition of equilibrium and introducing the proper inertia forces in accordance with d'Alembert's principle. With this simplification of the problem, aircraft stress analysis proceeds as an almost independent function in the process of aircraft design.

This same assumption that the structure is a rigid body is made in the aerodynamic design of a plane. And the determination of the external shape also proceeds independently. The quantitative effect of structural deformations in flight upon the aerodynamic characteristics of the airplane is ignored.

This procedure greatly simplified the overall problem of aircraft design. The stress analyst assumed that his was simply a problem of statics. The aerodynamacist assumed that his was a problem of incompressible flow.

▶ **Conditions Change**—This method was all right in the past. Even military and racing aircraft had comparatively low operating speeds. Structural deformations were of comparatively small magnitude and of little aerodynamic concern at low speeds. And the mathematical treatment required to solve combined aerodynamic-structural problems is enormously complex.

But then came a change. During the war aircraft speeds moved up past 500 mph. It no longer was safe to assume that design consisted of separate problems of statics and flow. So, the science of aeroclasticity was born.

▶ **Three-in-One**—Because it combines the three basic aeronautical sciences of aerodynamics, structures and stability-and-control, aeroelasticity embraces all of the off-design problems heretofore characterized as "phenomena." They include vibration, flutter, buffeting, divergence, control-reversal, gust loading and impact loads.

These phenomena have been handled in the past by analyzing individual airplanes through wind tunnel and flight tests and correcting, or minimizing, the difficulties through the use of individual design changes. This is an expensive and time-taking method of "development" which aeroelasticity attempts to rationalize into general equations useful for design purposes.

Contributing to the complexity of the new science is the frequent combination of two or more of these separate effects into a single difficulty. For example, no mathematical method can attribute control difficulties in high-speed flight individually to compressibility or to distortion.

The only method so far available is the use of flight tests at low and high altitude, since compressibility effects are manifest at a given Mach number whereas distortion effects are manifest at a given dynamic pressure.

The vastness of the science of aeroelasticity can be appreciated by this review of some of the phenomena being studied:

FLUTTER

One of the oldest and persistent aeroelastic problems is flutter, first studied in 1916. It is a rapid oscillation of an airplane surface created by an initial disturbance, and sustained by a couple between the external airflow and the internal elastic forces of the structure. It can quickly build up in amplitude until structural failure occurs. While there is a wide variety of flutter phenomena, subsonic, transonic and supersonic flutter are distinct and require individual treatment.

▶ **Subsonic Wing Flutter**—Flutter begins when a wing twists under air load, the twist increasing towards the tip. This twist changes the angle of attack at a given chord plane and, therefore, the lift along that strip. Simultaneously, the change in lift also creates bending loads causing the wing to flex. This also increases towards the tips.

The motion has both flexural and torsional components. If the wing structure is sufficiently stiff to constrain either of these components, flutter does not occur. As the wing flexes it reduces the angle of attack of the airstream, the airload is reduced and therefore the torsion of the section is reduced.

This reduction in the twist past the design angle of incidence reinstates the twist in the opposite direction and the process is repeated to form a complete cycle. The torsional displacement lags behind the flexural displacement and it is this phase difference that determines the ability of a wing to damp out oscillatory instability. This phase difference can be controlled through the proper location of the wing elastic and gravity axes.

This simplified description is applicable only to flutter in two degrees of freedom. There is flutter in a single degree of freedom (at the stall) and flutter in as many as six degrees of freedom.

When the disturbing motion is small, the oscillations are damped out and no flutter occurs. However, there occurs a critical flutter speed at which the oscillation just maintains itself and this speed is directly related to airspeed.

While this speed is constant, the elastic and aerodynamic forces just balance each other, and the amplitude and frequency of the flutter remains constant. As the critical flutter speed is exceeded, however, the aerodynamic forces predominate and the amplitude of the motion increases until structural failure occurs.

▶ **On Subsonic Wing-Aileron Flutter**—When the center of gravity of an aileron does not coincide with its hinge axis, normal wing flexing creates an alternating vertical motion of the aileron hinge axis which, in turn, creates an angular motion to the aileron.

The aileron is restrained from this flapping motion by the control cables but since these are also flexible the aileron system has a natural frequency of its own. This aileron frequency may be above or below that of the wing so the aileron oscillations will be either in phase with the wing oscillations, or exert a damping force.

The aileron frequency may even have a phase angle of 90 deg. with that of the wing, resulting in the aileron being

Free Bibliography

A comprehensive bibliography on associated aeroelastic phenomena has been prepared especially for readers of Aviation Week. Address Engineering Department, Aviation Week, 330 West 42nd Street, New York 18, N. Y.

up when the wing is in the middle of its downward stroke. This causes a downward air force on the wing, with consequent instability.

► **No Simple Cure**—The solution to this problem is, of course, static balance but this is not simple. Lead balance weights have been used for many years to insure that the center-of-gravity of the aileron passes through the hinge line but the location of the weights is a critical consideration.

As the wing undergoes a subcritical flutter, the aileron balance weights near the wingtip will oscillate with a greater amplitude than those further inboard. This brings about varying inertia forces along the aileron leading edge.

This variation will induce a twist in the aileron leading edge which can produce aileron flutter and, in turn, wing-aileron flutter. The ideal solution is the location of the aileron elastic and gravity axes along the hinge line but this is a complex design problem.

► **Subsonic Empennage Flutter**—The problem of empennage flutter is complicated by two major factors: elasticity of the fuselage to which the empennage is attached, and the presence of the empennage in the wake of the wing.

The first factor introduces an additional bending and torsional mode, contributed by the fuselage, to the bending and torsional modes of the fin and stabilizer. Some studies have also included pitching of the aircraft, vertical translation of the aircraft, and wing bending as yet additional modes.

Thus, it is not possible to isolate tail surface flutter in the empennage. The problem should be considered as one of elevator- or rudder-airplane flutter.

The presence of the wing wake creates a form of instability more clearly defined as buffeting, but in the subsonic case these impulses are of a random nature and thus do not lend themselves to mathematical treatment and to design considerations.

► **Transonic, Supersonic Wing Flutter**—Introducing compressibility to the flutter problem adds a whole new range of parameters that must be considered. Flow changes over the wing associated with shock wave formation are much larger and more rapid than in the subsonic case. So they are much more conducive to the formation of disturbing forces.

However, the rearward shift in the aerodynamic center brings this important axis closer to the elastic and gravity axes of the wing so that the possibility of a couple is reduced sharply.

The introduction of wing sweep has been one of the major contributing factors to the rapid isolation of aeroelasticity as a separate new science. As the sweep angle is increased the effect upon the pressure distribution of wing bending becomes identical to that of straight wing twisting. Both change the local angle of attack.

For example, when the aileron (or elevon) of a swept wing is lowered, the lift over that portion of the wing is increased. The wing tip bends up, resulting in a reduction in an angle of attack of the wing as a whole and the imposition of an effective download on the upload of the aileron. At a certain airspeed this download will effectively cancel the upload of the aileron so that no rolling moment results. At a greater speed complete aileron reversal is manifest.

Another important result of this bending of a swept wing is its effect on longitudinal stability. As the wing bends, the distribution of the angle of attack shifts in such a manner that the load is increased at the wing root and decreased at the wing tip. This causes a shift forward in the wing aerodynamic center and a noseup moment about the center of gravity which is destabilizing. For example, in a high-speed pullout, sweptwing bending tends to sharpen the pullout.

► **Transonic, Supersonic Control Flutter**—As shock waves form over the wing or empennage, they react with the boundary layer to cause separation. The control surface aft must operate in turbulent flow with its attendant difficulties. In extreme cases, complete loss of control effectiveness results.

A phenomenon of the formation of shock waves over a wing, however, is that they occur initially at different times on the upper and lower surface. In transonic flow, separation might occur over the upper surface and then disappear, followed by separation over the lower surface and its disappearance.

Under these conditions, the flow at the trailing edge is characterized by rapid fluctuations which change the pressure distribution over the aileron with the same frequency. This rapid oscillation of the aileron has been termed "aileron buzz" to distinguish it from more familiar flutter.

However, this aileron buzz can quickly establish aileron flutter if the conditions outlined in the subsonic case are obtained. This same phenomenon exists over the fuselage of the airplane with the result that an eddying fuselage wake impinges on the tail surface.

These eddies occur with a lower frequency, however, and result in pressure changes over the vertical tail surfaces that create a condition termed "snaking" by test pilots. Again, this oscillation is distinguished from rudder or elevator flutter by its very low frequency but it can quickly establish flutter, as in the aileron case.

DIVERGENCE

A phenomenon that heretofore has caused little concern but is now growing in importance is the torsional deflection of a wing in one direction only. When the wing twists up and down it is termed flutter, but when the twist is only up or down it is termed divergence.

Divergence actually is a wholly aerodynamic phenomenon in that aerodynamic forces are the controlling factor in its appearance. The torsional stiffness of a wing is made up of its elastic stiffness, which is independent of airspeed, and an aerodynamic stiffness created by the variation in angle of attack due to twist.

