

TURBO TROUBLESHOOTING

According to Mike Busch, whose company is in the business of providing maintenance management to general aviation aircraft owners, there are generally five things that can go wrong with a turbo system: problems with the turbocharger, controller or wastegate, or leaks in the induction or exhaust systems. Most initially manifest as a loss of manifold pressure at altitude or premature bootstrapping (loss of manifold pressure control because the wastegate is fully closed).

There may be an underlying problem with the engine itself—such as a cylinder or ignition issue—however, most of those problems can be diagnosed with a good engine monitor. We wouldn't own a turbocharged airplane without an engine monitor that can record and download engine data.

Step one when noticing a problem is to document the details precisely when you notice them—manifold pressure behavior, power setting, altitude, temperature and airspeed, at the least.

However, if the problem is a sudden loss of manifold pressure in flight, don't mess around—assume that it is an exhaust system leak and that you have hot gases spewing inside the cowling and a serious fire risk. Reduce power and land as soon as practical. Don't assume it's a minor problem. Fires due to exhaust system failures have killed too many pilots and passengers.

The next step is consultation with your mechanic and, if the problem wasn't an exhaust system blowout, do a critical altitude check—see if engine will develop the manifold pressures at the benchmark altitudes called out in the Service Manual for the airplane. If the engine doesn't make power and starts to bootstrap at an unexpectedly low altitude, the problem is most likely to be an induction system leak.

An induction system leak may also show up as higher than normal manifold pressure when idling on

the ground. A visual inspection may disclose the leak or it may be necessary to pressurize the system with shop air and spray it with soapy water and look for bubbles.

An exhaust leak is less likely than an induction leak—assuming the exhaust system has been maintained carefully and inspected every 50 hours. They also tend to be easier to find on a visual inspection of the exhaust system, as they leave noticeable stains.

Wastegates can get sticky due to accumulations of lead, carbon and sulfur or coked oil. If manifold pressure seems to vary randomly, especially with power, altitude or speed changes, it may be the wastegate is going. Removing the wastegate and applying a source of adjustable air pressure can detect if the wastegate is closing smoothly as pressure builds toward 50 PSI and the spring drives it toward the open position as pressure is reduced. If it doesn't, it's probably time for an overhaul.

Controller problems are rare. On a twin, swap controllers and see if the problem changes engines. Otherwise, the poppet valve may have sludge that can be blown out with shop air in to the oil return port. Make sure the upper deck reference line has no liquid in it. If there is any, purge it and then clean the controller's aneroid chamber.

The turbo itself can go, although it's usually not high on the probability list. If it's the problem, it's usually obvious. FOD is easy to identify; blades rubbing on the housing on the hot side can be seen when the exhaust pipe is pulled for routine maintenance. Also, a worn-out center section usually shows up with oil leaking into the compressor and processing through the induction plumbing and engine or into the turbine, resulting in oily deposits in the tailpipe and on the belly. Nevertheless, oil in the turbo may be due to a bad check valve in the supply or return lines—inspect that first. The turbo itself may be fine.