Calculating Tire Contact Area

The tire contact area for any aircraft tire is calculated by dividing the single wheel load by the tire inflation pressure. If the load is expressed in pounds, and the tire pressure in pounds per square inch, then the area is in inches squared. The same thing works with kilograms and kg/cm2 - the result will then be in square centimeters.

The shape of the footprint area is usually understood to be a 1.6 ellipse (as referenced in the US Corps of Engineer's S-77-1 Report), wherein the major axis is 1.6 times the minor axis. The calculation to solve for the minor axis is .894 times the square root of the contact area. Note that the major axis runs parallel to the normal direction of motion of the aircraft, and the minor axis is perpendicular to the major axis.

Information concerning the landing gear footprint, tire inflation pressures, center of gravity location and load on the nose or main gear are provided in Section 7 of the "Airplane Characteristics for Airport Planning" manual for each airplane model at the following website: www.boeing.com/airports.

Example: 777-300 Main Gear Tire Contact Area

For this case, use the maximum taxi weight of 662,000 lbs configuration of the 777-300 as shown in Figure 7.2 “Landing Gear Footprint - 777-200/300” and Figure 7.3 “Maximum Pavement Loads - 777-200/300.” Figure 7.2 provides the main gear tire pressure of 215 PSI. Figure 7.3 shows the $V_{(mg)}$ per strut / maximum load at the static aft center of gravity for this airplane configuration of 313,900 pounds. Given that the 777-300 has six wheels per main gear as shown in Figure 7.2, to calculate the contact area first determine the load per tire (313,900 / 6 = 52,317) then to calculate the contact area, divide the load per tire by the PSI (52,317 / 215 = **243.3 in^2 contact area**).

The footprint area is a 1.6 ellipse determined as follows:
Minor axis is .894 x square root of the contact area (0.894 x sq root of 243.3 = **13.94 inches minor axis**)
Major axis is 1.6 x minor axis (1.6 x 13.94 = **22.30 inches major axis**)

Additional questions concerning this issue can be directed to Boeing’s Airport Technology group as follows:

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