

MICROPACK
FIRE & GAS



APPLICATION OF VISUAL FLAME DETECTION™

AIRCRAFT HANGARS

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When a fire occurs in an aircraft hangar the effects are devastating. The cost to replace a hangar after a fire is great, however, compared to the cost of replacing the precious aircraft it is housing, it is incomparable.

Flame detection with a high false alarm immunity and fast response is critical.



ISO 9001:2008 Certified

micropack.co.uk



Introduction

Micropack has extensive experience with the detection of fires in Aircraft Hangars through the supply of detection systems to hangars across the globe. This application is a challenging place for flame detectors to operate correctly.

Fundamentals

In a typical Aircraft Hangar there are four fundamental functions that the optical flame detection system should deliver:-

- Provide full coverage of the aircraft hangar. The building is a large open space that houses moving machinery and large aircraft. The flame detector must also contend with viewing the hangar and runway. Restrictors to the field of view of detectors are generally not recommended.
- The optical flame detection system must be mapped accordingly by certified Fire and Gas Practitioners / Fire Protection Engineers using an approved 3D Flame Detection Mapping Package - HazMap3D.
- Demonstrate a high false alarm immunity to radiant sources other than flames. For example EMI/RFI sources, Hot CO² emissions and welding.
- Provide a fast response to flaming fires to ensure the fire protection system can be activated in time to extinguish the fire and protect the expensive aircraft.

Aircraft Hangar Fires

As has been seen by costly and devastating fires in aircraft hangars reported around the globe, the need to have a properly mapped flame detection system by a certified Fire and Gas Practitioner (FGP) and adequately designed fire extinguishing system is critical.

Historically, jet fuels used were extremely volatile and when ignited would propagate rapidly. Safety measures have been introduced and current jet fuels are more difficult to ignite, providing a layer of safety.

Fires most commonly occur during times of refuelling, ongoing maintenance activities and spray painting.

In addition to these scenarios, Micropack also has experience of supplying detection systems to protect the windows of the passenger terminals in case of a fuel spill whilst fuelling the aircraft. This is not typically common, however, the use of water curtains in the event of a fire cools the windows to prevent the heat from shattering the glass and injuring passengers. The flame detectors are typically angled at jet ways to trigger the water deluge system.

The use of optical flame detection is not only limited to aircraft hangars. Areas such as the refuelling area for rental cars at airports is a common application for flame detection to be applied. In this application, moving vehicles, reflective surfaces and hot exhaust emissions all could have a negative effect on certain models of flame detector.

Fundamental Challenges

As we now know, the aircraft hangar is a tough environment for optical flame detection to operate successfully. Typical challenges that detection systems have to overcome to detect a fire reliably include;

- Blackbody radiation from the planes/engines
- EMI/RFI interference.
- Hot CO² emissions from the aircraft exhausts
- Sunlight flooding in from the large sliding doors and the potential for detection systems to also 'see' moving objects on the runway.
- Due to moving objects in the hangar, blockages will differ from day to day as the aircraft is moved or stored.
- Maintenance activities which could include welding or grinding.
- With the number of moving objects and sunlight shining in through the hangar doors, there are numerous reflective hot surfaces which detection systems must contend with.

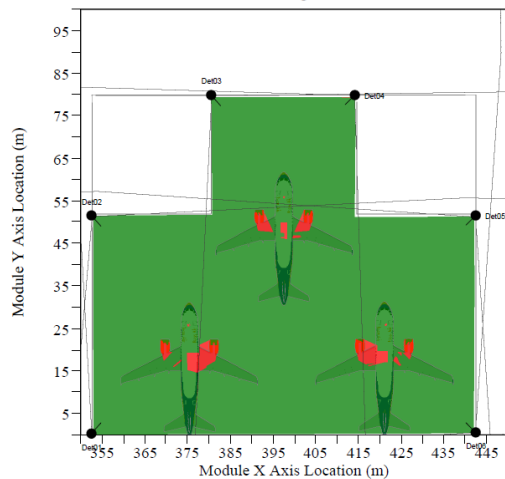
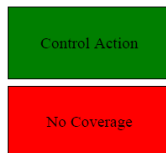
3D Flame Detection Mapping HazMap3D

As is recommended in certain design standards such as NFPA 409, a performance based design must be applied to each Aircraft Hangar. 3D Flame Detection Mapping using HazMap3D ensures that compliance is at the heart of every design. In any mapping study, the hazards and the escalation potential must be understood. By applying fire grades to each of the hazards and then accurately mapping the coverage of the hangar space and aircraft, the detection coverage can be calculated and reviewed to ensure it meets the performance targets set.

As well as ensuring the targets are met, it is equally important to ensure that the flame detection technology selected is appropriate for the fire type, is installed in a location which is easily maintainable and will also not fail to danger in the presence of desensitising sources.

