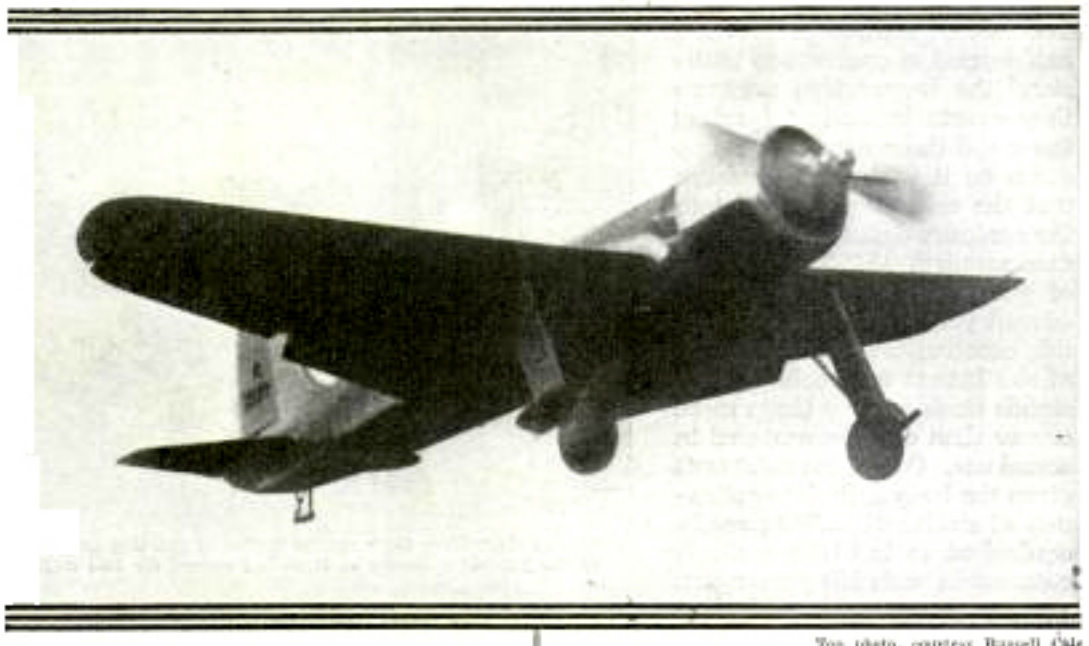
How HUGHES



Top photo, courtesy Russell Ogle

Hughes' racer landing after test flight and, left, plane with small racing wing before remodeling

LONG months of secret research by a corps of engineers and then more months of building and fitting behind guarded doors—that is the inside story of the mystery monoplane that Howard Hughes flew across the United States in seven hours and twenty-eight minutes in January.

The flight seems like fiction, almost like moving your finger across the map to span a continent. Yet Hughes' associates think he can beat his new record almost any time he desires. A mark of around six hours may be in the offing. For on his latest dash Hughes simply cruised from coast to coast. Mostly he used only fifty per cent of his power. One of the miracles of the flight is that Hughes used a strictly stock engine that was not "hopped up" for racing. Another is that his airplane is not a freak affair that must be pampered and groomed for a high-speed dash, but a sturdy practical plane that flies safely and easily at the speeds for which it was designed.

Instead of using tremendous power Hughes depended more upon perfect streamlining for his speed. All planes are streamlined to some extent but even on a modern transport the wings are dotted with tiny rivet heads, each of which contributes to resistance. The metal skin of Hughes' fuselage is not riveted in the usual way. Instead all plates are butt-jointed with splice plates underneath, using flush-type rivets to eliminate every vestige of drag. Of course, streamlining is not the whole story. Much of it lies in the months of wind-tunnel research at the

