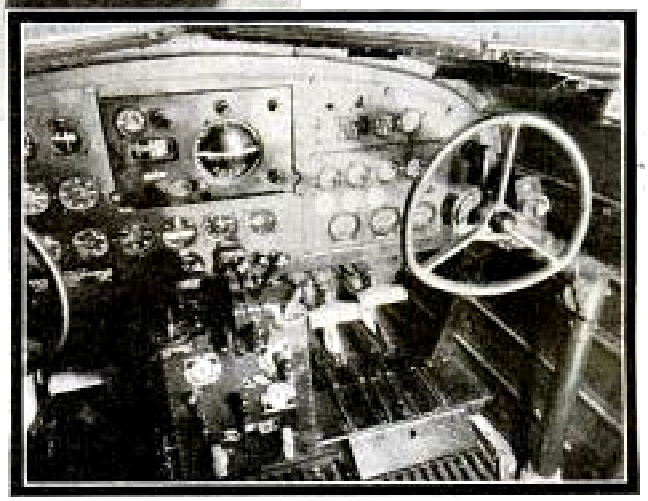
DOUGLAS *Tells*

T.W.A.'s senior pilot, "Si" Morehouse, clipped the transport time from Los Angeles to Newark to twelve hours, three minutes, fifty seconds in another Douglas. Then Capt. Rickenbacker carried thirteen passengers on the first one-day, round-trip flight for an air liner between New York and Miami in the same ship. On the return run to New York the airplane chopped four hours, twenty minutes from the previous transport record by negotiating the 1,195 miles in one minute over seven hours.

When Transcontinen-



Instrument Board of Douglas Transport, and Donald W. Douglas, Left, with K. D. Parmentier Who, with J. J. Moll, Placed Second in Handicap Section of London-Melbourne Air Race, Using Douglas Plane

By DONALD W. DOUGLAS

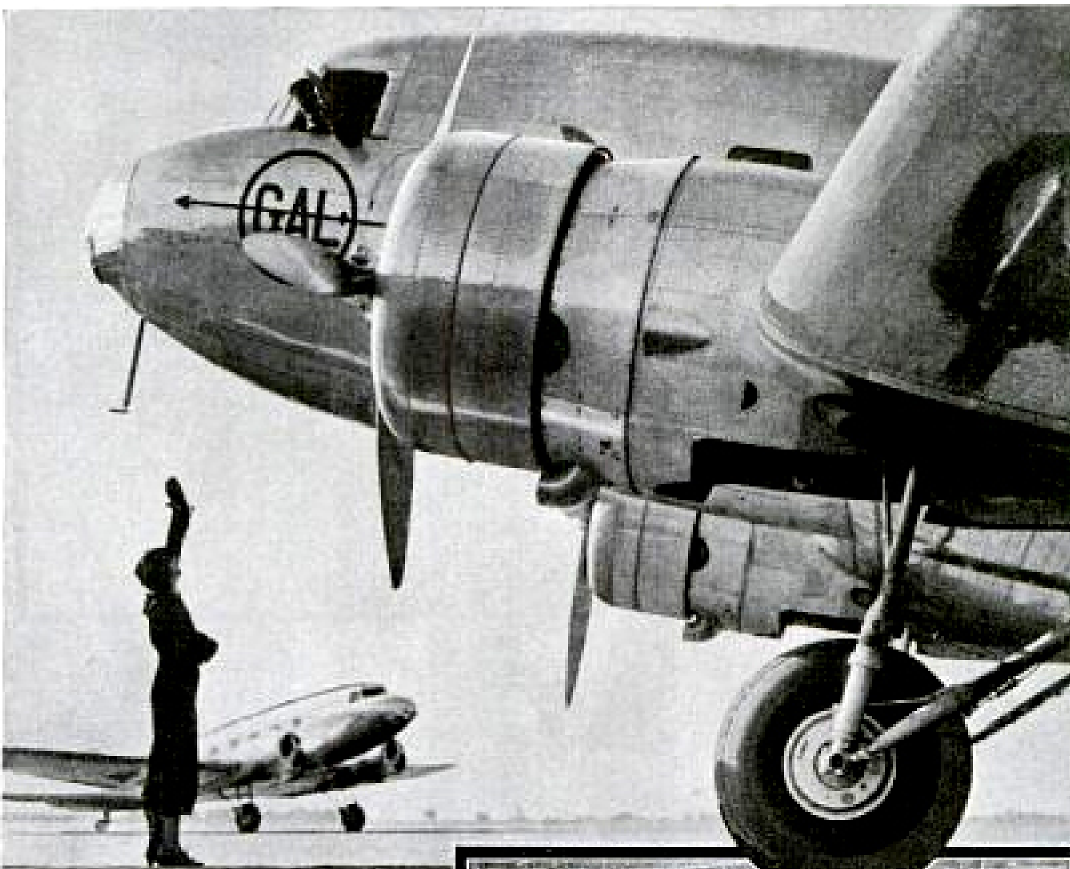
President, Douglas Aircraft Company, Inc.