► **Structural Failure Ahead**—Divergence can only occur when the aerodynamic stiffness becomes negative and reduces the total torsional stiffness of the wing to zero. At this speed the wing twist will be maintained and a further increase in speed will cause the aerodynamic forces to predominate over the restraining structural forces. The deformation will be increased until structural failure occurs.

The critical speed at which divergence occurs is a function of the disposition between the wing aerodynamic center and its elastic axis. Moving the elastic axis forward increases the divergence speed. Wings with the elastic axis forward of the aerodynamic center run only remote risks of divergence. In the transonic and supersonic case, in which large angles of sweep are used, the elastic axis is well forward of the aerodynamic center so that highly swept wings cannot diverge.

BUFFETING

A special form of empennage instability is the fluctuation in the tail loads created by wing wake eddying. This phenomenon is called buffeting and is manifested by rapid changes in control forces.

A special form of buffeting occurs in all aircraft as a prelude to (and warning of) the low-speed stall, but in this condition the loads are low and need not concern the designer. Highspeed buffeting, on the other hand, is accompanied by extremely high loads that have caused structural failure.

► **Buffet Boundary**—Buffeting begins at certain combinations of Mach number and load factor termed "buffet boundary." As these conditions are encountered, the tail of the airplane gives the pilot an impression that it is being struck hard blows, some quick and sharp, others slower but sustained.

These rapid changes in trim produce accelerations that are accompanied by high loads on the entire airplane structure. Therefore, the buffet boundary nominally is considered a limiting condition for safe aircraft operation. However, flight tests have shown that it is possible to exceed the buffet boundary for limited periods without structural

failure, and test pilots use a "tolerable limit of buffeting", which is not otherwise defined.

Because of the rapid and erratic fluctuations of the buffet loads, this phenomenon does not lend itself to mathematical treatment. But since some "tolerable limit" exists, this suggests that some approximate methods might be developed with sufficient accuracy for design purposes.

GUSTS

The increasing size, speed and wing loadings of aircraft emphasize the importance of fatigue in their "life expectancy". This latter also is governed largely by the probability of occurrence of a single load of such magnitude that the structure might be endangered.

These considerations led to an extensive and continuing study of atmospheric gusts with respect to the frequency of their occurrence, their structure, atmospheric conditions associated with them, the loads imposed on aircraft by them and methods for their alleviation.

▶ **Gust Frequency**—On the basis of extensive records, it appears that an aircraft will fly through gusty air about 10 percent of its service life, during which time it will encounter gusts at distance intervals equal to about 11 chord lengths. Positive and negative gusts are about equal in magnitude and frequency. Available data on gust frequencies permit approximate determination of stress frequencies in the primary structure of airplanes due to gusts.

However, the distribution of gust velocity along the span of a wing is not always uniform. Owing to the flexibility of the wing, accelerations created by gusts vary along the span.

Available data indicate that the maximum wingtip acceleration can be more than twice that of the fuselage and will occur earlier than the fuselage acceleration. The effect of such dynamic action is to cause superimposed stress cycles at the outer portion of the wing with a maximum amplitude about 10 percent that of the static stress for the uniformly distributed gust.

Since the natural period of wings increases in proportion to their size, and since the size of gusts to which the airplane will respond also increases with airplane size, the ratio of natural period to period of application of load remains about constant for a given airspeed. So the dynamic response of the structure does not appear to increase with airplane size.

IMPACT

An important error resulting from the classic assumption that the airplane structure is a rigid body arises from the transient oscillations excited by the landing of an airplane. These dynamic landing loads may produce critical design conditions in the new large, heavy aircraft with more flexible structures.

▶ **Loads**—The initial impact is applied to the airplane structure through the shock strut in the form of a vertical force along the strut axis and a moment about the landing gear attachment point. The wheel exerts a drag force produced by the wheel spin-up.

After the initial contact, a series of alternating loads is imposed on the structure. In the case of a modern twin-engine commercial transport, the total number of these oscillations per landing was found to be approximately 30 for the vertical loads and 80 for the horizontal loads. Wing dynamic loads produce torsional moments inboard of engine nacelles which, aggravated by the overhanging engines, may be critical in severe impact.

These dynamic loads are more severe in the case of the flying boat since the impact forces are introduced through a centrally-located hull instead of in the vicinity of the nodal lines along the engine nacelle axes.

STIFFNESS CRITERIA

The cure for aeroelastic problems such as outlined, is increased bending and torsional stiffness of the basic structure. But there are few structural factors that add more weight directly in proportion to their value than stiffness.

The general aeroelastic problem is the determination of the minimum stiffness required to accommodate each of the various phenomena outlined above. This presupposes an exact knowledge of the types and magnitude of each of the loads introduced by each variation in degree of each of these phenomena, a staggering mathematical problem.

Electronic calculating machines are proving invaluable aids in the reduction of sheer labor required for the mathematical solution to some of these problems, but a monumental amount of work still remains in the creation of derivatives expressing these forces and the demensionless equations required for solution to general problems.

▶ **Necessity**—The evolution in aircraft design towards smooth, thin wings intrinsically aids this basic aeroelastic problem. It demands high stiffness based on aerodynamic requirements alone. In prewar aircraft, wing stiffness was carried principally by the wing spars. Skin wrinkling was not regarded as objectionable in the interest of lightweight structure.

The wartime development of the NACA low-drag profiles, however, has drastically emphasized the importance of wing smoothness and fairness and demands new wing stiffness criteria based upon the skin as the principal source of stiffness. Not only does almost imperceptible skin wrinkling destroy the low-drag characteristics of these new airfoils, but it substantially reduces the value of their critical Mach numbers.

These requirements grow progressively more severe with aircraft designed for operation at high speed at high altitude at high load factors. A surface finish that feels smooth to the touch and a fairness that permits a straightedge to be rocked smoothly over the surface in a chordwise direction may be satisfactory for low drag and high critical Mach numbers at 1G acceleration.

But at high speed, altitude and load factors, distortion of this surface can wreak havoc with the aerodynamic characteristics of this same wing. Adequate skin stiffness must be provided to accommodate load factors up to the critical Mach number of the basic profile.

▶ **Little Space**—As wings have grown progressively thinner and skins thicker, the space within the wing available for the increased stiffener spacing has grown proportionately smaller. Since these stiffener bulbs almost touched each other, it was a logical step to join them, in a series of channel webs, into a multicellular structure.

The trend toward making the skin responsible for increasing stiffness has introduced the desirability of tapered skin to get structural efficiency and minimum weight design. However, this preserves the existing problem of spanwise variations in wing bending and torsional stiffness which creates so many aeroelastic problems.

The proper choice between stiffness and weight distribution comprises a basic problem which will tax the ingenuity of designers.

▶ **Combustions**—All that just touches on the new domain of aeroelasticity. Another complex consideration is combinations of the isolated phenomenon. For example control reversal has an intimate bearing on stability and control. stability has an important connection with flutter, and flutter and vibration are becoming integrally linked.

Such integration of formerly unrelated subjects eventually will be the chief worth of aeroelasticity to aeronautical science.

New Process Saves Time and Material

A new process which permits casting of shrouded, high-speed impellers in one piece, with such complete control of critical dimensions and surfaces that machining and balancing are almost totally eliminated, has been developed at the Teterboro, N. J. foundries of the Eclipse-Pioneer division of Bendix Aviation Corp.

Process, known as Bendix technique of plaster mold casting, not only adapts to mass production requirements, but can be used to turn out parts of complex inner construction. It reportedly will maintain critical uniformity and wall thickness and, wherever desired, will produce satin-smooth finishes on internal and external surfaces.

Since machining is minimized, and in some cases eliminated, complex parts, previously cast in sections to permit work on inner surfaces, now can be cast in one piece with considerable savings in time, labor, and material. Also, ability of process to produce thin, reinforced walls gives it added advantage of saving weight without loss of strength.

Eclipse engineers actually claim an increase in strength through new technique and point to improved performance of impellers where peripheral speeds up to 1500 ft./sec. generate tremendous centrifugal forces.

Process is the result of six years of development and research by the company's metallurgists and methods engineers, and can be applied to all nonferrous metals.

New Insulation Foam Stresses Low Weight

An unusually light insulating material that offers promise for use in aircraft applications, has been developed at Westinghouse Laboratories, East Pittsburgh, Pa.

So light that it actually will float in some gases, material is a plastic foam that expands to 100 times its original volume when baked. It weighs 10-20 times less than the meringue topping on a pie.

Foam is made from a synthetic phenolic resin and looks like a sponge. It is resistant to fire, moisture, fungus growth, and insects.

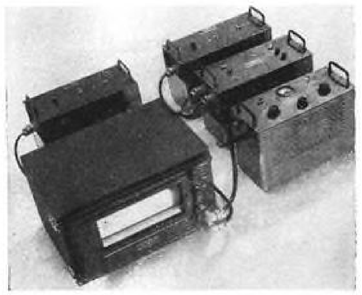
Its reported low cost makes it practical for many applications.