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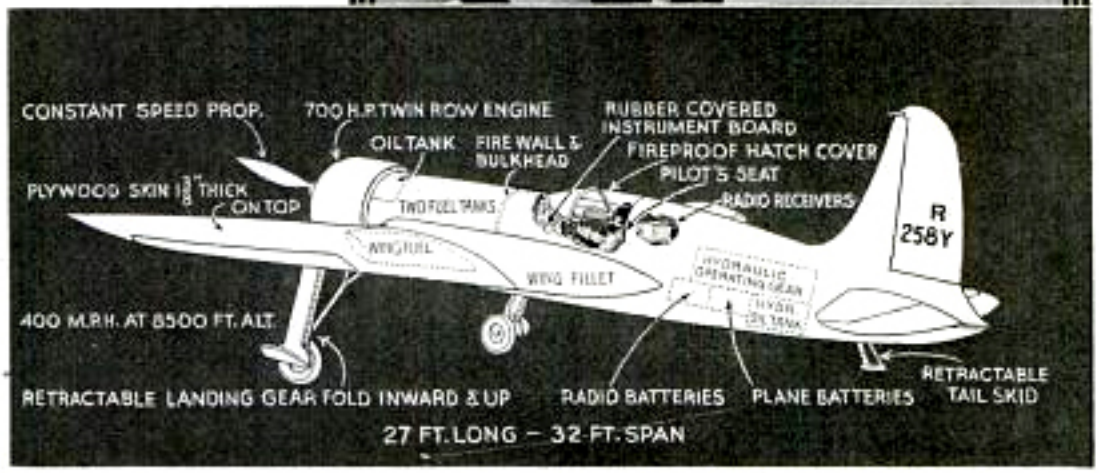
California Institute of Technology.

"In the wind tunnel we worked with speeds never before seriously studied in this country," says one of Hughes' engineers. "Compressibility of air is different at high speeds and this had to be studied in designing the special wing curve. But the result is a sturdy airplane that can carry a good load at a top speed of around 400 miles per hour at 8,500 feet altitude, with a cruising speed of around 340 miles per hour. At sea level these speeds are somewhat slower."

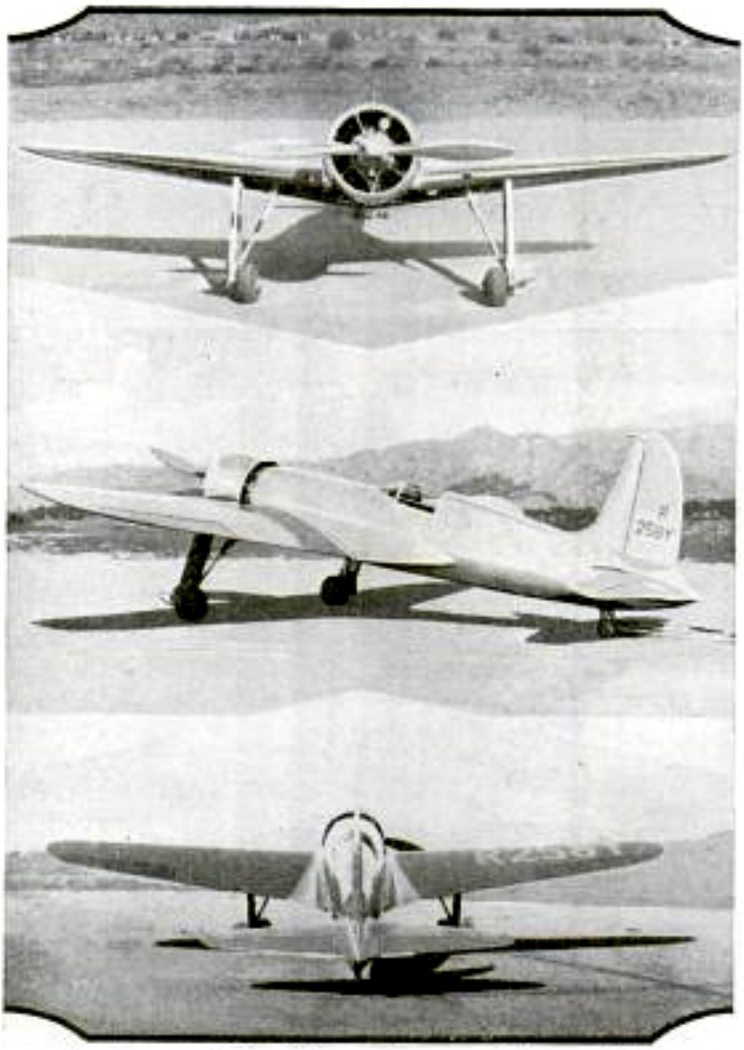
Hughes averaged 332 miles per hour on his transcontinental flight