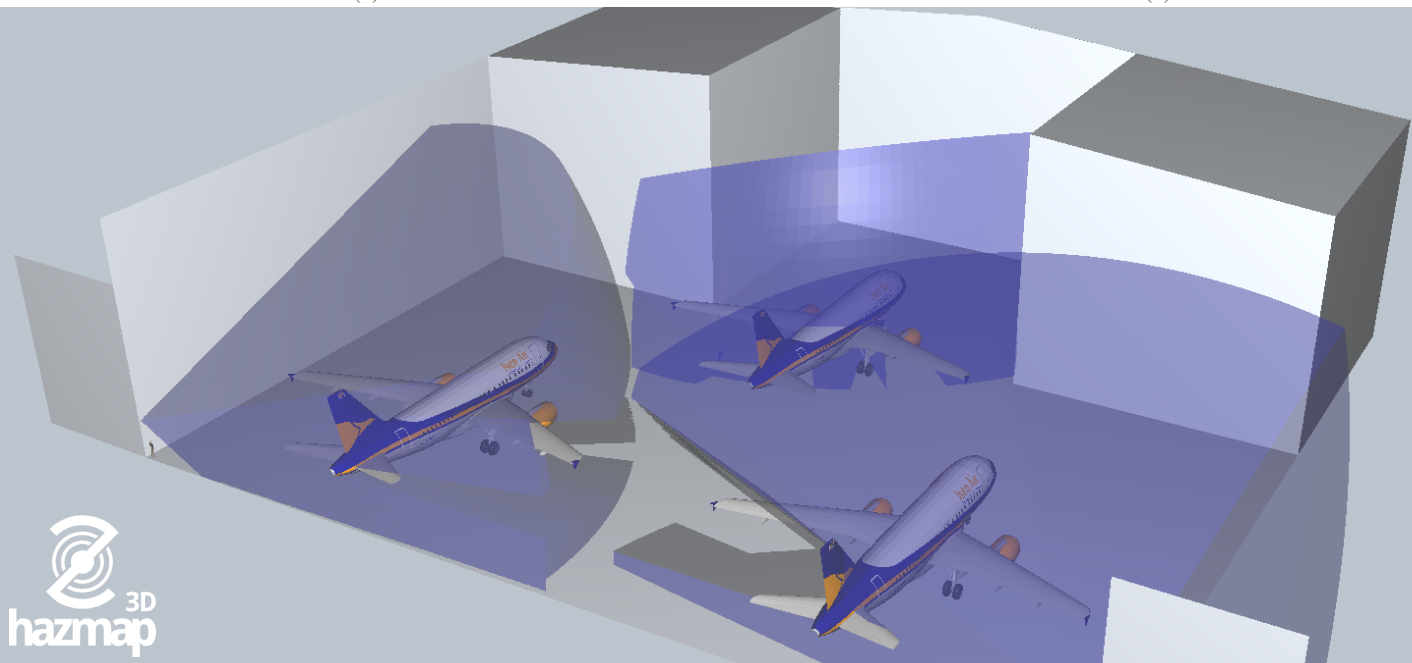
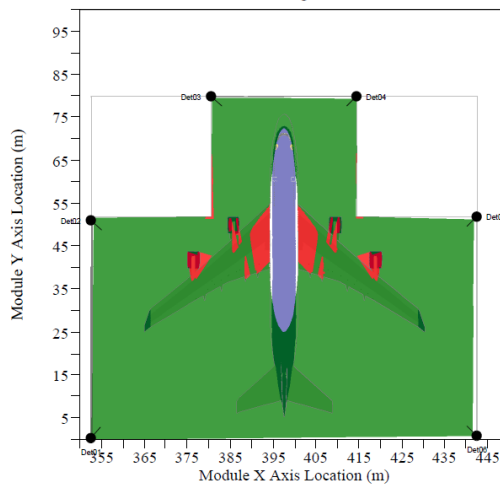
Fire Detector coverage at 2.069m ALD

COVERAGE KEY



Fire Detector coverage at 3.458m ALD

COVERAGE KEY





Visual Flame Detection™

Visual Flame Detection™ is a technology which detects fires visually in the near IR spectrum. It uses on-board flame recognition analytics and machine vision to ensure that it is only fires that are detected and not common false alarm stimuli. The technology was originally developed for the Oil and Gas industry which is renowned for being an extremely harsh environment for technology to operate.

In addition to being a reliable technology for detecting fires, the FDS301 also has the capability of outputting a live colour video feed to a monitoring station which gives the operator critical information on any ensuing fire. The FDS301 also has an on-board micro-SD card which records a video pre and post alarm. This video is invaluable for determining the cause of any fire and saves time and money when investigating the cause of a fire.