WHEN a bi-motored transport streaked eastward from Los Angeles to New York in thirteen hours, four minutes, twenty seconds, it sounded the death knell of three-engine construction in commercial aviation and boosted transcontinental transport flying speed 100 miles an hour.

The flight distance of 2,609 miles demonstrated that today it is both safe and feasible to fly over vast ocean stretches, using modified land airplanes. The trip from California to Hawaii is 2,200 miles. The span from Harbor Grace to Ireland is but 1,800.

Since that epochal flight last February, records continue to fall. Only last November Capt. Eddie Rickenbacker, flying with tal and Western Air, Inc., now T.W.A., came to us over a year ago with an order for more than forty airplanes, they wanted transports to cruise at 160 miles an hour, a top speed of 187 miles an hour or more. Also they asked us to meet these specifi-

SECRETS of SPEED

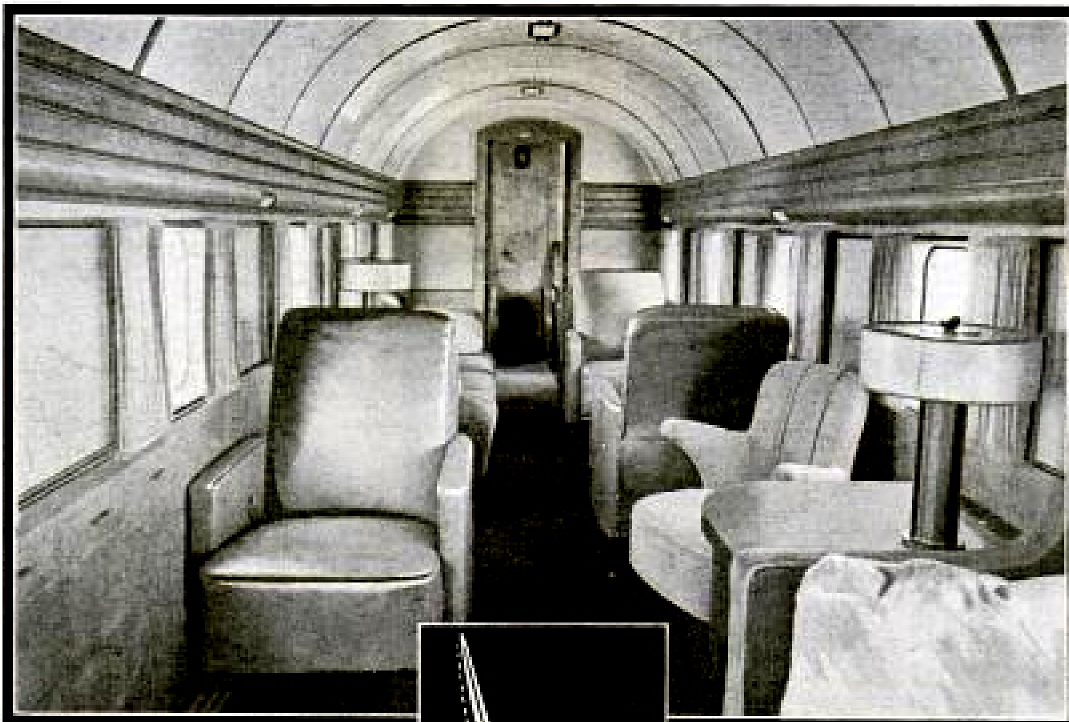


The Nose of a Douglas Transport, and Fuselage Assembly Room of Douglas Aircraft Company Factory

cations without seeking speed through lightness at the expense of slashed pay-load capacity.

