# Engine Maintenance and Performance Monitoring

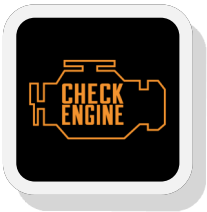
Did you know that most general aviation fatal accidents are caused by in-flight loss of control? Many of these loss of control accidents are due to engine failure-related factors. Between 2001-2010, 35 of 70 randomly selected accidents had engine maintenance errors identified as a contributing factor. Proper engine maintenance, post maintenance, advanced pre-flight, and performance monitoring can go a long way to eliminating this type of mishap.

## Sound Maintenance Practices

Ideally, pilots and mechanics should work together to make sure the aircraft is operated and maintained properly. As a pilot, you are encouraged to take an active role in maintenance by reviewing inspection results and discussing Airworthiness Directives and Service Bulletins with your mechanic.

⇒ **Get to know your airplane and your mechanic!**

- Assist with inspections. It's a great way to get to know your mechanic and your aircraft. Every service interval is an opportunity to see what's going on with your engine.
- Give your aircraft a once-over while the oil is draining. Look for leaks and stains in the engine compartment and wherever fuel or hydraulic fluid flows.




- Look for missing, broken, or loose hardware. Check the condition of hoses, belts, and baffles. Tires, brakes, and oleo struts deserve your attention as well.

It's a lot easier to identify and correct deficiencies while your bird is in the shop than to make another service appointment.

⇒ **Operate efficiently! It promotes engine longevity.**

How we operate our engines has a lot to do with how long our engines will last.

- Fly often. It's actually harder on an engine if the airplane is in a hangar – or worse – a ramp queen. Regular operation keeps your engine components lubricated, markedly reducing corrosion potential.
- Don't shock the system. Thermal shock can be very hard on engines so be sure yours has reached operating temperature before taking off.
- Perform smooth and steady power changes. This is especially true for turbo-charged power plants.
- Strictly follow manufacturer recommendations when operating on the lean side of peak exhaust gas temperature. Saving a gallon or two is not worth it if your engine overheats in the process.

- Plan your descents with some power to keep the engine warm — especially for turbos.
- Monitor engine performance from flight to flight. Small changes over time can forecast developing engine problems.

⇒ **Don't ignore regular maintenance!**

- Be sure to comply with all manufacturer-recommended service intervals.
- Fifty-hour oil changes are recommended for most normally-aspirated piston engines.

- Turbo-charged engines should undergo oil changes more frequently.
- An oil filter inspection with each oil change will yield immediate feedback.
- Investigate further if you find metal particulate in the filter.
- Oil analysis can reveal a lot about engine health, but it works best when several samples create a trend.
- Perform compression and magneto timing checks, check spark plugs and the exhaust system every other oil change.

**Resources**:

To learn more about engine data management systems, read "Check Engine!" in the Nuts, Bolts, and Electrons Department of the May/June 2015 edition of *FAA Safety Briefing*. To see how flight data monitoring can help improve your skills, read "Total Recall" in the March/April 2014 issue of *FAA Safety Briefing*.

## Engine Performance Monitoring

⇒ Basic instrumentation such as **airspeed indicators, attitude indicators, angle of attack indicators, manifold pressure gauges, RPM gauges, and G-force meters** all give immediate feedback as to whether design limitations have or are about to be exceeded. This information is available real-time on every flight.

⇒ **Engine diagnostic equipment** can come in many different forms. One version is the external, hand-held test kit that attaches to ignition plugs and determines system functionality. A good test kit can check engine compression, magnetos, ignition leads, and engine timing.

⇒ **Engine data management (EDM)** systems come in a variety of forms and are offered by a host of different companies. These devices watch over your engine while you concentrate on flying the aircraft and, combined with a controller, can meter your mixture and exhaust gas temperature (EGT) to optimize lean-of-peak operations. Some brands even offer the interpretive software and/or provide professional analysis as to what your data might indicate. In most cases, you can upload your information directly to a website and request a report when anomalies present themselves.


⇒ A **digital/electronic engine control (D/EEC)** regulates the functions of the injection system to ensure the engine provides the power that is required of it. An engine control unit reads a multitude of sensors and manipulates the engine by adjusting a series of actuators. Sensors include ones for airflow, engine cooling, throttle position, and fuel flow.