

YOU TOO CAN BECOME A TEST PILOT

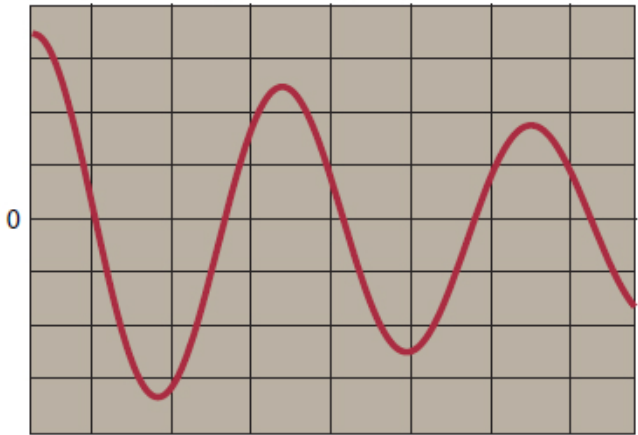
The FAA Advisory Circular 23-8C, "Flight Test Guide for Certification of Part 23 Airplanes," details acceptable means by which an aircraft manufacturer may demonstrate compliance with FAR 23. I used this publication to guide an experiment with my own Cessna 152 Aerobat. I waited for a day with smooth winds and took the airplane to altitude. I cleared the area, set power and trimmed the plane for hands-off flying.

For the phugoid oscillation, I pulled back on the pitch control to decrease the airspeed by about 10 percent, returned the yoke to its original position and then released it. During the subsequent roller-coaster type ride, I kept the wings level with small, alternating rudder inputs. The time between successive minimum (or maximum) airspeed excursions is the period of the motion, which I found to be about 28 seconds. If one were to gather enough data to graph the airspeed as a function of time, it can lead to a computation of the time to half amplitude, a measure of the damping in the system.

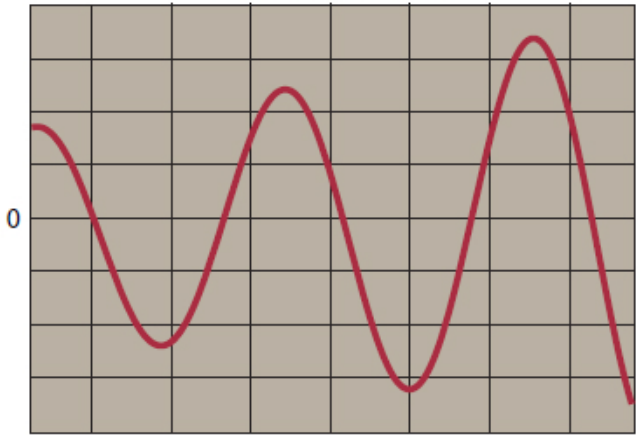
The short-period oscillation is excited with a much quicker elevator movement called an elevator doublet. I smoothly but rapidly decreased the pitch attitude by a few degrees, reversed to pitch up by a few degrees and then returned the elevator control to its original position. Without sophisticated instrumentation on the aircraft, the most one can do is witness how quickly the oscillations die (heavily damped) or how the airplane returns directly to its trim condition (overdamped). The short period damping is so pronounced in my Aerobat that it's possibly overdamped.

Any longitudinal disturbance involves a combination of phugoid and short-period oscillations: a fellow flyer at a distance sees the pitch attitude and altitude changing (the phugoid component). Harder to see is that the angle of attack is very quickly oscillating (short-period component). The latter soon dies out leaving only the remnants of the phugoid motion.

Stable, Underdamped Oscillation



Unstable Oscillation



Stable, Overdamped