It cost us $325,000 to produce DC-1, the Douglas transport of the February run. With that background, we turned to constructing DC-2, the speed ship of last November. We can produce the DC-2 type ship commercially today at approximately $80,000.

There was no way to accomplish these results by simply increasing power. We had to tackle minute elements of fuselage design and all the refinements in aircraft engineering. Combating wind resistance became an immediate objective with absolute streamline the goal. Wind-tunnel tests proved you cannot get full streamline with a tri-motored plane, because one of the engines must go on the nose. Other experiments found the efficiency point for trimming flaps, established proper design for the engine cowl, and checked for the most successful type of fillet. We used three complete sets of wings and made several radi-



cal departures even in landing gear. Drawing up the landing gear cuts wind resistance to the point where you gain approximately twenty-five miles an hour over any other arrangement thus far devised.

Another factor we used to gain speed was developed by the National Advisory Committee for Aeronautics. We place the nacelle which carries each engine so that each propeller is on the center line with the wing. This cuts the wind resistance of the nacelle.

To further the streamline idea, we used a smooth sheet with generous fillets instead of sharp corners. If you work with metal skin instead of fabric you can attain any shape you desire. With the old fabric system the "formers" underneath offered restrictions of their own which could not be overcome.

The metal we used is duralumin. This is coated with pure aluminum on each side to thickness approximating five per cent of the thickness of the sheet. This makes the wing skin into a sort of a sandwich. The aluminum coat has such resistance to corrosion that additional paint is unnecessary for land airplanes not operating in a sea area.

The fillets are the covering for the wing-root of an airplane, molding the wing into the fuselage. If they are generous and well-rounded you get less wind resistance than if they are square or angular.

Another source of additional speed is the supercharged motors. Because air conditions vary at different altitudes and

