an instrument malfunction, but if it continues to remain high, a landing as soon as practical for a checkup is advised.

TACHOMETER

The tachometer, similar to its automotive counterpart, simply measures engine crankshaft RPM. In fixed-pitch propeller aircraft, it is the reference used to set engine power. Aircraft with constant-speed props use the tachometer to set the desired propeller RPM for the condition of flight. The instrument range markings are fairly standard among aircraft, with RPM limits varying somewhat. However, there are two important variations. In some aircraft, the yellow arc has a time restriction; for example, the Cessna 210N POH only permits operations in the yellow arc for five minutes at maximum power. The other is an occasional, narrow red arc located within the green arc. Operations within the red arc are not permitted except to pass through when increasing or decreasing RPM. The purpose of the red arc usually is to prevent a harmonic or resonant vibration that may lead to structural fatigue and failure. Due to the uniqueness of markings, tachometers are not interchangeable between different aircraft models.

There are three basic types of tachometers: magnetic drag, remotely driven, and electronic. The magnetic drag type is a first cousin to the automotive speedometer. One end of a flexible cable is attached to an engine-driven gear, which turns at one-half the engine RPM. The other end rotates a permanent magnet in the instrument case. Around the magnet is a drag (conductive metal) cup that is "dragged" along as the permanent magnet turns, driving a calibrated pointer. Not particularly accurate, any indication of inexplicably low power, or the inability to synchronize engines in twins, should be viewed as a reason to suspect the tachometer's accuracy if there are no other indications of engine malfunction.

Most instruments also will have a recording hour-meter designed to record time, but it is calibrated to record accurately only during cruise speed. The main source of problems is associated with the flexible double-wound drive cable. Either too much or too little lubrication with graphite will interfere with proper operation. If the indicator oscillates, the problem is likely to be either a loose casing or kinks in the cable.

The remotely driven tachometer uses a three-phase, engine-driven AC generator that drives a synchronous motor located inside the instrument. The motor, similar to the drag-cup type, turns a magnet, which operates an indicator needle. The primary advantage of this type of system is that there is no mechanical cable. Also, rather than having to rely on voltage to turn the synchronous motor, it is controlled by frequency, which is far more stable and makes the tachometer accurate through a wide RPM range.

Some aircraft have the more sophisticated electronic tachometer, which utilizes a set of special breaker points (they have no ignition function). The tach senses the opening and closing rate of the points and displays it as RPM. Multiengine aircraft commonly will have a synchroscope added to the dual tachometers. This helps trim both engines for identical power settings and aids in synchronizing engines to avoid prop "beat"—a source of both pilot and airframe metal fatigue.

Lombardo, David A.(Author). Aircraft Systems.
Blacklick, OH, USA: McGraw-Hill Professional Book Group, 1998. p 103.
http://site.ebrary.com/lib/modarres/Doc?id=5001849&page=119