

Introduction

International air regulations require that each engine be equipped with a self-contained oil system capable of providing continuous oil flow to the engine, under all conditions. The recirculatory oil system stores, carries, cools, and distributes oil needed for lubricating and cooling every bearing, gear, spline, carbon seal, and certain accessories.

Oil Flow

The de-aerated, filtered fresh oil flow, delivered by a single positive-displacement pump from a tank attached to the engine, is supplied to each component through a piping network and/or internal flow passages. The supply pump delivery pressure can be regulated or unregulated, depending on the engine builder's practice. An antisiphon system prevents the tank draining due to the siphoning effect that is created upon engine shutdown through the supply network when the tank is located above a supply nozzle. A pressure relief valve protects the supply pump and circuit against abnormal output pressure that can occur during cold starts. The flow distribution is metered through oil nozzles, protected in some applications by last chance filters or dead end pockets. The flow rate to each component is based on lubrication and cooling requirements in the particular area to be lubricated.

Scavenged Oil Flow

After lubricating and cooling, the components in the bearing sumps (or compartments), the oil flows down by gravity to the bottom of the sumps, carrying heat, air bubbles, wear particles and debris if any. The oil is then scavenged from each sump by a dedicated positive-displacement pump element through a separate circuit. The scavenged oil flow is slightly lower than the supply flow due to normal oil consumption through the deoiler, oil seals, and oil leaks.

- The scavenge pump elements are designed to have excess capacity in order to keep each sump drained, without gulping in every flight condition.

- Therefore, a large amount of air is carried by the scavenge oil and must be removed through a de-aerator when entering the tank.
- Each pump element is generally protected by a wire mesh screen against foreign objects with the fine filtration being done by cartridge type filters: one on the supply line and sometimes another on the scavenge line.

The pressure and scavenge pump elements are generally stacked in the same housing installed on the accessory gearbox and driven by the core engine. Chip detectors, strainers, and filters, for monitoring are often located on the lubrication unit. Oil cooling is achieved by heat transfer from the scavenged oil to the burn-off fuel and to fan or ram air as is required. The coolers can be located on the scavenge side and/or the supply side.

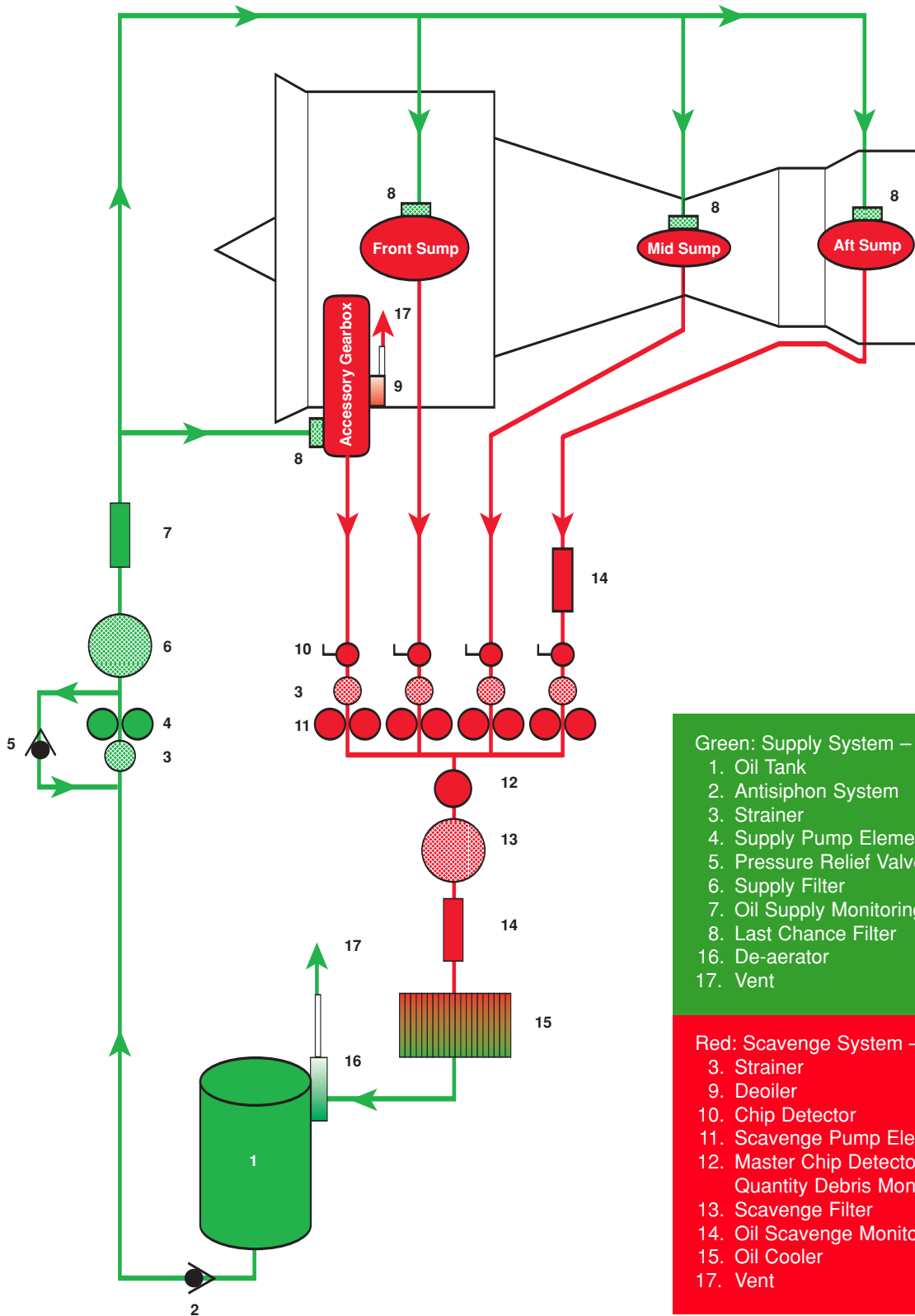
Monitoring System

A monitoring system provides information to the cockpit on the engine health by measuring some oil parameters such as oil supply pressure and temperature and filter ΔP . A beep/red alarm goes on in case of failure. In the most advanced on-board computerized systems, additional parameters are recorded and analyzed in real-time or after landing, such as filter ΔP , scavenge temperatures, oil quantity in the tank, and quantity of debris released by the sumps.

Key Fact

The circulating jet oil has as its important functions: 90 percent to transfer calories, 5–10 percent to reduce friction, 2–3 percent to seal, to circulate contaminants to catchment devices and to protect against corrosion.

Typical Jet Engine Oil System



- Green: Supply System – Fresh Oil**
 - 1. Oil Tank
 - 2. Antisiphon System
 - 3. Strainer
 - 4. Supply Pump Element
 - 5. Pressure Relief Valve
 - 6. Supply Filter
 - 7. Oil Supply Monitoring
 - 8. Last Chance Filter
 - 16. De-aerator
 - 17. Vent
- Red: Scavenge System – Hot Oil**
 - 3. Strainer
 - 9. Deoiler
 - 10. Chip Detector
 - 11. Scavenge Pump Element
 - 12. Master Chip Detector
Quantity Debris Monitor
 - 13. Scavenge Filter
 - 14. Oil Scavenge Monitoring
 - 15. Oil Cooler
 - 17. Vent