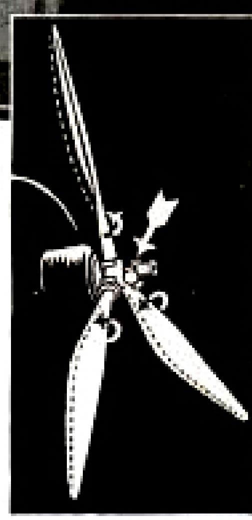
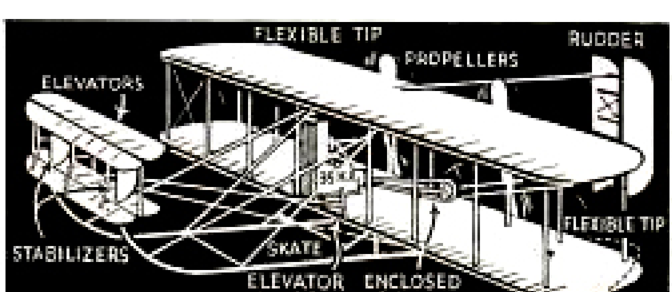
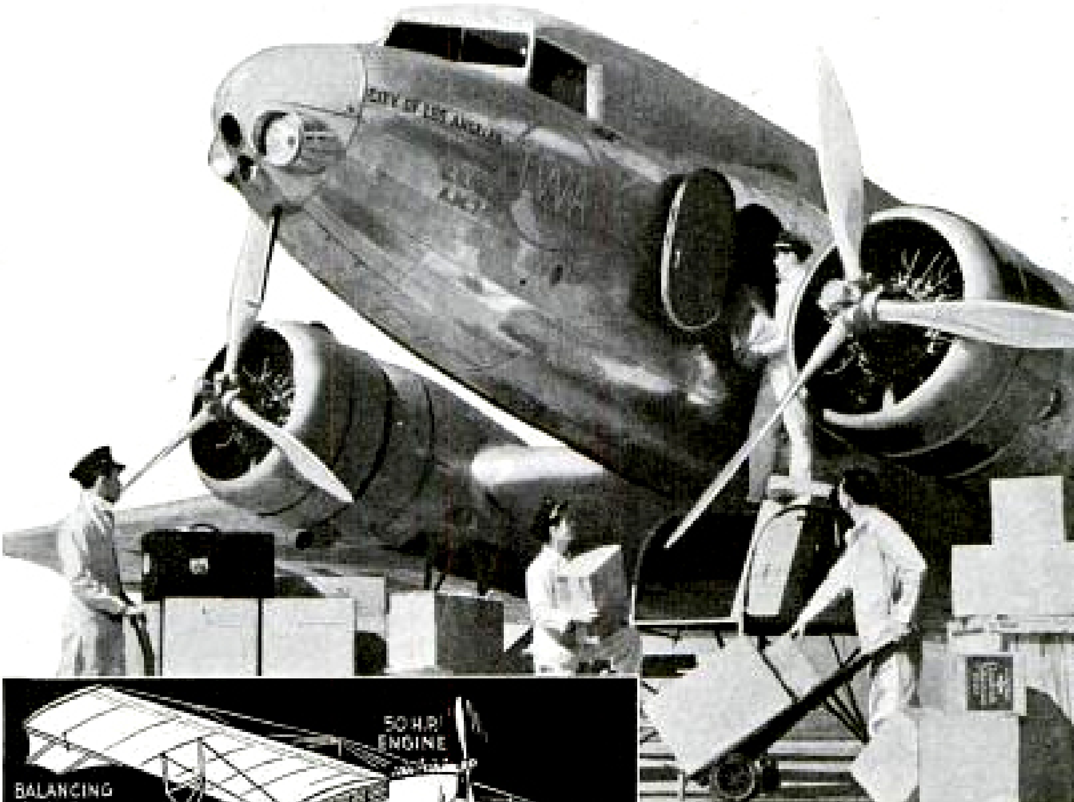
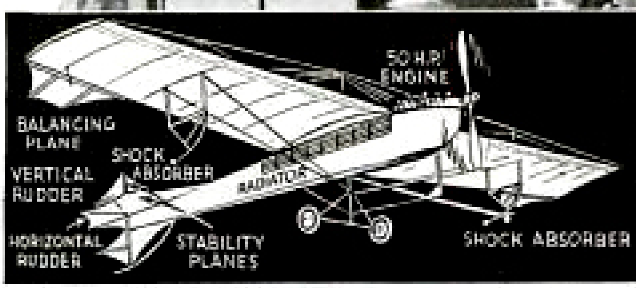


Diagram Shows Action of Controllable Pitch Propeller; Arrow Indicates Gears Which Change Pitch



Evolutionary Wright Biplane with Flexible Wing Tips; Above, Interior of De Luxe Douglas Transport





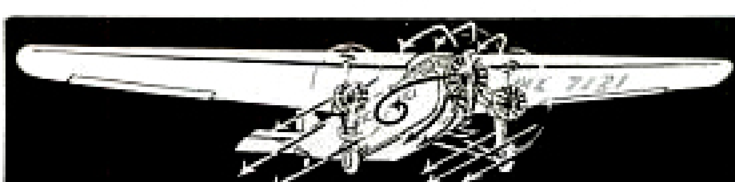
Loading Douglas Transport, and a 1907 Monoplane, Showing First Application of Ailerons or "Balancing Plane"

no single propeller adjustment gives maximum efficiency in all, we used propellers of adjustable pitch so the angle can be changed while in flight to conform with the density of the atmosphere.

When we start out to build an airplane, we plan the cabin first and then build the airplane around it. From the cabin you determine the size of the fuselage. The rest of the airplane is worked out accordingly. The actual wing area depends upon the landing speed. In turn, that landing speed hinges upon the maximum lift which the wing will support in pounds per square foot. That maximum comes at a particular angle that cannot be specified arbitrarily because it varies with different types of construction. With landing flaps, we can get nearly fifty per cent more lift per square foot at the angle of maximum lift than we can without flaps. This means we can reduce the wing area just that much and the less the wing area the less the wind resistance and the greater the potential speed.