The plastic, in a liquid state, is mixed with a powder and heated at 350 F. for about 15 min. As the liquid expands into foam, it traps thousands of oxygen bubbles. These become air bubbles as the solidified foam is exposed to the atmosphere.

After processing, the material contains 1 part of resin to about 100 parts of air. This is reported to make it the lightest solid known in ratio of weight to volume.

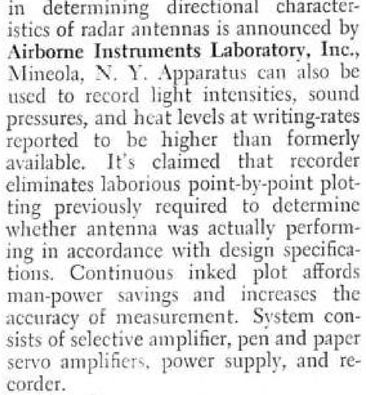
Another advantage is claimed with respect to shipment and storage problems encountered with some insulating materials. The plastic foam can be handled as a liquid in a barrel and foamed where needed.

NEW AVIATION PRODUCTS



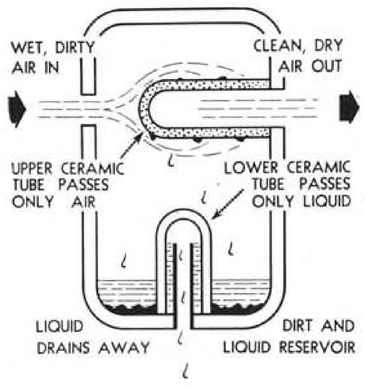
Checks Antennas

Rectangular coordinate recording system, type AIL 373, used primarily in determining directional characteristics of radar antennas is announced by **Airborne Instruments Laboratory, Inc.**, Mineola, N. Y. Apparatus can also be used to record light intensities, sound pressures, and heat levels at writing-rates reported to be higher than formerly available. It's claimed that recorder eliminates laborious point-by-point plotting previously required to determine whether antenna was actually performing in accordance with design specifications. Continuous inked plot affords man-power savings and increases the accuracy of measurement. System consists of selective amplifier, pen and paper servo amplifiers, power supply, and recorder.



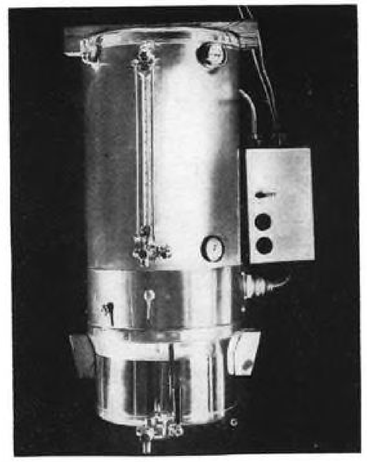
Aircraft Control Relay

Differential-voltage type generator control relay for aircraft and stationary powerplant applications is announced by **Hartman Electrical Mfg. Co.**, Mansfield, Ohio. Model A-700A is designed to operate with d.c. generator having maximum capacity of 300 amp. and normal regulated voltage of 28.5. Claim is that device eliminates current drain when idle, and also that main contact points will last indefinitely. Another feature is that by closing on differential voltage between generator and bus, rather than at fixed voltage, the cutout eliminates flutter on opening. Conforming to AF Specification AN-S-42a, device is designed for rated operation from sea level to 50,000 ft. at ambient temperatures ranging from −67 to 160 F. In addition to use as reverse current cutout, it can also be used simultaneously as starting contactor for auxiliary powerplants which are started by applying voltage to generator. Unit occupies space of 4-in. cube, weighs approximately 2½ lb.



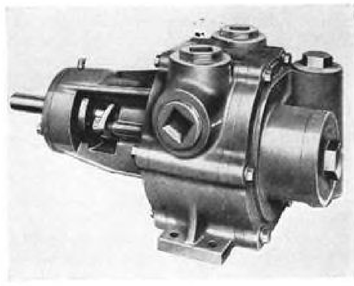
Cleans, Dries Gases

For liquid separation, agitation, drying and spraying and for instruments and pneumatic mechanisms requiring positive conditioning of air or gas, "Liqui-ejector" is offered by **Selas Corp. of America**, Phila., Pa. Device removes water and water-oil emulsions automatically and contiuously from compressed air or gas lines. Phase separation and liquid ejection are accomplished by two ceramic tubes; one water-repellent, the other water-permeable but air-impervious. Compressed medium passes through first tube where it is stripped of aqueous contamination and dirt. Moisture drops to bottom and drains through the second tube without loss of air. Device also acts as filter, removing atmospheric dirt and solid particles finer than 100 microns in diameter. Unit comes in three sizes with water ejection rate varying from .5-2.5 gal./24 hr. There are no moving parts, traps, cocks or shutoffs. Maintenance is limited to removal of accumulated dirt.



For Coffee Aloft

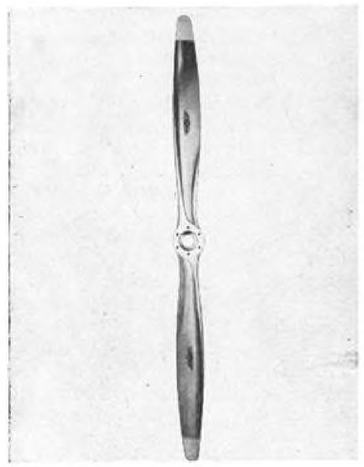
High-altitude, automatic coffee-maker is intended to eliminate need for thermos coffee or brewing drink at low water-temperature because of reduced atmospheric pressure. Made by **High Altitude Coffee Maker Co.**, 1015 Alberni St., Palo Alto, Calif., urn comes in 3½ and 5-gal. sizes, will use changeable heating unit adaptable to a.c. or d.c. of varying voltages. Makeup consists of two main chambers, upper for water storage and heating, lower for brewing basket and coffee receiver. Coffee can be made in small batches if desired. Temperature is controlled under pressure. Weight of 5-gal. model, designed for bulkhead mounting, is 30 lb.



Fluid-Supply Aid

New heavy duty tri-rotor pump for non-lubricating liquids, developed by **Yale & Towne Mfg. Co.**, Stamford, Conn., is offered as especially suitable for handling aviation gasoline, naptha, solvents and similar materials, at differential pressures of 50 psi. and below. Pump may be equipped with solid bypass or variable volume control type heads, making it adaptable to wide variety of requirements. Heads are interchangeable. Unit is available in 80, 90 or 100 gpm. sizes.

SALES & SERVICE



New Metal Sensenich Prop

Hartzell Goes to Metal Blades

Clip-Tip McCauley Prop

Goodyear Duck Mounts Four-Blader

Propeller Trend Is to All-Metal

Lightplane customer's acceptance of McCauley prop is causing manufacturers to reevaluate their product.

A more aggressive attitude on the part of propeller designers apparently has resulted from the slackening of lightplane sales and consequent falling off of the propeller market.

Growing trend is toward metal blades for lightplane propellers, stimulated doubtless by customer acceptance of the McCauley fixed pitch aluminum propeller. Simplicity, maintenance-free operation and improved performance of this postwar product has brought the Dayton, Ohio, manufacturer a large portion of the total lightplane propeller business. As a result the other manufacturers are taking a second look at their own products and making some changes.

▶**Expands Into Aluminum**—Sensenich Corp., Lancaster, Pa., for years the largest maker of fixed-pitch wood propellers, last week announced its entry into the fixed-pitch aluminum propeller field. It will continue to make wood propellers also.

The new metal Sensenich offers a diameter range of 72 to 76 in. for various installations. CAA has certificated it for operation at continuous 125 hp. rating at 2650 rpm. Model M76AM is available for engines with SAE No. 2 flange crankshaft, including Franklin Model 4AL-225 and Lycoming O-235-C and O-235-C1 engines. Model M76AK is for engines which incorporate the SAE No. 1 standard flange and SAE No. 0 taper shaft hub, including Continental C75, C85 and C90.

▶**Testing**—Vibration testing for use with the O-235-C1 has been completed and the propeller is approved without rpm. restrictions or placard. CAA vibration tests for the other engines are incomplete. However USAF has recently completed vibration tests on the C-85 engine with the M76AK propeller, and expects to run additional tests soon on a C-90-powered liasion plane with the same propeller.

First all-metal selective pitch propeller in the lightplane range was introduced recently by Hartzell Propeller Co., Piqua, Ohio, on the 1949 Ryan Navion. Ryan has been using composite blade Hartzell selective pitch propellers heretofore. It reports the following performance with the new metal bladed installation, used with a 205 hp. Continental engine: With full 2750 lb. gross load no wind sea level the 1948 Navion has 1000 ft./min. rate of climb; 100 ft. better than the 900 ft./min. climb with the other Hartzell. The 1948 Ryan with engine rated at 185 hp. had an 830 ft./min. rate of climb. Takeoff over a 50 ft. obstacle under similar conditions is shortened to 800 ft. with the new propeller as compared to 875 ft. formerly.

