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DATE: 9/4/69

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: AIRCRAFT HYDROPLANING OR AQUAPLANING ON WET RUNWAYS

1. PURPOSE. This circular provides information to the problem of aircraft tires hydroplaning on wet runways.

2. INFORMATION.

   a. It is recognized that a film of water on runways can seriously affect aircraft ground controllability and braking efficiency. As the speed of the aircraft and the depth of the water increase, the water layer builds up an increasing resistance to displacement, resulting in the formation of a wedge of water beneath the tire. The vertical component of this resistance progressively lifts the tire decreasing the area in contact with the runway until, with certain aircraft configurations and depths, the tire is completely out of contact with the runway surface and starts hydroplaning on a film of water. In this condition, the tires no longer contribute to directional control and braking action is nil.

   b. There are three types of hydroplaning:

      (1) The first is dynamic hydroplaning which occurs when there is standing water on the runway surface. Water about one-tenth of an inch deep acts to lift the tire off the runway as explained above.

      (2) The second type is viscous hydroplaning due to the viscous properties of water. In this type, a thin film of fluid not more than one-thousandth of an inch in depth cannot be penetrated by the tire and the tire rolls on top of the film. This can occur at a much lower speed than dynamic hydroplaning but requires a smooth or smooth acting surface.

      (3) The third type, known as reverted rubber hydroplaning, requires a prolonged locked wheel skid, reverted rubber, and a wet

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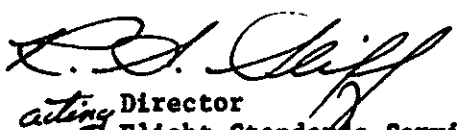
runway surface. The reverted rubber acts as a seal between the tire and the runway and delays water exit from the tire footprint area. The water heats and is converted to steam and the steam supports the tire off the pavement.

c. From data obtained during hydroplaning tests, the minimum dynamic hydroplaning speed of a tire has been determined to be 8.6 times the square root of the tire pressure in pounds per square inch. For the Jet Commander 1121, with a main tire pressure of 135 pounds, and a nose wheel tire pressure of 45 pounds, the calculated hydroplaning speed is approximately 100 knots. If a high speed turn off is anticipated, the calculated hydroplaning speed of the nosewheel tire is approximately 60 knots. It is important to note that the calculated speed referred to above is for the start of dynamic hydroplaning. Once hydroplaning has started, it may persist to a significantly slower speed depending on the type being experienced.

3. ACTION: When landing on a wet runway, close adherence to established operational procedures is essential relative to touchdown point, speed control, and the use of speed brakes, wheel brakes, reverse thrust and turn-off point, when a high speed turn-off is anticipated.



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