

HONEYWELL BRINGS SOLUTIONS TO AEROSPACE PROXIMITY SENSORS CHALLENGES

All aircraft need reliable, rugged proximity sensors to ensure that systems such as cargo loading, doors, flight controls, and landing gear, for example, work correctly and safely.



Figure 1. Aircraft need reliable proximity sensors to function. Image courtesy of [Pixabay](#).

Finding suitable proximity sensors for such harsh operating environments and critical applications can be difficult — but Honeywell’s GAPS and HAPS proximity sensor solutions are up to the challenge. This article reviews of what proximity sensors do, followed by the challenges aerospace applications pose, and how Honeywell addresses these challenges and offers other benefits.

WHAT ARE PROXIMITY SENSORS?

A proximity sensor detects the presence or absence of an object within its range without making physical contact — they look for disruptions in their emitted signals caused by a change in the object’s position (or presence). A variety of technologies power proximity sensors, including electrical properties, light, infrared, or ultrasonic. For example, infrared sensors look for a change in the infrared signal to indicate an object has moved. A similar process is used for light and ultrasonic sensors. In other applications, sensors may depend on a change in electrical or magnetic signals for detection. When an object is detected, regardless of the technology used to detect it, an electrical signal is output for use by control systems.

PROXIMITY SENSORS IN AEROSPACE APPLICATIONS

In aerospace applications, proximity sensors have specific functions and configurations, according to their location in the aircraft. A few examples of the sensors functions include

- Flight controls: verifying flap, slat/skew, and spoiler position
- Cargo loading: detecting latch to ensure the pallet is locked in
- Landing gear: checking for uplock, downlock, and weight on wheels (WOW)
- Doors: verifying open or closed position and checking locked status
- Evacuation slide door-lock mechanism: detecting proper actuation
- Thrust Reverser Actuation System (TRAS): checking for stowed or deployed status



Figure 2. Proximity sensors come in several configurations. [Source.](#)

CHALLENGES

Harsh environments are typical of the operating conditions for many aircraft systems, and proximity sensors must maintain their performance in the presence of vibration, shock loadings, dust, humidity, moisture, and more.

Lightning protection is also necessary for any aircraft system, including protection of proximity sensors. If these sensors fail after a lightning strike, the damage could interfere with the safety of the aircraft.

Any proximity sensor must meet aerospace size, weight, and power (SWaP) requirements and resist exposure to liquids, including hydraulic fluid, fuel, rain, and seawater.

HONEYWELL GAPS AND HAPS

Honeywell offers its [General Aerospace Proximity Sensors \(GAPS\)](#) and [Harsh Aerospace Proximity Sensors \(HAPS\)](#) series as a solution to the need for proximity sensors that include lightning protection and vibration resistance. These hermetically-sealed proximity sensors have all-welded, stainless steel and Inconel construction and a hermetic connector. They are also SWaP-optimized with a small footprint and minimal weight.

In addition, both GAPS and HAPS include Honeywell’s Internal Health Monitoring, which detects internal failures and displays a fault output instead of a false positive or false negative. An optional third output state indicates whether the sensor is healthy or has failed.

GAPS and HAPS sensors have an MTBF of 500,000, maximum operating temperatures of 115°C, and can handle a 20G vibration loading. They also share Level 3 lightning-induced transient susceptibility, as internal electronics within the sensor are lightning-isolated from the external housing, and an integrated internal shield provides both lightning and EMI protection.

AEROSPACE PROXIMITY SENSORS, GAPS & HAPS SERIES



Figure 3. GAPS and HAPS application comparison table. [Source](#).

Figure 3 compares GAPS and HAPS in terms of their various applications. [GAPS](#) are designed for most areas of applications, including landing gear, doors, hydraulics, primary surface, rear stabilizer, gen actuators, airframe, evacuation slides, turbo speed/ACM.

Conversely, HAPS was engineered for harsh-duty aircraft applications such as thrust reverser actuation systems (TRAS), valve, engine, actuator, nacelle, and canopy systems.

GAPS	DIFFERENTIATORS	HAPS
500,000	MTBF > FLIGHT HOURS	500,000
	MECHANICAL CHARACTERISTICS	
115°C	OPERATING TEMPERATURE	115°C
20 G	VIBRATION	20 G*
40 G	OPERATING SHOCK	20 G
	ELECTRICAL CHARACTERISTICS	
150 mA Level W	RADIO FREQUENCY CONDUCTED SUSCEPTIBILITY	300 mA Level Y
100 V/m CAT F	RADIO FREQUENCY RADIATED SUSCEPTIBILITY	200 V/m CAT G
Level 3	LIGHTNING INDUCED TRANSIENT SUSCEPTIBILITY	Level 3
ON/OFF 20 mA	OUTPUT TYPE	IHM ON/OFF 250 mA
1000 Vdc/750 Vac	DIELECTRIC/IR	500 Vdc/500 Vac

Figure 4. Essential differentiators between GAPS and HAPS. [Source.](#)

Figure 4 summarizes the basic specifications and differences between GAPS and HAPS. GAPS can handle high-shock loadings and have a higher dielectric/IR. They also differ in radio frequency conducted and radiated susceptibility. Regarding output, GAPS has an ON/OFF signal of 20mA, and HAPS has an IHM ON/OFF signal of 250mA.

BENEFITS OF HONEYWELL GAPS AND HAPS

Honeywell GAPS and HAPS offer several benefits, including features that reduce maintenance costs, such as hermetic sealing, which also supports mean time between failure (MTBF), and a health monitoring system, which also reduces downtime.

Along with maintenance costs advantages, enhanced vibration and EMI specifications help support longer flight hours and their current install base helps increase MTBF and enhance performance. Finally, Honeywell's GAPS and HAPS materials come from a highly stable supplier.

LEARNING MORE ABOUT GAPS AND HAPS

When specifying non-contact proximity sensors for aerospace applications, many challenges must be overcome. GAPS and HAPS by Honeywell not only overcome those hurdles, but also bring additional benefits. If you are looking for rugged, reliable proximity sensors, reach out to a Powell representative at honeywellinfo@powell.com or visit our website Powell Electronics today to learn more.