▶**Competition**—Indications are that the metal-bladed Hartzell selective pitch propeller will have some competition from other manufacturers before very long.

There are indications Sensenich soon may install metal blades on the Skyblade controllable propeller.

Advantages of metal blades are outlined briefly by Ryan in its report on the Hartzell: "There is no chance for change in balance due to possible warping or moisture pickup. The blades are of course more durable than wood or plastic with metal tipping and they require less maintenance and are also less subject to possible damage in flying through rain. In case of ground collision or belly landing where major propeller damage is involved, the metal blades instead of breaking as with the other types can be straightened by rework at the factory and used as entirely satisfactory."

Ryan charges $136 more for factory installation of the metal blade Hartzell than for the plastic-blade Hartzell on its new planes.

▶**Advantages of Wood**—Main advantage of making wood propellers is that it is mostly a hand operation, without elaborate tooling involved, so that a variety of wooden propellers can be manufactured by a single company in small quantities without great produc-

tion outlay. Metal propellers require considerable tooling cost. Model changes are more expensive.

Favorable reports are given by Cessna on recent flight tests with a square-tipped experimental McCauley propeller used to attack the airplane noise problem. Flight tests indicated a small gain in efficiency over the round-tipped propeller, and an apparent slight reduction in noise. Without decibel readings, it was concluded that the frequency of the square-tip propeller noise was in a more acceptable range than that of other propellers tried. Considerable gain in efficiency was reported over that from a fixed-pitch four-blade wood Sensenich propeller on the Cessna 170 four-place plane.

▶ **ARF Plane**—Meanwhile the small but highly competent engineering staff of Aeronautical Research Foundation at Boston, is continuing quiet airplane research, using as a guinea pig Goodyear Aircraft's three-place pusher amphibian.

With earlier tests virtually completed on conventional tractor two-place and four-place Stinson and Piper planes, Professors Otto Koppen, Fay Taylor and Lynn Bollinger wanted to see how their combination of an engine with reduction gear and muffling plus a multi-blade propeller turned slowly, would work on an amphibian.

So Sensenich has turned out another four-blade fixed pitch prop of 68 in. diameter which has already been installed on the Goodyear plane. Later, the Goodyear pusher will go through a series of tests with the adjustable propeller hubs which accommodate two, three, four, six or eight blades, for a complete series of readings on its noise. Amount of reduction of noise is expected to be greater than in either the Stinson or Cub, since the Goodyear airplane, untreated for noise reduction, is probably the noisiest airplane of its size, with the possible exception of the Republic Seabee, another small pusher amphibian.

Bollinger and Koppen are also working on the noise problem with the 9-foot slow-turning Aeromatic propeller they are using on their new Helioplane (AVIATION WEEK, May 16), a private venture not connected with the Aeronautical Research Foundation.

▶ **Midget Progress**—Some of the most interesting postwar propeller developments have been in little wood two-bladers for midget racers in the Goodyear and Continental races.

Indications are that some of the best of these wood designs or some other new designs may be reproduced soon in all-metal propellers. Only all-metal propellers used thus far in the postwar midget races have been McCauley propellers of nearly standard designs, occasionally with square tip modification.

Liberalized Copter Regulations Seen

Liberalized regulations governing rotary-wing craft operations in close built-up areas are indicated by a Civil Aeronautics Board decision last week.

The Board dismissed a case filed against Charles Marthens, Arizona Airways helicopter pilot, charged with operating a Bell helicopter in a careless or reckless manner. He landed in a downtown Tucson business district with a crowd of several hundred spectators.

Marthens appealed the adverse finding of a CAB examiner and CAB ruled that the pilot had taken "every reasonable precaution" by making advance arrangements with the police department and a local civic group to control the crowd to insure its safety. The finding of the examiner suspending Marthens' license for 30 days was overruled.

Board decision is regarded as a signpost to CAA's Office of Aviation Safety toward more liberal interpretation of regulations in the future.

Weather Survey

Seeking improvement in weather reports to nonscheduled flyers, Flight Safety Foundation, Inc., is distributing 2000 postcard questionnaire report forms.

Company and individual owners of aircraft are asked to report discrepancies between weather reports received and actual weather encountered in flights. U. S. Weather Bureau has promised to investigate discrepancies reported. Corporation Aircraft Owners Assn. has offered to distribute cards to its members.

Aircraft Owners & Pilots Assn. has been conducting a somewhat similar postcard survey on weather report discrepancies among its members for some time.

Both surveys are based on frequent pilot complaints of wide variations experienced between weather forecasts, and weather actually encountered in flights.

Airstrip Tower

A control tower on the Chicago lakefront airstrip on Northerly Island is expected to be in operation late this summer. Total operations at the strip from opening date Dec. 10 to Mar. 31 were 1625 arrivals and 1602 departures. March operations averaged 47 a day. A DC-3 is the largest plane to land on the strip.

CAA airport limitations on the strip forbid its use under strong crosswind conditions.

Domestic Trunkline Operations

(First Quarter 1948 and 1949)

Carrier	Rev. Pass. Miles (Add 000) 1949	1948	Percent Change	Net Income 1949	1948
American	309,384	224,451	+38	$(326,332)	$(5,053,509)
Braniff	41,070	39,864	+3	(178,096)	(510,209)
Capital	58,273	48,124	+21	(499,119)	(1,245,858)
Chi. & So.	22,343	21,323	+5	(84,225)	(334,794)
Colonial	8,985	6,687	+34	(119,973)	(161,068)
Continental	12,525	11,206	+12	(169,873)	(96,385)
Delta	55,291	43,790	+26	238,478	(531,876)
Eastern	267,284	275,536	−3	1,732,585	1,420,901
Inland	5,838	5,598	+4	26,058	(25,920)
Mid-Cont.	20,813	18,217	+14	2,452	(104,914)
National	49,176	16,194	+205	688,577	(719,980)
Northeast	10,268	8,925	+14	(195,587)	(524,229)
Northwest	58,566	57,151	+2	(1,530,060)	(1,970,193)
TWA	177,697	183,186	−3	(2,962,931)	(1,486,484)
United	237,398	190,616	+24	(3,436,142)	(3,401,293)
Western	22,475	23,859	−6	(154,588)	(654,828)
Totals	1,357,386	1,174,727	+15.5	$(6,968,776)	$(15,400,639)

(CAA figures. Scheduled operations only.)
Parentheses indicate deficit.

Airline Earnings Stump the Experts

In the face of a general business slump the carriers continue to cut deficits and increase revenue mileage.

By Charles Adams

The steady upward trend of airline traffic and earnings at a time when general business activity is slackening continues to stump the experts.

When last year's predictions of substantial traffic gains missed fire badly, the industry's economic forecasters refused to go out on another limb at the start of 1949. But with first quarter results far ahead of 1948, airline executives are again expressing cautious optimism.

▶ **Contributing Factors**—Better regularity, family fares, skycoach service, and the unprecedented safety record apparently have figured importantly in the recent traffic boom. Higher mail pay is also bolstering revenues.

Scheduled revenue passenger mileage flown by the 16 domestic trunklines during first quarter 1949 was up 15.5 percent over the same time last year, and the net loss was cut to less than $7 million. The carriers were $15.4 million in the red at the end of the first three months of 1948 and were unable to wipe out the deficit during the usually-profitable summer months.

▶ **Five Show Profit**—Thirteen of the 16 domestic trunklines reported gains in passenger business for first quarter 1949. Five of the companies were in the black for the period. Last year, only Eastern Air Lines made money in the first quarter.

The railroads are not sharing in the airlines' passenger traffic upturn. Assn. of American Railroads statisticians now estimate that rail passenger business this year will be 12.8 percent under 1948. Earlier they had foreseen a drop of only 11.4 percent.

(Interstate Commerce Commission announced this month that the railroads had shown a profit on their passenger service in only four of the past 13 years—1942 through 1945. Last year their passenger deficit was $560 million.)

▶ **AA Sets the Pace**—American Airlines is continuing to pace the air transport industry's comeback. April earnings wiped out AA's small first quarter domestic net loss of $326,000.

President C. R. Smith has informed stockholders that the company would show a profit for 1949 if business conditions remain at present levels. Last year, American's domestic net loss for the first quarter was over $5 million.

AA's 38 percent increase in revenue passenger mileage in first quarter 1949 was perhaps the outstanding performance in the industry. Its April passenger traffic was 33.5 percent ahead of the same month last year.

National Airlines' revenue passenger mileage during first quarter 1949 was 205 percent ahead of 1948. But NAL was crippled by a strike most of last year.

▶ **Hunter Encouraged**—Northwest Airlines President Croil Hunter has told his company's stockholders that while it is still too early to tell how successful the summer months will be, "optimism is justified by the gains in revenue and reductions in costs experienced during the first quarter. We can be sure of ending the first half of 1949 in a much better position than we closed the first half of last year."

