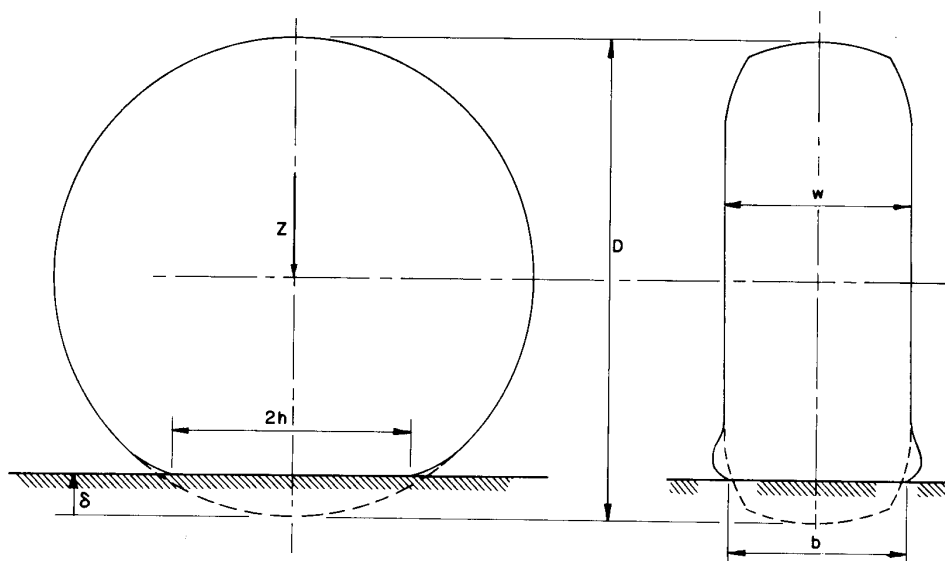


VERTICAL DEFLECTION CHARACTERISTICS OF AIRCRAFT TYRES

1. NOTATION AND UNITS

Tyre geometrical properties are defined in Sketch 1.1. Most equations in this Item are expressed in non-dimensional form so that any consistent set of units can be used.

		SI	British
A_g	gross area of tyre-ground contact (including areas covered by tread grooves)	m^2	in^2
b	width of tyre-ground contact area	m	in
C_z	coefficient in expression for tyre deflection under normal (to runway surface) load, see Table 4.1		
D	diameter of undeflected, inflated tyre	m	in
h	half-length of tyre-ground contact area	m	in
p	inflation pressure (gauge) of undeflected tyre	N/m^2	lbf/in^2
p_r	tyre "rated" inflation pressure	N/m^2	lbf/in^2
w	width of undeflected, inflated tyre section	m	in
Z	normal (to runway surface) load on wheel	N	lbf
Δp	pressure rise due to deflection of tyre under normal (to runway surface) load	N/m^2	lbf/in^2
δ	tyre deflection under normal (to runway surface) load	m	in



Sketch 1.1 Tyre and tyre-footprint geometry

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2. AIRCRAFT TYRE PROPERTIES UNDER NORMAL (TO RUNWAY SURFACE) LOAD

Table 4.1 gives properties of aircraft-type cross-ply tyres subjected to normal (to runway surface) load. Equations (4.1) and (4.2), for tyre deflection, δ , are primarily for use in calculating aircraft pitch attitude during ground operations (although the Examples of References 3 and 4 use δ in calculating “spin-up” moments on a braked wheel). Equations (4.4) to (4.6) for tyre-footprint dimensions and areas are included in Table 4.1 because they are required in calculations related to the passage of a tyre through a fluid layer, see Reference 6, and in the calculation of tyre side-force characteristics.

The expressions given in Table 4.1 are taken from Reference 2. Many of the relationships developed there have been confirmed for modern cross-ply tyres in further tests reported in Reference 5. In particular, Reference 5 has established that load-deflection curves and contact area lengths are well represented by the expressions in Table 4.1 while some of the data have been validated for speeds up to 100 knots. When Reference 2 was prepared, account was also taken of data in Reference 1 which showed similar trends and magnitudes. However, most of the expressions presented in Reference 2 (and so in Table 4.1) show differences from the comparable expressions in Reference 1. These differences are small and are believed to represent changes in tyre properties in the intervening years.

Radial tyres: No generalised data are available for the characteristics of radial tyres for use on aircraft. A particular difficulty in this respect is that, at present, no design standards have been adopted for such tyres and different design philosophies have been adopted by individual manufacturers.

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