additional coolant. In cruise, despite the lower power setting, a significantly leaner mixture is used, which creates greater potential for overheating. Remember that at cruise, mixture is the most important EGT control.

One of the most overlooked instruments is the cylinder head temperature gauge (CHT). During takeoff and climb, cowl flaps should be open and the proper airspeed should be flown. If the temperature becomes excessively hot with full-open cowl flaps, the pilot must increase airspeed with a shallower climb, so the engine will get a greater flow of cooling ram air. Even cruise may require partially open cowl flaps, especially when operating at economy power settings. Remember that the turbocharger is stuffing hot air into the engine.

Another confusing aspect of this situation is that cylinder cooling is reduced at high altitude. It may not seem logical because it is so cold at higher altitudes, but less dense air has very poor cooling properties. If the pilot cannot keep CHT within an acceptable range at high altitude, he or she may need to request a lower altitude to take advantage of greater air density.

Descent requires consideration, too. Turbocharged engines operate hotter at higher altitudes. This provides a tremendous potential for thermal shock during a descent. Except in an emergency, the pilot should never pull the power back to idle at high altitudes. Plan on making power descents. Use flaps and gear if necessary to increase vertical speed, but maintain power. A good rule of thumb is to use 5-inch reductions in m.p., with a couple of minutes between reductions. This allows time for the engine to adjust to the decreasing temperature.

When preflighting the engine, carefully examine the turbocharger and exhaust pipes for cracks. The engine and turbocharger should be checked for loose fittings, oil leaks, cracks, cuts, or holes. Surrounding areas should be inspected for paint blisters or corrosion, indicating excessive heat. Other potential problem areas include clogged air cleaners and clogged engine crankcase breathers. If a preheat is necessary, take sufficient time to ensure that the entire engine is heated. Often the temperature probes will be heated sufficiently to give an erroneous indication in the cockpit, while oil in the engine sump and outlying accessories still is congealed.

TROUBLESHOOTING

The single most important rule of thumb in troubleshooting a turbocharger problem is to check the engine first. Far too many units are repaired or replaced only to have the problem reappear immediately. Most turbocharger problems are caused by one of the following: lack of lubrication, foreign object damage, or contamination of lubrication. Table 7-1 provides a problem, cause, remedy troubleshooting checklist.

The most common turbocharger problem is lack of lubrication, which usually shows up first as bearing failure, wheel rub, seal damage, or shaft breakage. Foreign objects can damage either the turbine blades or the compressor, but in either case, a wheel imbalance at 100,000 RPM can be devastating. Contamination of lubricant causes scored shaft journals and bearings, blocks oil holes, plugs seals, and eventually leads to heavy oil leakage.