NWA cut its domestic net loss from $1,970,000 in the first three months of 1948 to $1,530,000 this year. Its Orient service showed a small profit.

In April, with the help of its new transcontinental coach service, Northwest's passenger traffic soared 23 percent above last year. Domestic passenger revenue was up 17 percent in April, and NWA expected to show a profit for the month.

Without the skycoach, Northwest's domestic revenue passenger mileage during first quarter 1949 rose only 2 percent over the same 1948 period.

▶ **Drinkwater Optimistic**—Western Air lines has a good chance of showing a net profit in 1949 with a 51 percent load factor provided it can maintain its present level of costs and mail rates, according to President T. C. Drinkwater. His forecast was made on the basis of first quarter results showing a net loss of $154,000, compared with $654,000 in the same 1948 period.

WAL's revenue passenger mileage was down 6 percent from the first three months of last year. Part of the decline is believed due to the fierce competition given Western by cut-rate uncertificated carriers on the Los Angeles-San Francisco run.

The California legislature is now considering a bill which would require uncertificated lines to prove the need for their service and get a certificate from the State Public Utilities Commission.

▶ **Deficit for United**—Despite a 24 percent gain in revenue passenger mileage, United Air Lines had a $3,436,000 net deficit on domestic operations in first quarter 1949—highest in the industry. In the same period last year, UAL's net domestic loss was $3,401,000, a figure which was later cut sharply by retroactive mail payments.

Company officials noted that the retroactive mail payments, capitalization of costs on grounded DC-6s, higher fed-

eral income tax credits and other factors obscured actual gains made in 1949 over the 1948 period. "If these factors were eliminated and 1948 first quarter results were placed on the same basis as those for 1949, the latter would represent a (systemwise) improvement of $886,791, or 21 percent over the first quarter last year," UAL declared.

► **TWA Loss Up**—TWA last year made hay domestically while American's and United's DC-6s were grounded. As a result, TWA's domestic revenue passenger miles flown in first quarter 1949 were 3 percent below 1948, and the deficit increased.

But in April, TWA's domestic revenue passenger mileage jumped 13 percent over the same month during the last year.

Company was close to break-even point in April and expected to make money in May.

Capital Airlines, which reduced its first quarter losses sharply as compared to 1948, reported a $163,949 net profit in April. The company flew more revenue passenger miles in April than in any month since Oct., 1946.

► **Load Factor Eases**—The 16 domestic trunklines reported an average load factor of 55.12 percent in first quarter 1949—down from 56.92 percent in the same period last year. A 19 percent gain in seat miles available depressed the load factor despite the rise in passenger traffic.

Freight flown domestically increased nearly 50 percent from 13,618,000 ton miles in first quarter 1948 to 20,234,000 in the same period this year. Mail volume was up 21 percent from 8,400,000 ton miles to 10,131,000 ton miles; but express traffic fell 17 percent from 7,247,000 ton miles in first quarter 1948 to 5,985,000 ton miles in first quarter 1949.

RFC Expert Hits CAB, Airlines

Senate Committee hears economist rap subsidies, boost air coach and military travel by air.

A razor-edged attack on airline management and the Civil Aeronautics Board's methods of carrying out the commerce and national defense objectives of the 1938 Civil Aeronautics Act was made before the Senate Interstate and Foreign Commerce Committee by a government financial expert late this month.

Richard Hellman, Federal Power Commission economist loaned to the Reconstruction Finance Corp. to help prepare an airline financial study for President Truman, was the expert. He made broad recommendations for strengthening the air transport industry. The White House has refused to release the RFC report for publication.

► **Lethargy Alleged**—CAB, Hellman charged, has been "beaten down" by the industry and lapsed into a lethargic "rely-on-subsidy" philosophy. "The board now gives the industry pretty near what it wants."

He objected to CAB's "high-rate" thinking and to the Board's alleged stifling of air cargo development.

"I know of no other regulated industry . . . subsidized by the public . . . that has followed a philosophy . . . that it will not serve the public generally but only the upper 20 percent income families," Hellman commented.

► **Other Witnesses**—Other recent witnesses in the Senate Committee's airline investigation were: Charles F. Willis, president of Willis Air Service; Cyril C. Thompson, executive secretary, Airport Operators Council; B. F. Napheys, Airline Dispatchers Assn.; and C. E. Woolman, Delta Air Lines president.

Hellman's recommendations covered these points:

• **Government Business**—He proposed an end to exclusive transport of military personnel by rail and estimated that this would funnel from $20 million to $30 million in new business annually to the domestic airlines—at no extra cost to the Government.

Short-haul air rates, Hellman pointed out, approach rail rates; and on long-haul trips the per diem allowance savings would balance higher air rates. Airlines have offered a 10 percent fare reduction on military business to match the rails' 10 percent reduction, he said, and the matter is now up for decision by the national military establishment.

• **Coach Service**—A "dynamic pricing policy" should be pushed in the industry, Hellman declared. "The airlines have completed their growth on first-class traffic and now must be made to turn to coach traffic."

He challenged any airline to demonstrate that coach services cannot be made profitable. While not mentioning names, he severely criticized a study concluding against coach service made by one carrier (believed to be United Air Lines).

"I have rarely seen a more incompetent study, and I would suggest . . . that . . . these airlines which say that coach service is not feasible . . . show their studies," Hellman continued. Carriers should generate new traffic by first offering rate reductions instead of waiting for traffic to generate before cutting fares, he stated.

• **Cargo Service**—Stimulation of cargo operations through military subsidization could be justified, Hellman declared. He urged a legal clarification which would open the way for the Air Force to develop all-freight planes.

• **High Gasoline Rates**—Hellman hit high gasoline prices, pointing out that each cent per gallon reduction in the price of gas would save the domestic trunklines $3,500,000 annually.

• **Stiffer CAB Regulation**—The economist urged CAB to clamp down on the industry in four ways: a stricter disallowance policy in mail pay awards; disallowance for inadvisable equipment purchases; abandonment of its policy of cushioning carriers against bankruptcy with mail pay awards; and securities regulation.

The Board, he said, should engage a group of engineers to make spot-checks in the field on airline operations and recommend disallowances for inefficient practices.

When carriers purchase giant planes for thin-traffic routes, funds for the service should not be supplied through high mail rate payments, Hellman declared. He urged CAB to veto Northwest Airlines' tentative RFC loan for Stratocruisers, claiming that there are now only an average of twelve passengers per trip over the Orient route.

If the carrier goes through with its Stratocruiser contract, Hellman indicated an additional $15 million RFC loan might be required. Private bankers reportedly are reluctant to go through with a $9 million loan anticipated by NWA; and the carrier would have to invest heavily in new ground facilities at Seattle to accommodate the Stratocruisers.

By eliminating the threat of bankruptcy, Hellman declared, CAB has wiped out "probably the greatest" management incentive. Proposing CAB regulation of airline financing, he said most of the industry has "demonstrated . . . its complete ineptitude on planning its financial structure." He recommended that a ceiling be placed on debt financing.

• **Short-Haul Services**—Feeders, which carry one-hundredth of the mail ton-mileage but receive one-fifth of the domestic mail pay, should be abolished, Hellman stated. There could be a few exceptions in which local service over mountains results in major time saving.

He estimated the Government paid out $11.5 million in subsidizing feeder passengers in 1948, and with all authorized feeder services in operation this would amount to $23 million. "Feeders are not warranted for commerce, mail, or the national defense," he declared.

► **Willis Favored**—Sen. Edwin Johnson (D., Colo.), chairman of the Interstate and Foreign Commerce Committee, charged CAB with "flagrant discrimination" in tentatively certificating U. S. airlines instead of Willis Air Service to fly Eastern Seaboard all-cargo routes. Johnson's statement, in which Sen. Owen Brewster (R., Me.) concurred, came after President Charles Willis reported his carrier had operated with a $24,881 profit during 1948, despite an outlay of approximately $65,000 in legal fees; "while U. S. Airlines has only $400,000 left out of the $2,500,000 raised in a 1946 stock issue."

C. E. Woolman, Delta Air Lines president, protested "forced" airline mergers and certificate suspensions. But Sen. Johnson declared: "If CAB made a mistake (in awarding an uneconomical route), should they blindly stick to it? Making the public interest subservient to commitments to carriers is going too far."

UNION JOB

First spadeful of dirt at the ground-breaking for the Air Line Pilots Association's new $400,000 headquarters building at Chicago was turned by union president David L. Behncke. The two-story air-conditioned structure will be dedicated to Behncke "in recognition of his lifetime of service to the airline pilots."

Airlines Receive Safety Awards

National Safety Council reports 1.3 deaths per 100 million passenger miles; auto rate is higher.

Twenty-seven certificated airlines which helped make 1948 the safest year in the history of U. S. air transportation have received awards from the National Safety Council.