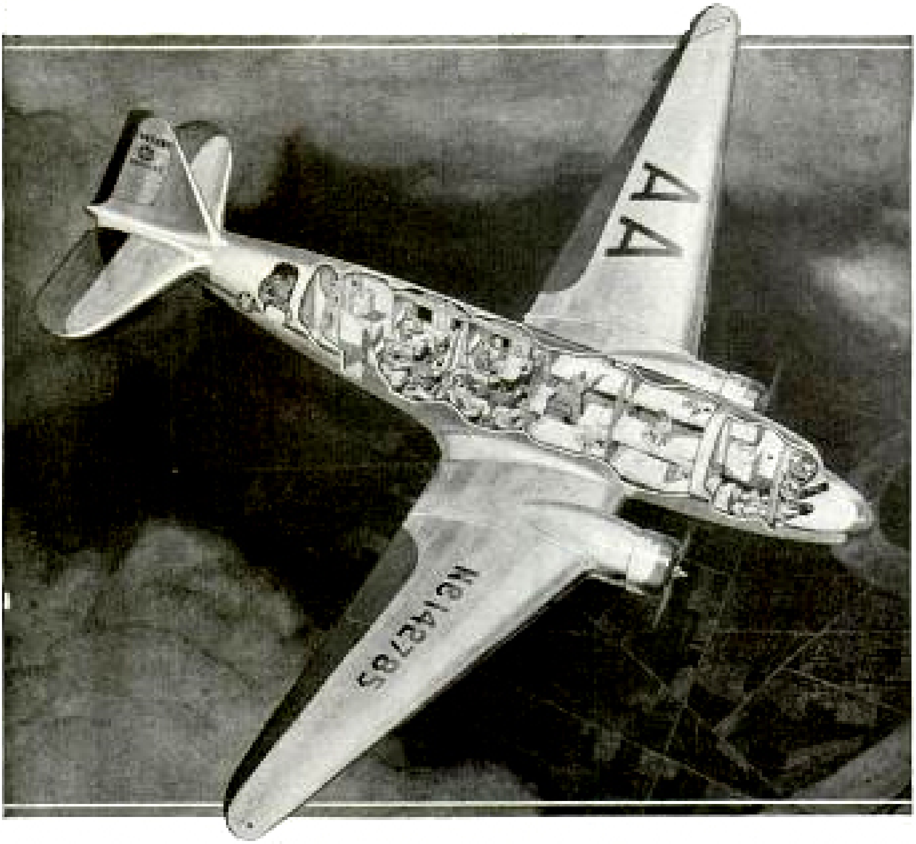
The flaps on the Douglas transport connect at the lower surface of the trailing edge of the wing so they drop downward at about a forty-five degree angle. They extend from the inner end of one aileron to the inner end of the other. These flaps are operated hydraulically as is the landing gear, both devices working from the

(Continued to page 127A)



A Tri-Motor Transport with Lines Indicating Slipstream from Three Motors and Showing Why Nose Motor Is Less Efficient Than Others

