D1459 • Cont. Kenneth Crist c/o Times - Los Angeles Calif

# DOUGLAS *Tells*


Santa Monica. Calif.

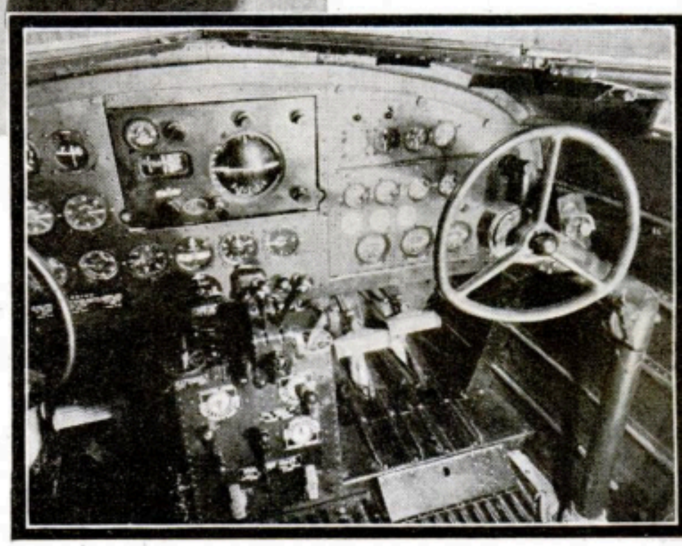
**By DONALD W. DOUGLAS**
***President, Douglas Aircraft Company, Inc.***

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 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 Transcontinental 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-



*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*

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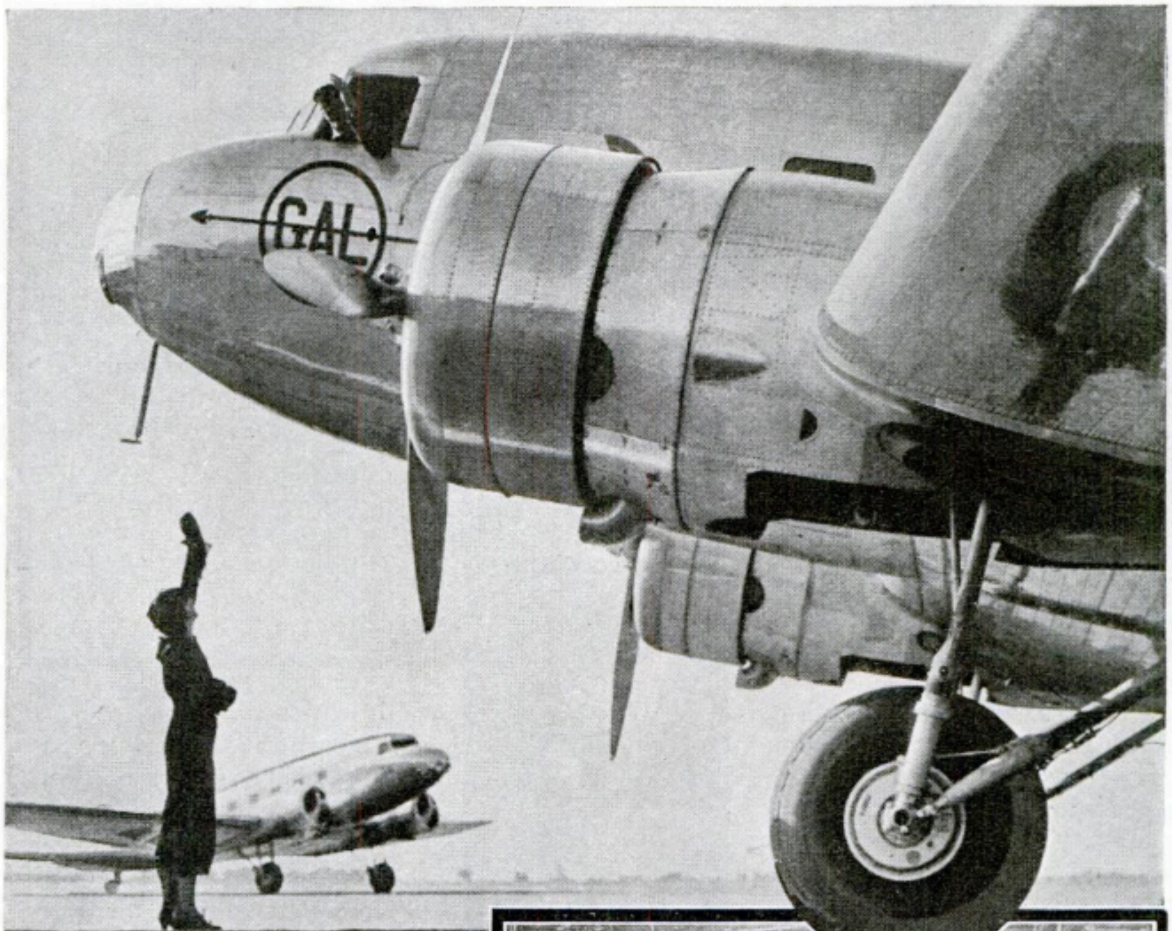
# SECRETS of SPEED