Last year, the Council reported, U. S. domestic and international airline operations resulted in only 1.3 deaths per 100 million passenger miles flown by the lines.

By comparison, death rate for automobile transportation in 1948 was expected to show little change from the 1947 mark of 2.3 per 100 million passenger miles.

► **32,000 Auto Fatalities**—Six accidents in scheduled domestic and international airline operation last year cost the lives of 128 persons—103 passengers and 25 crew members. About 32,000 automobile passengers were killed in 1948 and more than a million injured.

The air transport industry continued to set new safety records during the first five months of 1949. Barring mishaps before the end of May, U. S. domestic and international carriers will have flown nine months and about six billion revenue passenger miles without a fatality.

This achievement is equal to carrying safely all the passengers flown on scheduled U. S. domestic and international carriers from the year of 1932 through 1941.

There were 289 passenger fatalities in that 10-year period.

► **All-Time Record**—American Airlines set a new all-time record when it completed 1948 with a total of 2,933,272,000 passenger miles since its last fatal accident on Dec. 28, 1946, to lead the Safety Council's list of billion-mile awards.

Other billion-mile award winners were TWA, with 2,144,168,000 safe passenger miles since Mar. 11, 1947; and Braniff Airways, which rolled up 1,112,599,000 passenger miles since its last death on Mar. 26, 1939.

In addition to a perfect record in 1948, two airlines were given special Safety Council citations for reaching five-year anniversaries of operation (or multiples of five years) without a fatal accident.

► **NEA, Panagra Honored**—Northeast Airlines won a 15-year award for no fatal accidents since its establishment on Aug. 11, 1933, a period during which it has flown 299,382,000 passenger miles. Pan American-Grace Airways was honored for five years and 523,422,000 passenger miles since its last fatality on Jan. 22, 1943.

Although American holds the passenger-mile record, Hawaiian Airlines added 1948 to its all-time mark for consecutive years of safe flying. HAL hasn't had an accident since its establishment on Nov. 11, 1929—a period of over 19 years during which it has flown 223,279,000 passenger miles.

► **Other Awards**—The Safety Council also honored these U. S. carriers for completing 1948 without a passenger or crew fatality—number of safe passenger miles flown up to Jan. 1, 1948, being shown in parentheses, followed by the date of the last fatal accident:

American Overseas (389 million) Oct. 3, 1946; Capital (459 million) June 13, 1947; Chicago & Southern (671 million) Aug. 5, 1936; Colonial (234 million) Apr. 18, 1930.

Continental (325 million) May 1, 1935; Inland (128 million) none; Mid-Continent (380 million) Nov. 15, 1934; National (475 million) Oct. 5, 1945.

Uraba, Medellin & Central (10.8 million) none; Western (285 million) Dec. 24, 1946; Caribbean-Atlantic (18 million) none.

► **Feederline Citations**—Ten feederlines were given citations for completing 1948 without a fatal accident. No U. S. feeder has suffered a passenger fatality since the first certificated short-haul operator started its service in August, 1945.

Northwest Airlines, which in 1947 had flown five years and more than a billion passenger miles without a fatality, saw its record broken on Aug. 29, 1948, when a plane crashed near Winona, Minn., killing 33 passengers and four crew members.

Another long-time safety record fell in 1948 when a Delta Air Lines plane crashed during a Chicago takeoff on Mar. 10, killing eight passengers and four crew members. Until the accident, Delta had compiled more than 733 million safe passenger miles over a 12-year period.

More for Family

Continuance of first-of-the-week family fares from June 30, 1949, to Mar. 31, 1950, is planned by 16 domestic trunklines and feeders if CAB approves the plan.

Started by American Airlines in September, the plan provides that if one member of a family pays full fare for a trip on Monday, Tuesday or Wednesday (usually light traffic periods) other members of the family may travel at half fare.

Blade Fatigue Cause Of Forced Landing

Failure of a propeller blade in flight and subsequent loss of the No. 4 engine probably caused the accident which forced an American Airlines DC-6 to make an emergency landing at the CAA auxiliary field, Columbus, N. Mex., last Dec. 3.

A Civil Aeronautics Board report on the mishap said fatigue failure of the propeller blade apparently resulted from circumferential indentation induced on the inside surface of the blade shank during manufacture at the time the deicing ring was installed by the upset process. The Curtiss-Wright propeller involved had been in service 1122 hr.

▶ **Limited Number Made**—Only a limited number of this design blade (744-6C2-O) were manufactured between Dec. 22, 1947, and Apr. 19, 1948, according to CAB. The ring upset process was not used on blade designs other than the 744-6C2-O.

In order to determine if similar internal irregularities exist in any other blades of this type, the manufacturer has withdrawn from flight operations all units subjected to the upset ring process. Only those blades that satisfactorily pass a revised reinspection program will be returned to service.

The blade on the AA DC-6 fractured at about the 9½-inch station. Fatigue failure covered approximately two-thirds of the circumference before final rupture in tension took place.

▶ **Engine Torn Out**—Bound from Dallas to Tucson, the DC-6 was cruising at 18,000 ft. when the crew felt a severe jolt. They saw No. 4 engine had been torn from the plane and No. 4 nacelle was on fire. Emergency procedures were followed, and fire was extinguished.

Following loss of the No. 4 engine, plane operated and handled normally for three-engine operation. No injuries to passengers or crew were incurred during the emergency landing.

Inspection of the No. 4 nacelle area revealed engine had let go at the vibrator isolator mounts. All forces involved were absorbed by these mounts, and no structural damage was found aft of firewall. Fire damage was superficial, and no other part of the plane was damaged in any way.

Independents Join International Group

The Natl. Independent Air Carriers, an association of U.S. uncertified operators, has joined forces with the International Federation of Independent Air Transport Companies (FITAP) "to fight against cartelization of air transportation throughout the world."

James Fischgrund, vice president of Standard Airlines and chairman of the U.S. group, said the Federation consists of the independent airline organizations of France, Great Britain, Netherlands, South Africa and Switzerland, and member companies in Norway, Sweden, Italy, Spain, Egypt, East Africa and India. Fischgrund added that the independent lines of U.S., France, Great Britain, Netherlands and South Africa are those principally threatened by "chosen instrument" carriers which are trying to create conditions rendering operations by other companies impossible.

TWA Skycoach Load Factor 91 Percent

TWA has made a spectacular success of its initial venture into four-cents-a-mile skycoach service.

Load factors reached the saturation point during the first three months of its cut-rate DC-3 operations between Los Angeles and Kansas City. In April, 91 percent of the seats on the 24-passenger planes were filled.

▶ **Expansion Spurred**—Popularity of cut-rate, night-time flights on this run spurred plans for extension of TWA's skycoach to other routes starting with New York-Chicago service May 31 (AVIATION WEEK, May 23).

TWA's four night flights operating on the schedules of the present Los Angeles-Kansas City skycoach had a 30 percent passenger load factor for the 30 days preceding inauguration of the new, low-fare service on Feb. 7. The passenger load factor soared to 67 percent in the first 30 days of skycoach flight.

March load factor moved up to 76 percent. In April it hit 91 percent and leveled off at close to that point during the first part of May.

▶ **Seasonal Gains**—Normal seasonal increases probably would have pushed the 30 percent load factor of last January to 45 or 50 percent by May if skycoach service had not been introduced, TWA estimates. The company's research department had predicted last January that April's load factor on the skycoach run would reach 90 percent.

▶ **No Measurable Diversion**—TWA says that overall there has been no measurable diversion from standard-fare flights to skycoach, because the number of passengers carried in the area has continued to increase steadily. A Constellation flight leaving Los Angeles about the same time as the skycoach trip (and making two of the skycoach trip's stops) has recently maintained a 75 percent passenger load factor.

West-to-east travel continues to be best on the skycoach run. CAB has authorized TWA to offer the low-fare service at least until July 31.

SHORTLINES

▶ **Air Transport Associates**—Has asked CAB for certificate or exemption to carry persons and property between Seattle and Fairbanks, Alaska; between Seattle and New York; between Chicago and San Francisco; and between San Francisco and Los Angeles. The Seattle-based company now operates under a nonscheduled letter of registration.

▶ **Alaska Airlines**—Reports $16,572 net profit on $1,076,801 gross revenue for the three months ended Jan. 31. Company lost $258,814 on $462,578 gross revenue in same period previous year.

▶ **Australia**—Major airlines increased their fares 12 to 40 percent this month because of steadily rising costs. Air Ministry said Australia's fares remain cheapest in the world despite the hike.

▶ **Braniff**—Plans to start twice-weekly DC-4 service into La Paz, Bolivia, June 3, with the first JATO-equipped passenger plane to fly commercial schedules. JATO will give the DC-4 an available extra takeoff thrust equal to 1200 hp. at the 13,398-ft. high La Paz airport.

▶ **BOAC**—Flew 2357 passengers on 78

flights between the U. S. and Great Britain during first quarter 1949 against 2036 passengers on 107 flights in first quarter 1948. Average passenger load increased from 19 to 30.2.

