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DESIRED CHARACTERISTICS FOR HELICOPTER WHEELS, TIRES AND BRAKES

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DESIRED CHARACTERISTICS FOR HELICOPTER

WHEELS, TIRES AND BRAKES

I BRAKES

Stopping the helicopter in forward run on the ground and steering and taxiing are generally considered as functions of the flight controls rather than the wheel brakes and, therefore, rate of deceleration, dissipation of heat and life expectancy are not generally considered in specifying the characteristics of helicopter wheel brakes. However, in the event that an aircraft is to be used for training purposes, particularly in the technique of power-off landings, individually operated wheel brakes would be a definite advantage for steering and stopping the aircraft. These brakes would then be similar in function to those used in conventional aircraft. Power-off landings in helicopter should not require more than 100 feet of roll with ground contact at 40 miles per hour. Under normal conditions it should be assumed that approximately 10 power-off emergency landings would be encountered during life of a helicopter. The brake shall be designed to absorb 75% of energy requirement to stop a helicopter of 40 miles per hour ground contact speed in 100 feet.

(a) For Steering and Decelerating the Helicopter.- It is, therefore recommended that consideration be given to the installation of wheel brakes and wheel brake controls of the same type and for the same functions as is the case for conventional aircraft.

(b) For Parking the Helicopter.- Parking brakes should be designed to hold a helicopter on ground sloping at least 15 degrees; for operation on shipboard, it might be necessary to design to a 20-degree slope. Designing to a 15-degree slope will provide braking force adequate to hold the helicopter satisfactorily against a wind. High winds or rolling decks, of course, would require mooring. This specification would seem to be adequate also to counteract any unbalanced torque that might react on the wheels when clutching-in to start the rotor. Operation of the brakes should be from the cockpit, and it is not felt that a locking pin in the wheel would be adequate. A single control, operated by hand or foot, should be entirely satisfactory. Braking can be accomplished either with an external shoe, or any other standard aircraft wheel brake system operated either mechanically, or hydraulically. Installation of the braking mechanism may require operation through a swivel axis, as in the case of swiveling wheels.

To hold a helicopter on a 15-degree slope will require a force of G Sin 15, or $.259_G$, or $.13_G$ per wheel. It is believed that the brake systems now used for conventional airplanes can be modified for helicopters by reducing the brake energy capacity to the extent indicated above. The structural strength of the brake need never exceed the drag strength of the landing gear with acceptable factor of safety.

II WHEELS

The manufacturers of conventional airplane wheels have indicated that the present production wheels of magnesium should be satisfactory as the lightest weight design for a given load for either airplane or helicopter. It is not believed that wheel bearings can be eliminated. The fatigue roll requirements for helicopter wheels will not be as severe as for fixed wing aircraft wheels.

III TIRES

Special helicopter tires of various types have been fabricated by the tire manufacturers. Weight has been saved by reducing tread and side-wall rubber and considerable progress has been made in developing a good degree of internal damping in the tire. The Tire and Rim Association has recognized the different operating conditions of helicopter tires and has rated the maximum load capacities at 1.5 times the rating for conventional airplane installations. This results in much smaller and lighter tires for a given static load on helicopters. It should be recognized that the wheel and tire size may be determined by the rolling radius required and flotation of the tires in soft earth, sand, mud, etc., where the wheel and tire selected solely by static load would be too small to meet these additional requirements.