An innovative flame detector solution for helidecks and aircraft hangars

Applications that demand heightened immunity to false alarms include the use of helicopters offshore and aircraft hangars, both military and commercial.

Dr Eliot Sizeland

The Civil Aviation Authority publication CAP 437 'Standards for offshore helicopter landing areas' has become an accepted worldwide source of reference. The latest edition, 8.2 July 2021,[1] maintains its position as one of the go-to documents for helicopter safety offshore.

The requirements set out in the publication relate to fixed and mobile installations, whether they are operating in the oil & gas or renewable energy sectors.

CAP 437 requires new-build Normally Unattended Installations (NUIs) be fitted with deck-integrated firefighting systems (DIFFS) and existing NUI's be retro-fitted with an alternative automatically activated firefighting system.

DIFFS on NUIs should be integrated with platform safety systems such that pop-up nozzles are activated automatically in the event of an impact of a helicopter on the helideck where a Post-Crash Fire (PCF) is a foreseeable outcome. The overall design of a DIFFS should incorporate a method of fire detection, typically optical flame detection, and be configured to avoid spurious trips. The system should also be cable of remote override. This article discusses the latest advances Fire & Gas Detection Technologies have made for this application and aircraft hangars.

Triple IR flame detectors

Triple IR (IR3) flame detectors are arguably the most used optical flame detector for hydrocarbon fires today.

A triple IR detector has three sensors, each sensitive to a different IR wavelength. The IR radiation emitted by a typical hydrocarbon fire is more intense at the wavelength accepted by one sensor, typically 4.5 microns, than the other two which monitor adjacent spectral bands (guard bands) for false alarms. With other sources of radiation (e.g. heaters, lamps, sunlight) this is not the case, as the intensity at 4.5 micron is no greater than the intensity of at least one of the guard bands. Electronic circuitry in the detector translates the information received into data that can be analysed for:

- Flame flicker analysis.
- Threshold energy signal comparison.
- Mathematical ratios and correlations between various signals.

▼ **Aircraft in a hangar looking at an auxiliary power unit (APU) .**

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Table 1: FM tested and approved data (FLS-IR3-HD-X3)[2]

Fuel	Pan Size	Distance – ft (m)	Average Response – Seconds
N-Heptane	1 x 1ft	262 (80)	4.2
Gasoline	1 x 1ft	230 (70)	3.2
Diesel	1 x 1ft	164 (50)	3.6
JP5	1 x 1ft	164 (50)	3.6
JP5	2 x 2ft	262 (80)	10.3
Kerosene	1 x 1ft	164 (50)	3.5
Polypropylene	1 x 1ft	115 (35)	3.3
IPA	1 x 1ft	180 (55)	2.5

Triple IR detectors are virtually immune to false alarms and can have extremely long detection distances to some fire types. There are, however, wide performance variations from brand to brand as no two triple IR detectors are the same.

FGD has developed a special IR3 configuration for applications where the presence of exhaust (combustion) gases of engines and turbines is known to cause false alarms for competing devices.

This detector configuration is ideally suited to applications in compliance with CAP 437 as helicopter engine downdraft is a potential false-alarm source.

False alarms offshore are a genuine concern for production and safety. Should a helicopter engine downdraft induce a false alarm on approach to a helideck, the firefighting system could activate automatically and create a safety concern for all onboard the aircraft.

The special FlameSpec IR3 and IR3-HD configurations have been independently tested and approved by Factory Mutual (FM). The table below shows the response data for the FLS-IR3-HD-ASX3, as approved by FM, with the detector set to extreme sensitivity. The suffix 3 denotes the special configuration that minimises false alarms due to hot carbon dioxide.

What is more, FM tested the detector with a wide range of modulated and unmodulated false-alarm sources. The sources used are widely found in industrial applications, e.g. arc welding, electric arcs, sunlight, sunlight with rain droplets, heaters and lights.

A typical helideck Installation

A typical helideck suppression system is activated by a stand-alone control system mounted close to the DIFFs skid in an ATEX-approved enclosure.

This system automatically monitors the helideck via three FlameSpec IR3-HD flame detectors, located at 120-degree intervals around the perimeter of the helideck.

The FLS-IR3-HD has an embedded HD camera, which can be viewed remotely from a control room or shore-based facility thereby providing live CCTV coverage of the helideck area. This feature is particularly suited to facilities operating in remote locations, like a NUI.

The live video feed provides real-time incident status and allows a more accurate and informed response to be taken by control-room operators.

A further benefit of this device is that video and data of events are stored quickly to non-volatile memory within the detector for post-incident investigation. Recordings start one minute before detection and continue for up to four minutes.

FGD recommends the FLS-IR3-ASX3 and FLS-IR3-HD-ASX3 for CAP 437 installations.

Aircraft hangars

The benefits this latest FGD development brings to the market is not limited to helideck applications. In aircraft hangars jet engines and auxiliary power units (APUs) along with maintenance operations (like hot work) present significant sources of false alarm for traditional IR3 detectors.

Aircraft hangars vary in size, utilization and the number of aircraft they house. Each hangar can be classified as of one of four hangar group types, in compliance with NFPA 409.[3] The classification depends on the construction, building dimensions, door height and the types of fire risks present. It's important to therefore understand that fire detection and protection systems must be designed to the unique characteristics and needs of the facility.

Optical flame detectors are used extensively in aircraft hangars as they can cover a large area and respond quickly to a fire. The detectors are usually positioned looking towards the wing tips, thereby providing coverage above and below the aircraft's wings. Where helicopters are housed in a hangar it is more common to direct detection towards the engine area.

Aircraft hangars have fixed automatic fire suppression systems. Damage to plant and equipment by accidental activation of these systems can cause millions of dollars in damage to property and machinery. As an example, the cost to clean and repair an engine that has been doused with foam has been documented as being around 50% of its replacement.[4] FGD recommends the FLS-IR3-ASX3 and FLS-IR3-HD-ASX3 for aircraft hangar installations.

Summary

In this article we have presented an innovative solution to help reduce false alarms in applications where exhaust gases from aircraft engines may be an issue for traditional IR3 flame detectors. The FlameSpec IR3-HD-X3 configuration combines superior false-alarm immunity, outstanding speeds of detection and an HD CCTV capability that offers a live video feed with real-time incident status to operators who can make informed decisions and direct responders accordingly.

For more information, go to www.fg-detection.com

References

1. UK Civil Aviation Authority, Safety Regulation Group, CAP 437 Standards for Offshore Helicopter Landing Areas, Edition 8, amendment 02; July 2021.
2. FlameSpec IR3-HD manual, document number F101V0020.06, published June 2021.
3. NFPA 409, 2016 Edition
4. Aircraft Hangar Fire Suppression System Design Study, Naval Research Laboratory, Washington, DC, June 16, 2000.

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