► **Central Air Transport Corp.**—Expects its first Convair-Liner to arrive in China this month. Craft was to be ferried to its Hong Kong base on a 14,000-mile flight via Canada, Greenland, Iceland, Europe, Iraq, Saudi Arabia and India. Five other Convair-Liners will be ferried by CATC crews over same route.

► **Hawaii**—Territorial legislature has reduced the aviation fuel tax from 5 to 4 cents a gallon. Motor fuel tax stayed at 6 cents. Efforts to require that Hawaii's airport program be financed entirely from the aviation fuel tax, landing fees and other airport fees were opposed by the airlines and defeated.

► **Northeast**—RFC has given final approval to a $1,750,000 loan for service and equipment expansion.

► **Slick**—Plans to make no major changes in its C-46 cargo fleet in the immediate future despite recent tentative CAB certification.

► **TWA**—Recent agreement with the Air Line Pilots Assn. placed transcontinental copilots' starting pay at $290 monthly, with top of $570 after six years service. Starting base pay for copilots in international service is $350, with $570 top at end of the tenth six-month period.

► **United**—President W. A. Patterson has announced that UAL's 55-passenger Stratocruisers will go in service between the West Coast and Hawaii not later than Oct. 15. First of the company's seven Boeings should be delivered around July 1.

► **Viking Air Lines**—Recently became second transcontinental nonscheduled operator to offer nonstop DC-4 service eastbound from Los Angeles to New York.

CAB SCHEDULE

June 14—Hearing in VAL-Air Lines and Trans-Texas Airways route case. (Dockets 3645, 3646 and 3367)

June 15—Hearing on foreign air carrier permit application of Linea Aeropostal Venezolana. (Docket 3751)

June 20—Hearing on Purdue Aeronautics Corp.'s lightplane route application. (Docket 3713)

June 20—Hearing on renewal of Southwest Airways' feeder certificate and suspension of United Air Lines' service at four California points. (Docket 3718)

June 20—Hearing on Carco Air Service's lightplane route application. (Docket 3629)

July 18—Hearing on Hughes Tool Co. control of TWA. (Docket 2796)

July 18—Hearing on renewal of Pioneer Air Lines' feeder certificate and suspension of service at points on routes of Braniff, Continental and American. (Docket 3719)

CAB Okays Summer Trips to Rome, Israel

Two uncertificated carriers—The Flying Tiger Line and Trans-Caribbean Air Cargo Lines—will get a small piece of the trans-Atlantic passenger business during the peak summer travel season.

The Flying Tigers have received special CAB authorization to make three roundtrips between the U. S. and Rome this summer carrying Catholic student groups in connection with the Holy Year celebration. Trans-Caribbean will be permitted to make two roundtrips to Tel Aviv, Israel, with student groups enrolled in the New York University Summer School Workshop in Palestinian Life and Culture.

► **Prohibition Lifted**—Uncertificated airlines are prohibited under the Civil Aeronautics Act from carrying passengers between the U. S. and foreign points on a nonscheduled common carrier basis. CAB in the past has granted few exemptions from this regulation but in this case, despite a TWA protest, decided that certificated carriers will be unable to provide adequate charter or regular scheduled service to accommodate students during summer.

Both the Flying Tigers and Trans-Caribbean had indicated to CAB that they were filing applications for exemptions although they believed the flights constituted legitimate contract or charter activity beyond the Board's regulatory jurisdiction. Holding to its extremely narrow view of what constitutes a contract operation, the Board decided that even the proposed limited number of flights were common carrier in nature and could be made legally only under exemptions.

Merger Agreement

Mid-Continent Airlines directors have approved an agreement with Parks Air Lines whereby the feeder would become a wholly-owned subsidiary of MCA, subject to Civil Aeronautics Board approval (AVIATION WEEK, Apr. 25). J. W. Miller, MCA president, said his company would file a petition with CAB seeking permission to acquire Parks' 4000-mile short-haul system.

The agreement provides that the purchase of Parks is to be accomplished through a stock exchange on the basis of one share of Mid-Continent for each 2.4 shares of Parks. Parks' outstanding stock totals 32,392 shares. The feeder was one of five ordered by CAB to start operations by July 1 or lose its certificate.

New ICAO Member

Finland has become the 52nd member nation of the International Civil Aviation Organization.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • PLANES • EQUIPMENT—USED or RESALE

NEW ADVERTISEMENTS received Friday will appear in the issue mailed the following Friday subject to limitation of space available

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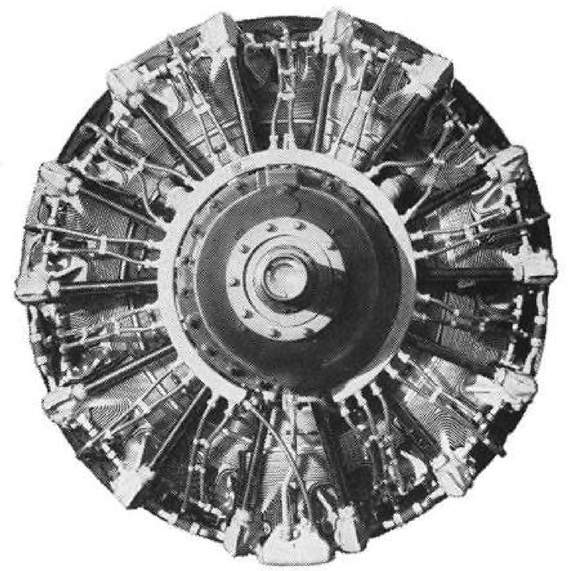

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WHAT'S NEW

New Books

"Flight into History: The Wright Brothers and the Air Age," by Elsbeth E. Freudenthal, published by the University of Oklahoma Press, Norman, Okla. Price $3.75

Excessive number of errors appearing in the book seriously detract from its value as an aviation history reference. It appears likely rather it will compound the already considerable confusion which exists concerning early days of aviation.

Limited space permits only a few typical examples of the book's mistakes, many of them in details already well established in previously published writings and documents.

The author names as a witness of the first powerplane flights made by the Wrights at Kittyhawk a "John Ward" who has never before been listed in this company. Presumably she means Johnny Moore, only remaining living witness to the first flights.

She describes Huffman field near Dayton where the Wrights made early flights as a 100-acre field when actually it was 66 acres.

She is seriously mixed up on the birthplace of Wilbur Wright, and on the places where the Wright family lived, although all these things have been reported correctly in previous publications.

Perhaps more serious than the factual errors is the writer's tendency to ascribe to other aviation pioneers much of the original work for which the Wrights are properly credited.

A key to some mis-interpretations is supplied by the repeated citations in her footnotes of Dr. Albert Zahm, bitter enemy of the Wright brothers, as one of her principal "authorities." The long-time campaign of Dr. Zahm to discredit the Wrights' contributions to aviation, and his reports, which in large measure caused the Wright-Smithsonian controversy, afterwards repudiated by the institution, are well known.

Although written some six years after the Fred C. Kelly book, "The Wright Brothers," the Freudenthal book falls far below the earlier one in historical reporting and cannot be considered a serious competitor.

—Alexander McSurely

"Most-Used Aviation Terms," 1000 terms and definitions taken from the Aviation Dictionary and Reference Guide, and reprinted with their Gregg Shorthand equivalents. Available from Aero Publishers, Inc., 2162 Sunset Blvd., Los Angeles 26, Calif. Price $1.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—MAY 30, 1949

SEARCHLIGHT SECTION
(Classified Advertising)

EDITORIAL

Give Air Freight Its Chance

Except for its unjustifiable failure to include Willis Air Freight in its approvals, the Civil Aeronautics Board's decision granting tentative certificates to four all-cargo operators is commendable.

The excellent record of Willis deserved more consideration than it received from the Board, and AVIATION WEEK expects to have more to say on this subject editorially.

The Board's insistence on certificating these independent carriers is courageous, in light of the strong opposition of the major scheduled airlines. Some of these old-line companies have used every possible legal excuse to defer this case. As long ago as last July, Slick Airways listed 38 principal delay maneuvers. The campaign is still underway.

Briefly, the complainants say, first, there is not enough airfreight business to sustain all carriers. Then they contend that the new lines will rob the old carriers of an important new revenue source which in turn will add to the taxpayer's costs in mail subsidies.

All of this may prove to be true, but we doubt it. No means of transportation has ever reached maximum public service and maturity until it became a mass carrier of freight. So far, commercial aviation's freight business has been negligible. And the pioneers like Slick, flying Tigers, Willis and the others did most of the spade work in launching the air freight industry we do have. We believe the potentials of air freight are enormous. We believe that specialists in air freight—who are not interested in passenger transportation—have done and will continue to do a better job of transporting and developing freight business than others. Furthermore, they do not ask a dollar of subsidy from the government in their rates.

