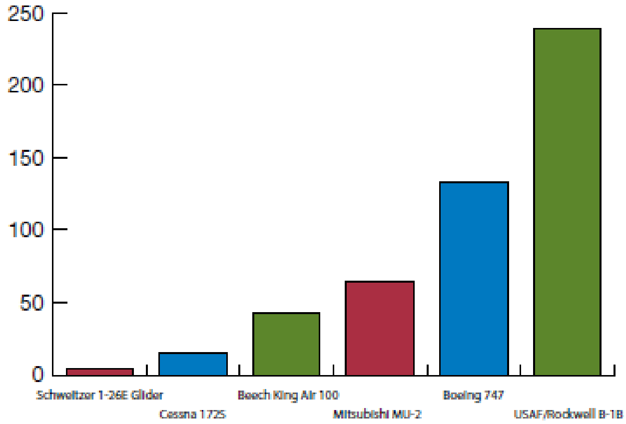
Different Airplanes Have Different Wing Loadings



Wing loading values are different for different types of airplanes. For example, gliders have relatively low wing loading to maximize lift. Meanwhile, high wing loading (small wing surface area, low-drag wings) is characteristic of airplanes needing to fly at high airspeeds, like a modern military jet. Airplanes with similar configurations—like turboprop twins at comparable weights—may have significantly different wing loading. For example, wing loading for the relatively small-winged Mitsubishi MU-2 (weight: 11,575 lbs, wing surface area: 178 ft^2, power: 1552 shaft horsepower [shp]) is 55 percent greater than for the Beech King Air B100 at roughly the same weight (11,800 lbs, wing surface area: 279.7 ft^2, power: 1,430 shp). To accommodate the higher wing loading, the MU-2 has a lower power loading of 7.45 lbs/shp compared to 8.25 lbs/shp for the King Air. An advantage of high wing loading is faster airspeeds for cruise flight; disadvantages are higher rotation, landing and stalling speeds, as well as greater takeoff and landing distances.

Wing Loading

$$12.6\ \text{lbs/ft}^2 = \frac{2200\ \text{lbs}}{174\ \text{ft}^2}$$

Power Loading

$$12.2\ \text{lbs/hp} = \frac{2200\ \text{lbs}}{180\ \text{hp}}$$

Formula 4

Wing Loading

$$29.3\ \text{lbs/ft}^2 = \frac{5100\ \text{lbs}}{174\ \text{ft}^2}$$

Power Loading

$$28.3\ \text{lbs/hp} = \frac{5100\ \text{lbs}}{180\ \text{hp}}$$

Formula 5

Assume V_s for a particular airplane to be 60 KIAS at 1G. In a 45-degree, constant-altitude turn, load factor increases to 1.41G. Consequently, V_s increases to 71 KIAS:

$$V_s = (\sqrt{\text{Load Factor}}\,) \times V_s \text{ at 1G}$$
$$V_s = (\sqrt{1.41}\,) \times 60 \text{ KIAS}$$
$$V_s = 71 \text{ KIAS}$$

The result? An 18.33-percent increase in stalling speed—an accelerated stall—due to increased wing loading.

Formula 6