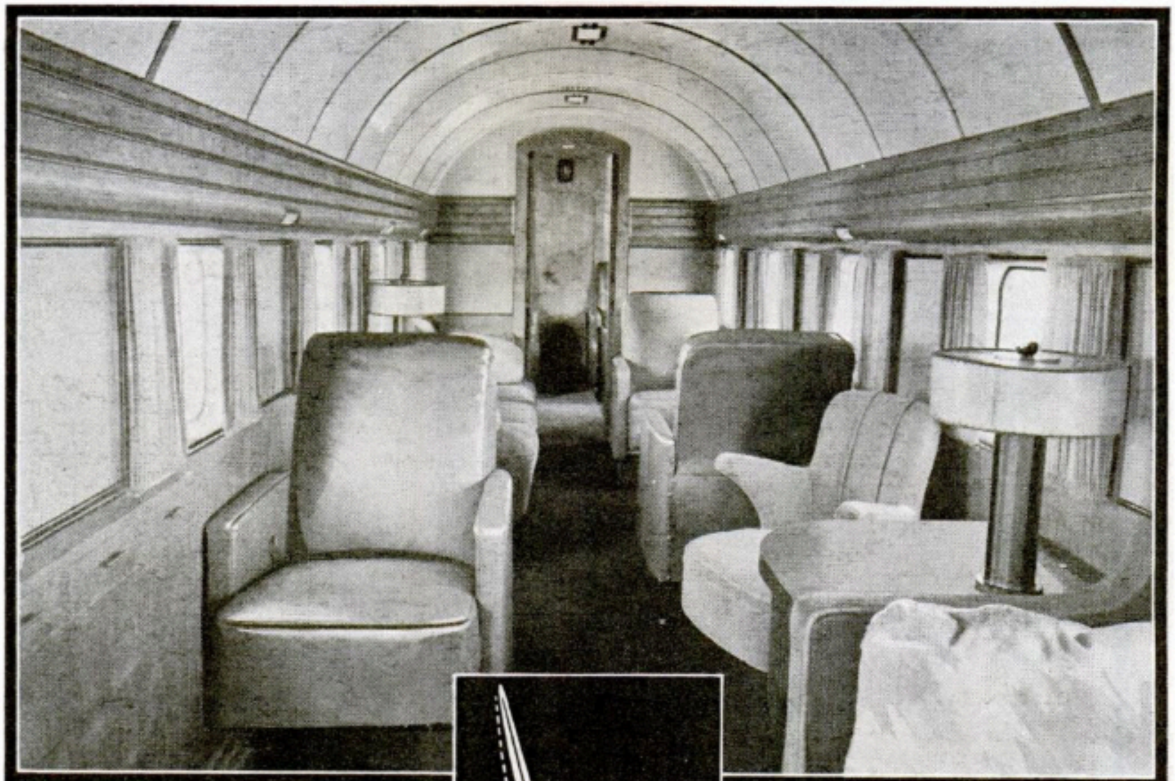



The Nose of a Douglas Transport, and Fuselage Assembly Room of Douglas Aircraft Company Factory

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 trimotored 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

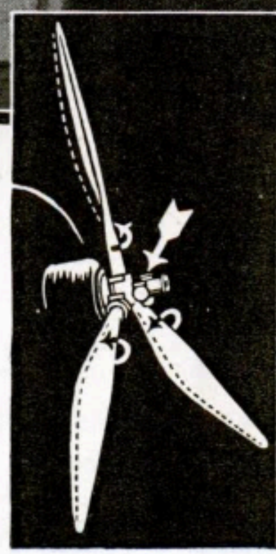
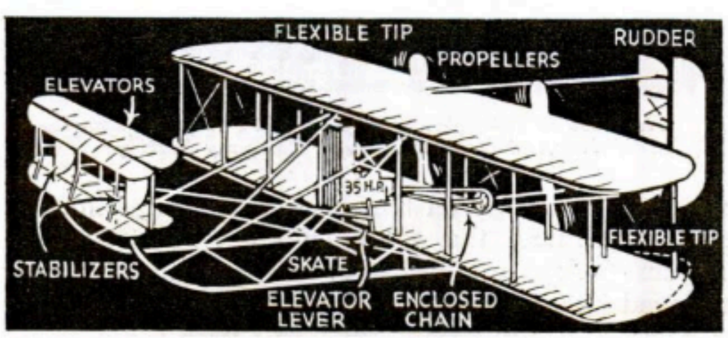


