



## ▶▶ APPLICATION NOTE

### LOW OIL LEVEL DETECTION IN AIRCRAFT GEARBOXES

*FCI Aerospace ANCS002A*



#### Problem

Monitoring oil level and its temperature are critical measurements to ensure proper oil lubrication and cooling of the moving components in sophisticated aircraft gearbox systems. Low or insufficient oil levels in an aircraft's engine, generator, rotary transmission, or AMAD (Aircraft Mounted Accessory Drill) gearboxes may create critical safety issues and/or expensive repairs on fixed-wing and rotary aircraft by causing premature or even catastrophic failure of the gearbox during flight operations.



#### Challenges

Old technology methods, such as a sight-glass mounted in the side of the gearbox housing, are both inconvenient and unreliable. Site-glass methods rely upon humans to remember to perform the check as well as interpret the level. Further, the oils and high viscosity fluids used in the gear boxes can coat and discolor site-glass itself resulting unreadability, erroneous reading, or non-readings. Other old technology mechanical level detectors can become stuck and fouled when applied in high viscosity oils and fluids resulting in unreliable operation and/or frequent routine maintenance procedures to ensure their operation.



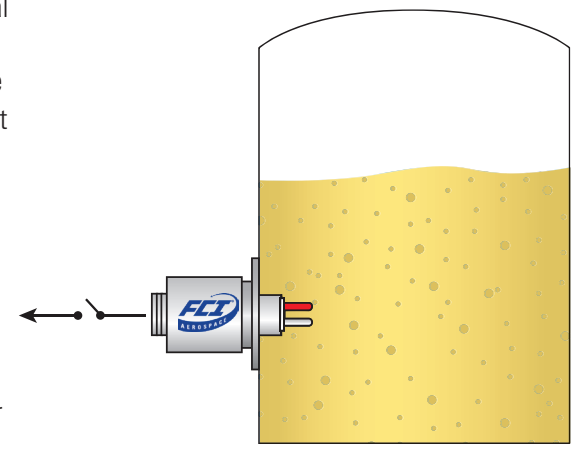
Further, because level measurement is not possible during in-flight operation while the oil is being dispersed throughout the gearbox, the best approach is to make the oil level measurements before flight or after operation. This ensures the oil has settled to a stable, true level in the gearbox to determine if oil needs to be added to the gearbox.

#### Solution:

Use a new technology, electronic sensing method with no moving parts to provide more reliable and accurate detection of oil levels that will provide cockpit staff and maintenance crews with an automated signal and indicator of "low oil level" prior to departure and after landing. This automated monitoring better assures critical oil/fluid levels in the aircraft are maintained for safe operation of the aircraft before its next departure.

FCI Aerospace division's thermal dispersion technology level sensors, AS-LL Series, provide this modern, electronic level sensing solution.

FCI's Model AS-LLS level sensors mount externally to the gearbox at critical elevations in the gearbox to rapidly and accurately, detect fluid level and provide an electronic signal to an alarm indicator or operator display of a low level condition.



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FCI's Model AS-LLE level sensing elements, also known as Remote Oil Level Sensors (ROLS), are another solution to gearbox oil level monitoring. ROLS sensors are rugged, lightweight, highly reliable and can be easily installed internally or externally into the gearbox. They are available in a two-wire, single point level design that may be periodically energized by the aircraft's electronics to detect the presence or absence of oil in the gearbox. Additional sense points can be integrated into a single element to provide level detection at multiple elevations in the gearbox.



| Model Type | Input Power  |                | Mounting |          |
|------------|--------------|----------------|----------|----------|
|            | Continuously | Intermittently | Internal | External |
| AS-LLS     |              |                |          |          |
| AS-LLE     |              |                |          |          |

An additional benefit of the FCI's Thermal Dispersion technology is it's multi-variable sensing. In addition to a wet/dry level signal it can also provide an electronic signal of the gearbox oil's temperature. This is accomplished by energizing the FCI sensor with a constant low current electrical source to the RTD in the sensor head design.

In both sensor configurations, actual flight operation experience has proven reliability of the FCI Thermal Dispersion Oil Level Sensor in excess of 250,000 hours Mean Time Between Failure (MTBF). This makes the FCI Thermal Dispersion Oil Level Sensors the best solution for aircraft gearbox oil level and oil level + temperature measurement.