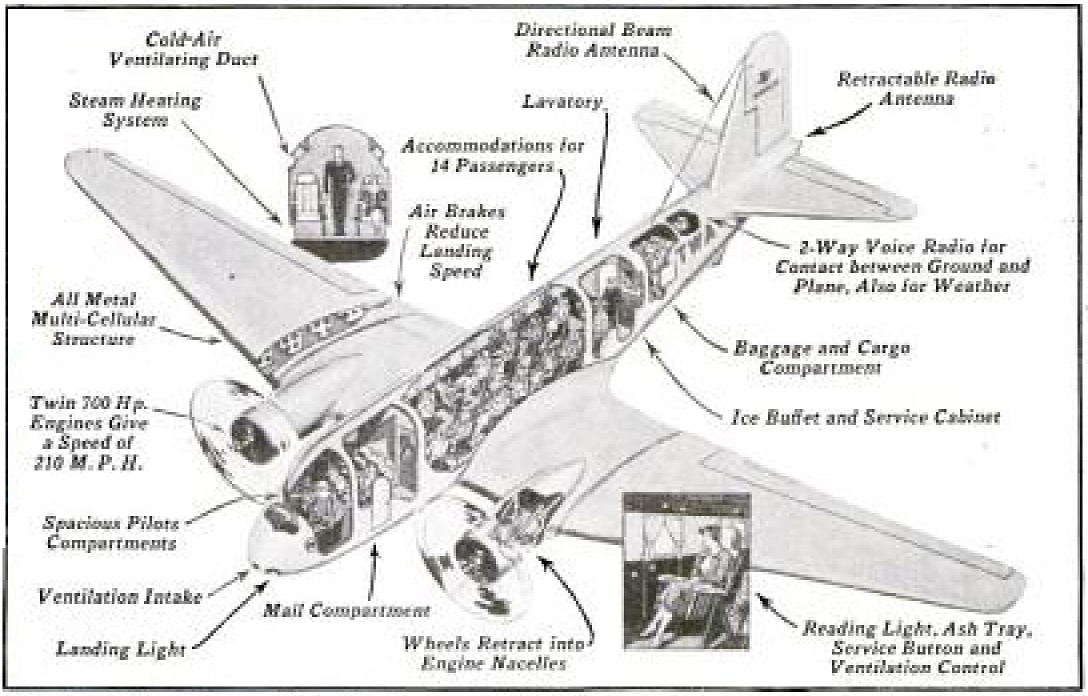
Twelve-Ton Flying Hotel Has Sixteen Berths



Drawing Shows, from Front to Rear, Pilots' Cabin; Mail-Express and Commissary Compartment; Two Sections with Berths Made Up; Two Sections for Day Travel; Dressing Rooms and Luggage Space

By night a great flying hotel with upper and lower berths for sixteen, by day a twenty-four-passenger luxury liner rocketing through the air at top speed of 215 miles an hour—such is the latest Douglas sleeper transport plane, a fleet of which is being built for American Airlines. The twelve-ton ship, a low-wing twin-engined monoplane built on the lines of previous Douglas transports but more roomy, has a cabin seven feet eight inches wide and six feet six inches high, accommodating four spacious passenger compartments on each side of a center aisle. For day travel each compartment has facing seats; as a sleeper, the back and bases of the seats form eight lower berths that are six feet five inches long and thirty-five inches wide. Upper berths are twenty-nine inches wide. Dropping down from the roof of the cabin, the "uppers" are accessible by steps and are provided with air by an extra slot above the cabin window. Separate dressing rooms for men and women are located at the rear of the ship. In front of the cabin is a complete commissary equipped to serve more elaborate meals than formerly, and to keep food and beverages hot or cold indefinitely. The ship's length is sixty-five feet, its wing span ninety-five feet. Besides baggage racks in the compartments, there is luggage and mail space at the rear of the fuselage and opposite the commissary. Au-