*Diagram Shows Action of Controllable Pitch Propeller; Arrow Indicates Gears Which Change Pitch*




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

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

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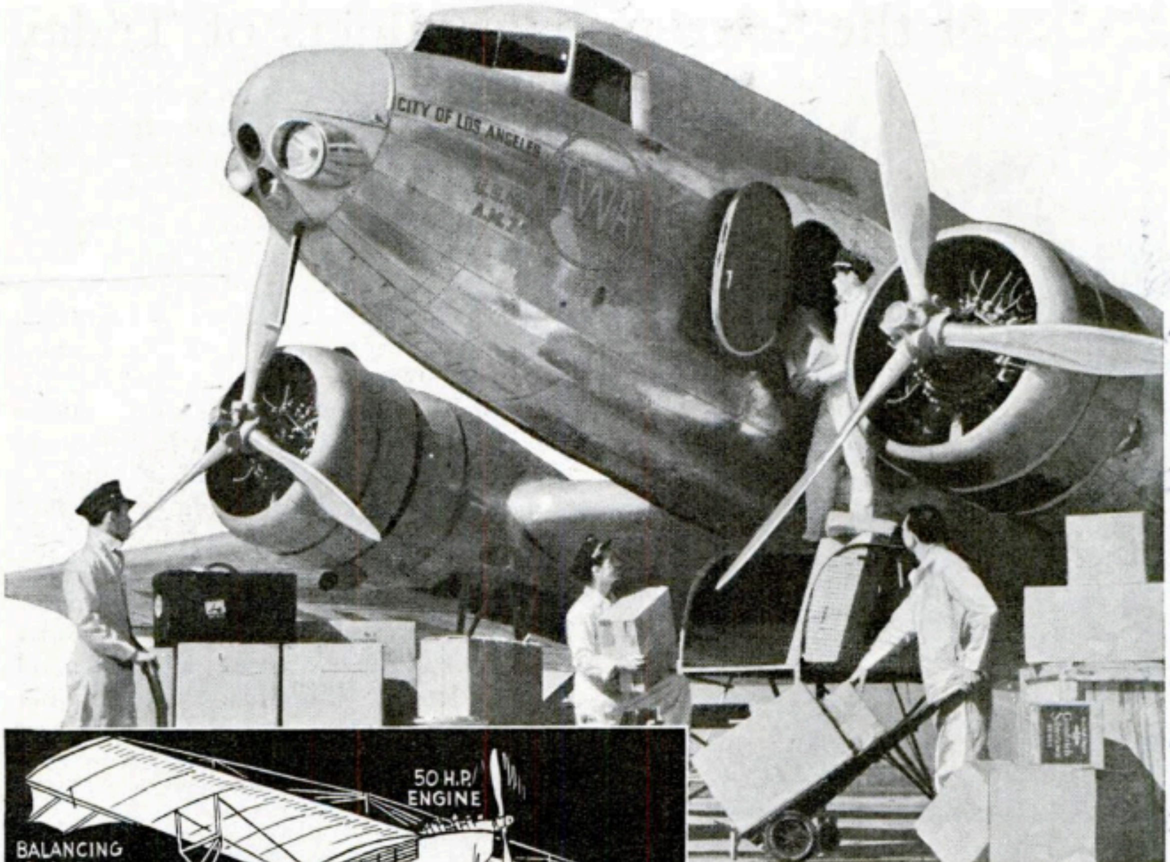