Howard Hughes who flew from Los Angeles to New York at better than five miles a minute and diagram showing details of his plane

and flew at an average altitude of 15,000 feet except when mountain ranges forced him up. His plane is the same $125,000 ship with which he established a world record of 352 miles per hour two years ago, except that a number of its parts have been improved. The changes, including a larger wing, increased its speed about twenty miles per hour at all altitudes

In spite of his high top speed Hughes is able to land at seventy miles per hour. "Air brakes" of the split trailing edge type that are mechanically operated help slow him down. Another factor in safe landings is the wide tread of the retractable landing wheels. The wheels are farther apart than usual and, with the retractable tail skid, provide three widely spaced



Three views of Hughes' plane as it appears with new and larger wing after alterations which added to speed

points for landing. Once Hughes blew a tire upon landing after a test hop, an accident that would have wrecked most racing planes, but he brought the monoplane to a stop without damage. The plane is fitted with standard air wheels and conventional brakes. It is twenty-seven feet long and the wing span is thirty-two feet. The wing is ten feet wide at the roots, tapers to a width of four feet at the tips, and is attached to the fuselage with a fillet of unusual design. Wing loading is thirty-five pounds per square inch with full load.

Although the fuselage is of metal, the wood wing is covered with a spruce plywood skin one and three-eighths inches thick on top. This is about an inch thicker than most plywood wing skins and seems to be a waste of material and weight. But it gives the wing a safety factor of five times at speeds above 600 miles per hour, a speed which the plane is theoretically able to achieve in a dive. The constant speed type of propeller is ten feet long and makes two revolutions to every three revolutions of the engine. Near the nose the fuselage skin is many times thicker than usual and averages three times the thickness used on lower-speed airplanes.

Hughes' motor is a stock air-cooled fourteen-cylinder twin-row radial Pratt & Whitney wasp junior that develops 700 horsepower at 2,500 revolutions per minute at 8,500 feet altitude. The engine has an outside diameter of forty-four and one-eighth inches, a dry weight of 1,060 pounds, and a displacement of 1,535 cubic inches. Compression ratio is 6.7 to one and the supercharger ratio is ten to one. Carburetion and magneto ignition are stock.

The plane carries 280 gallons of special 100-octane aviation fuel in two tanks aft of the motor and in smaller wing tanks. The engine and fuel compartment in the front of the fuselage is sealed from the cockpit by a heavy fire wall and bulkhead, behind which the instrument board is located. Although the plane is fitted for an automatic pilot, none was used for the last flight as there was not time to install it.

The instrument board contains a complete set of flight, navigational and engine instruments, including directional gyro and artificial horizon. Temperature gauges show the temperature of the outside air, carburetor heat, and head temperatures of

the individual motor cylinders. Radio beam and weather broadcast receivers are located in the fuselage aft of the cockpit, where batteries, hydraulic oil tank, and hydraulic mechanisms for elevating the pilot's seat, operating retractable landing gear and tail skid and moving the windshield and hatch covers are also located.

Elaborate precautions were taken to protect Hughes against every conceivable danger. The large instrument board in front of him is completely covered by a four-inch pad of sponge rubber with holes cut into it to reveal the dials. Fresh air enters the cockpit from an intake on the leading edge of the right wing far away from exhaust fumes. Hughes controls the amount of air by means of a valve and with a similar valve regulates the flow of warm air that passes through a heater after being taken in at the leading edge of the engine cowling. The inflowing air, fresh or heated, puts a slight pressure on the inside of the inclosed cockpit to prevent engine fumes or exhaust gases from leaking in.