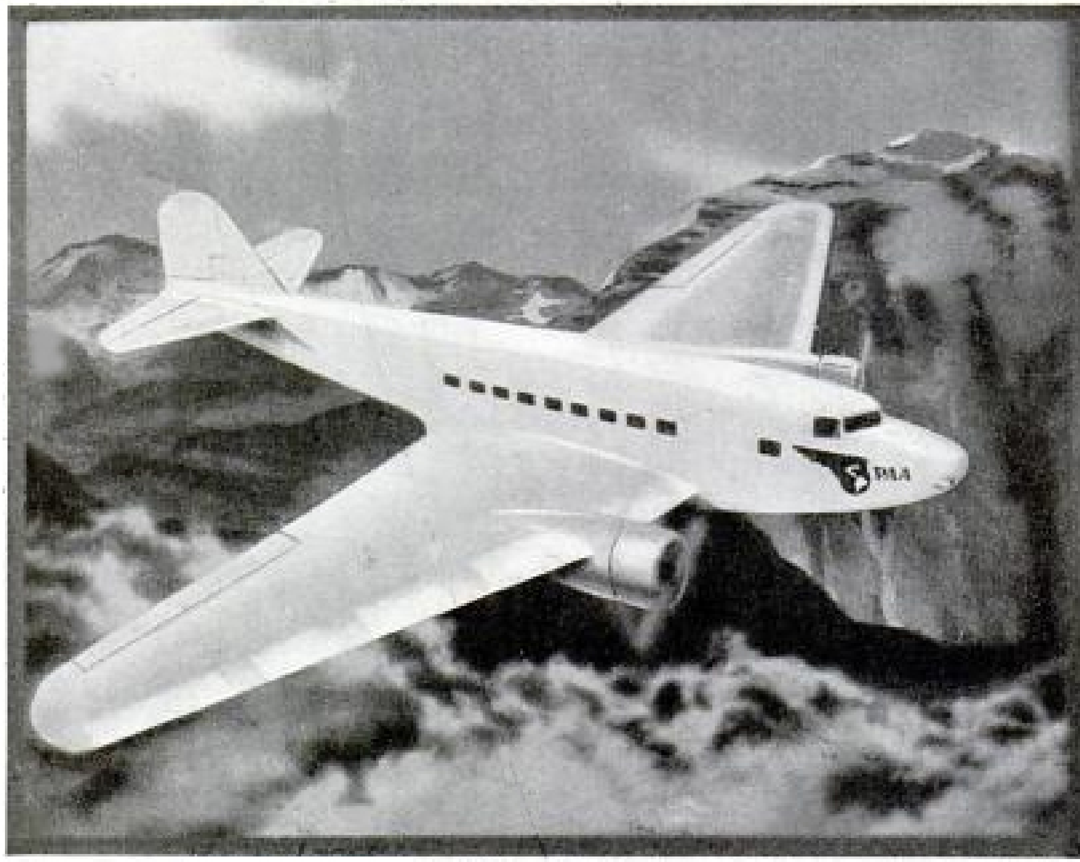
Latest Airliner Combines Speed and Comfort



Drawing Shows Features of Douglas Transport Which Will Be Used on Transcontinental and Western Air Route; Note Absence of Obstructions in Passenger Cabin; Either Motor Is Capable of Propelling the Ship

Capable of a speed of 210 miles at 8,000 feet, a new airliner for use on Transcontinental and Western Air lines has a landing speed of less than sixty miles per hour. The passenger cabin is unusually silent, as quiet as the average Pullman car, enabling the passengers to carry on conversations without raising their voices. The fourteen seats are adjustable to any comfortable position and may be reversed if passengers care to ride face to face for playing cards or talking. An ice buffet and service cabinet permit the serving of meals in the air. The airliner is manned by two pilots whose cockpit is equipped with all the modern instruments for safe aerial navigation, including radiophone transmitter and receiver. The all-metal wings and fuselage are perfect examples of streamlining. Landing wheels are retractable into the engine nacelles. While the great transport is powered by two 700-horsepower motors, it can take off, fly for long distances and land with only one motor running. In tests, one motor propelled the ship from take-off to 9,000 feet altitude, then across country 250 miles at better than 100 miles per hour, to land safely while overloaded. One feature of the ship is the abundance of head room. Another is the absence of aisle obstructions.

High-Speed Airliners to Join Two Continents



Fourteen-Passenger Transport Plane Which Will Speed Up Service over Pan-American Airways; Ships Like This Can Operate at Altitudes of 30,000 Feet at Speeds of 200 Miles Per Hour

Pan-American Airways has ordered two new types of transport planes which will be used to speed up the service between this country and points in Central and South America. Six Douglas transports have been ordered, each powered by two supercharged 700-horsepower motors and capable of operating at altitudes up to 30,000 feet. These planes will fly over the highest ranges of the Andes mountains at a speed of 200 miles per hour, carrying fourteen passengers, a crew of three and 1,000 pounds of mail and express over the north and south international route by way of Mexico and Central America and on down the coast of South America. Six Lockheed twin-engined transports also have been ordered. These planes will have a top speed of 215 miles per hour, a cruising speed of 185 miles per hour and will carry ten passengers, a crew of two and half a ton of mail and express.