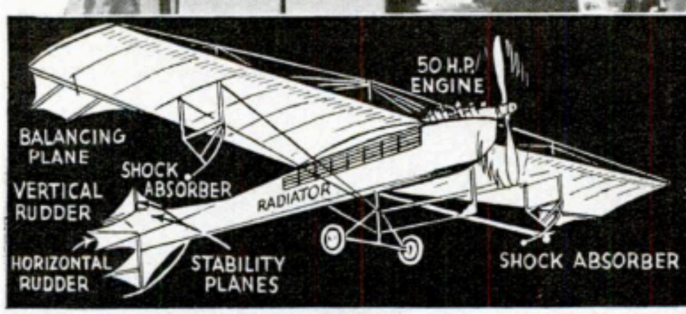


***Loading Douglas Transport, and a 1907 Monoplane, Showing First Application of Ailerons or "Balancing Plane"***

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

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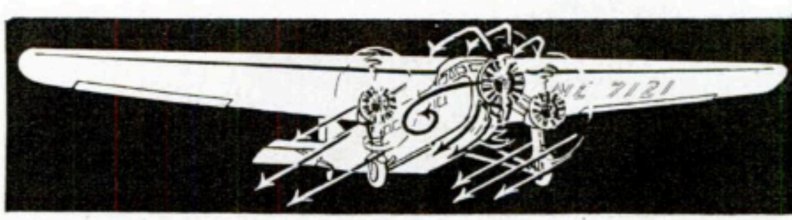
no single propeller adjustment gives maximum efficiency in all, we used propellers of adjustable pitch so the angle can be changed while in flight to conform with the density of the atmosphere.

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




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

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## DOUGLAS TELLS SECRETS OF SPEED

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same pump. The flaps have reduced landing speed to fifty-eight miles an hour.

We look to synchronization of motors to cut out all propeller "beat." Propeller beat is the drumming sound heard when the "props" are not traveling at the same speed. Now we are attempting to tie one propeller into the other to lose this pulsation entirely. Already we have cut airplane noise down to sixty-eight decibels as compared with seventy-two in a standard Pullman. This has been accomplished through developing materials to absorb noise rather than deflect it. Noise deflectors are heavy but noise absorbers are lightweight and do not give us bulk.

As to the future, it is probable that Diesel engines sometime will be used for airplanes. Only one commercial type of airplane Diesel has ever been built, and it was of only 200 horsepower, not enough for today's demand. The engineer who sponsored it died and his work has been allowed to lag. The Diesel idea, however, presents a potential development because even with the heavier motors the weight of fuel supply could be cut one-fourth.

Then there are the possibilities of the stratosphere. There is such little resistance there that the 12,000-foot speed of a given horsepower and load will practically double at from 38,000 to 40,000 feet. Such an altitude would give one of our late type Douglas transports a pace considerably above 400 miles an hour.

Among all the problems of stratosphere flying, two fundamentals are outstanding: the demand for oxygen and the necessity for air pressure. Passengers cannot breathe and motors will not work without oxygen. In Douglas transports now flying at 18,000 feet over the Andes mountains there is an individual oxygen valve for each passenger. A still better plan would be to introduce oxygen into the ventilating air. This, of course, is closely related to pressure, for if you are going to fly in the stratosphere you will have to pump up the cabin to assure passenger safety and comfort. This presents problems not yet solved.

Do not think there is no limit to speed in the stratosphere. You can get into a range where what air there is becomes compressed and we believe the limit of pace

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## UNCLE SAM—INVENTOR

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two government scientists have insured for American rice a higher percentage of whole kernels, and a flavor now associated only with certain special types of imported rice. These scientists, Jenkin W. Jones and J. W. Taylor, of the bureau of plant industry, have applied for a public-service patent covering the discovery and soon the process will be free to all the rice millers in the United States. It consists in soaking the rough rice in water and then steaming under pressure a sufficient time to gelatinize the kernels. The rice is then thoroughly dried and is ready for milling. The moist heat treatment toughens the grain by merging the starch grains into a solid mass which becomes very hard on drying.

Another valuable public-service patent recently granted is that to Robert J. Cheatham for a mesh marketing bag. This bag permits a housewife to see sacked potatoes, oranges and other fruit while at the same time saving the grocery man's time and hers through sacking up the food.

As an inventor Uncle Sam is the world's greatest and as a dispenser of his discoveries to the public he is unsurpassed.

## DOUGLAS TELLS SECRETS OF SPEED

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to be between 500 and 600 miles an hour.

There is a question as to whether or not the United States is big enough to warrant stratosphere work, for when you use the stratosphere you have to cut pay load and take on gasoline. This means transportation cost per passenger carried would increase and casts doubt on potential profit.

The thing we actually look for is this: trans-Pacific and trans-Atlantic flying with passengers and mail with modified land planes. We could waterproof wings, make compartments water-tight, and add greater fuel capacity. The flotation factor could be prepared so that a land plane, were it to be forced down at sea, could float as long as a flying boat. Flying boats are more unwieldly than land planes, have more resistance and are slower. In terms of pay load, high-speed land planes present the greatest overseas opportunity.

It only remains for a transoceanic operator to begin such an airline. The equipment is ready.