Wing And Power Loading: The Math

Determining your airplane's wing and power loading is a simple matter of running a couple of numbers. Use two formulas below to find wing loading (Formula 1) and power loading (Formula 2). Stated another way, wing loading and power loading vary directly with aircraft weight. Meanwhile, wing loading varies inversely with wing surface area and power loading varies inversely with engine power output.

For example, wing loading and power loading for a Cessna 172S NAV III with a wing surface area of 174 square feet, an engine generating 180 hp, and operating in the Normal Category at a maximum takeoff weight of 2550 pounds are presented in Formula 3.

These values, as stated in the Pilot's Operating Handbook, apply to specific conditions, i.e., maximum ramp weight, a 1G load imposed on the airframe and the engine operating optimally generating maximum hp at normal barometric pressure and temperature.

$$\text{Wing Loading (lbs/ft}^2\text{)} = \frac{\text{Current Weight (lbs)}}{\text{Wing Surface Area (ft}^2\text{)}}$$

Formula 1

$$\text{Power Loading (lbs/ft}^2\text{)} = \frac{\text{Current Weight (lbs)}}{\text{Generated Horsepower (hp)}}$$

Formula 2

Wing Loading			Power Loading		
$14.7\ \text{lbs/ft}^2$	=	$\frac{2550\ \text{lbs}}{174\ \text{ft}^2}$	$14.2\ \text{lbs/hp}$	=	$\frac{2550\ \text{lbs}}{180\ \text{hp}}$

Formula 3