One of the problems was to fit all the gear into the small available space. In the cockpit, instruments and controls take up so much room that there was no place for an oxygen tank for high-altitude flying. The problem was solved by installing the oxygen tank in the right wing above the space into which the retractable landing gear fits. From the tank an aluminum

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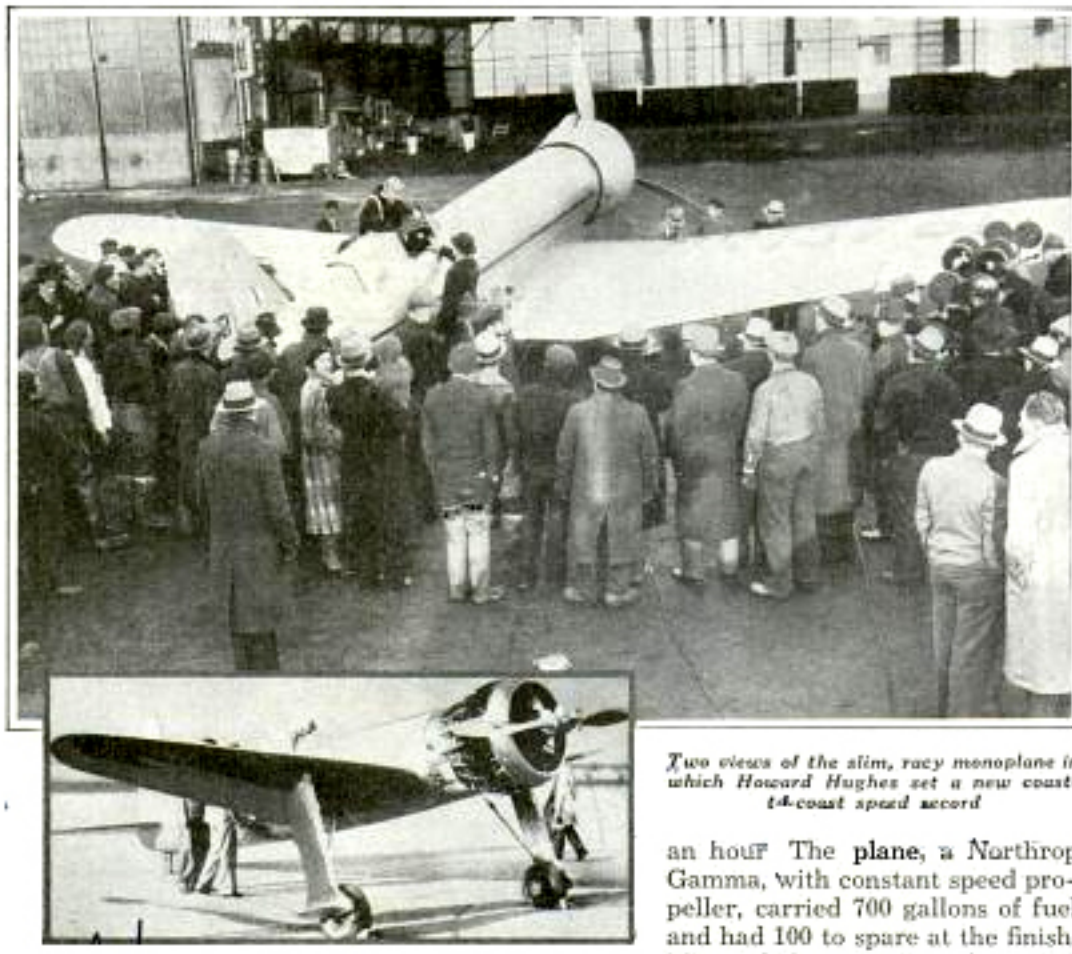
Plane Spans U. S. at Four Miles per Minute



Two views of the slim, racy monoplane in which Howard Hughes set a new coast-to-coast speed record

Hurtling through the sky from Burbank, Calif., to Newark, N. J., at better than four miles a minute, without a stop, brings fame to Howard Hughes—movie producer and speed pilot—as the new holder of the transcontinental flight record. Trying out a new type Wright engine in his low-wing, slender monoplane he lifted the ship off the west coast airport shortly after noon, picked a lane 18,000 feet high and in nine hours, twenty-seven minutes and ten seconds set the wheels down on the Newark runway. His record beat that of Col. Roscoe Turner by more than a half hour. Hughes already held a record for land planes of above 352 miles an hour, set on a three-kilometer course. He averaged nearly 260 miles an hour for the 2,450-mile transcontinental jump and covered the Indianapolis-Columbus sector at 295 miles an hour. The plane, a Northrop Gamma, with constant speed propeller, carried 700 gallons of fuel and had 100 to spare at the finish. The radial motor develops 925 horsepower at sea-level and a supercharger maintains high power at high altitudes.