Until the government separates mail rate subsidy payments from straight service compensation, the American taxpayer will never know how much of the mail pay is going into subsidizing low cargo rates or inefficient passenger service. The passenger airlines themselves do not know what their cargo transportation costs are. The air cargo carriers know down to the last tenth of a cent. Air cargo transport, like any other business, must be conducted on a business basis. Let's start it off on a business basis.

Certification of the all-cargo lines, for a five year period, will enable these companies to start serious air cargo development, including the design, production, and purchase and operation of the most efficient freight aircraft the current state of the art permits. It will enable these companies to start building permanent sales organizations which attract high caliber salesmen. It will give this country the impetus toward attainment of a highly efficient air cargo system at minimum cost from the taxpayer.

We hope CAB delays this case no more. It should make these certificates effective June 24, in accordance with the date in the tentative decision. If after five years the air freight system proves to be a failure, and an added drain on the taxpayer without adequate return, then and only then will it be time to turn the transportation of freight back to the passenger airlines.

Maximum commercial air freight development should bring the greatest expansion of peacetime aviation this country—or the world—has ever seen. Give air freight a chance to show what it can do. No more stalling, please.

Memo

From an Aviation Week Editorial Mar. 21:

". . . There are men and unemotional test equipment qualified to resolve the dispute. Before we spend another dollar, why not ascertain the exact and detailed performance of the B-36? Assemble a neutral group whose qualifications will satisfy all concerned. Put the big ship through a thorough-going flight-test program. The results need not be made public but the Secretary of the Air Force and the Secretary of Defense should get the facts. Once such results are compiled and all interested parties are appraised, there could be no foundation for rumor, no question of whether to forge full speed ahead on development or abandonment (of the B-36), no likelihood of Congressional investigations. . . . Let's kill the rumors now, let's kill the controversy before it really gets underway. If we don't kill it now, the battle may get out of control completely."

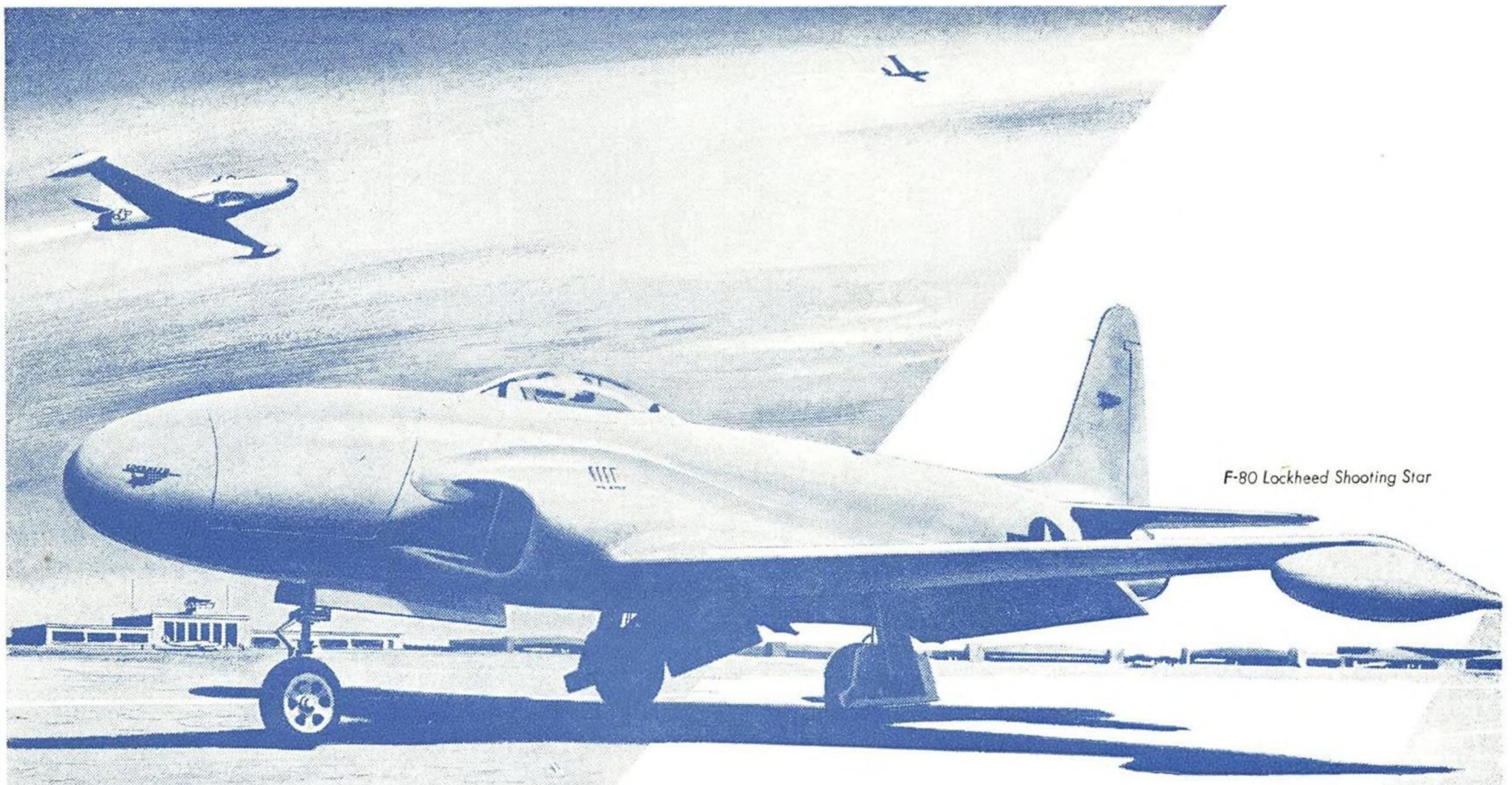
From the Same Issue of Aviation Week, Page 7:

"One of the questions raised in the present B-36 vs. fighter controversy is: Why has the Navy not been requested to pit the best of its current fighter crop against the Convair bomber? . . . ."

From a Washington Dispatch of the United Press May 17:

"The House Armed Services Committee has ordered the Defense Department to conduct 'impartial tests' of the Air Force's B-36 against the Navy's best jet fighters. The showdown test was ordered after the Navy claimed unofficially that it has a jet fighter that can intercept and shoot down a B-36. It had challenged the Air Force to put the B-36 to a test but the Air Force had remained silent. Chairman Vinson told his committee it was time the American people got a satisfactory answer to the controversial question whether the six-motored bomber is, as the Air Force claims, almost impossible to intercept . . ."

—ROBERT H. WOOD



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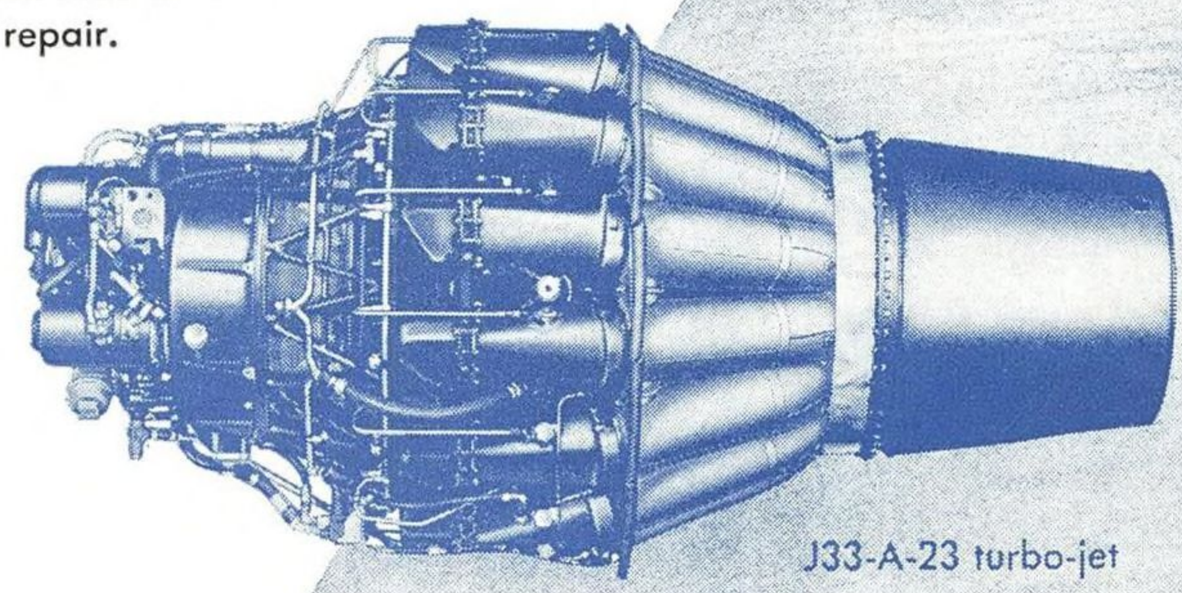
Northrop YB-49 Flying Wing
Grumman F9F-3 Panther



J33-A-23 turbo-jet

Allison

Builder of axial and centrifugal flow turbine engines

DIVISION OF GENERAL MOTORS

Indianapolis, Indiana