Visual Flame Detection™ Technology completely ignores EMI/RFI interference, blackbody radiation, hot CO² emissions, welding/grinding and sunlight while delivering a fast detection time to flaming fires. Unlike other technologies, Visual Flame Detection™ does not require the use of expensive, hard to configure field of view restrictors or laser aiming tools. As VFD uses a camera and a flame recognition algorithm to detect fires, the live video output that the operator can see is what the detector uses to detect fires. This is a critical point as VFD can be positioned extremely accurately using the video output to ensure that only specific hangar areas are protected and the airfield is not.

Due to these points, Visual Flame Detection™ technology is the default detection choice to be employed in Aircraft Hangars.

The highlight benefits of installing a Micropack FDS301 inside an Aircraft Hangar are as follows:

- Live colour video image of the aircraft hangar.
- Not affected by black body radiation (radiated from the aircraft body)
- Not affected by Welding/Grinding
- Not affected by differing light levels.
- Less affected by dirt/grime/oily deposits on the lens
- High temperature rating +85°C
- Pre and post alarm video recording of the event onto an on-board micro-SD card

Summary

In summary the unique nature of aircraft hangars proves a challenging environment for flame detectors to operate successfully. To ensure compliance with standards such as NFPA 409, a performance based design approach must be followed with the correct detection system used for the hazards present. The detection system must be coupled with a robust fire protection system capable of rapid response to ensure the aircraft are protected.

The performance based design of the detection system should be centred around a robust flame detection mapping study. This should be carried out using an approved F&G mapping package (i.e. HazMap3D) by either a Fire and Gas Practitioner (FGP Micropack exida) or professional fire protection engineer.

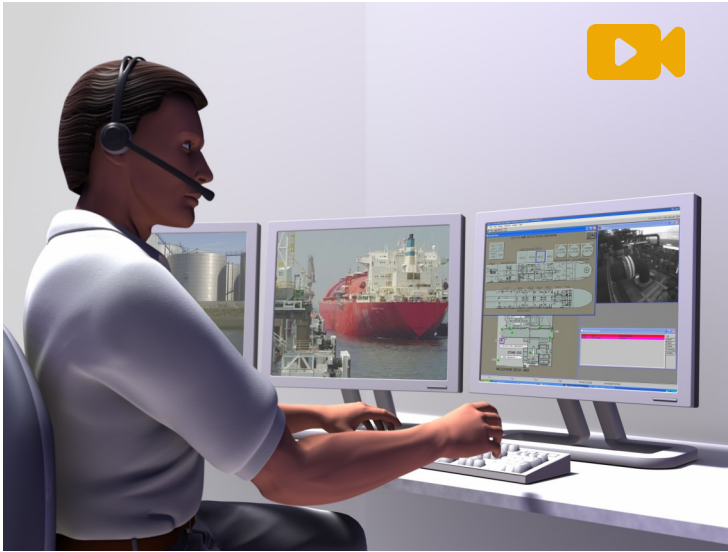


The use of Visual Flame Detection™ from Micropack will ensure that false alarms are eradicated while fast optical flame detection of fires is easily achieved. With the additional benefits of on-board alarm recording and live video output, Visual Flame Detection™ will allow you to go further with confidence when safety matters.

Author

This article was written by Graham Duncan, Business Development Manager of Micropack (Engineering) Ltd.

6 reasons to use Visual Flame Detection™ in Aircraft Hangars



FDS301 Visual Flame Detector—Operator Live Video Feedback



When Safety Matters. Visual Flame Detection™ will provide a fast response to jet fuel fires.



Challenging environment. Where other technologies would either false alarm or miss fires, Visual Flame Detection™ is unrivalled in its false alarm immunity and flame detection capability.



Safety Integrity Level
Certified as SIL 2 Capable by EXIDA



Go further with confidence. On-board micro-SD card in every unit capable of recording any occurring fire. Lessons could be learned from this video and preventative safety measures introduced.



Live Video Feedback. Incorporating a colour camera in each unit, the FDS301 offers a cost effective combined flame detection and CCTV solution.



When compliance is critical. Visual Flame Detection is recommended specifically by FM for use in challenging environments.



FDS301 TECHNICAL SPECIFICATION

Environmental

Operating Temp -60°C to +85°C (-76°F to +185°F)
 Storage Temp: -60°C to +85°C (-76°F to +185°F)
 Humidity 0 to 95% RH non-condensing

Operating Voltage

24Vdc Nominal – (18 to 32 Vdc Range)

Power Consumption

6 watts minimum (no heater), 10 watts typical, 15 watts maximum (with heater)

Speed of Response

~7 seconds (Typical)

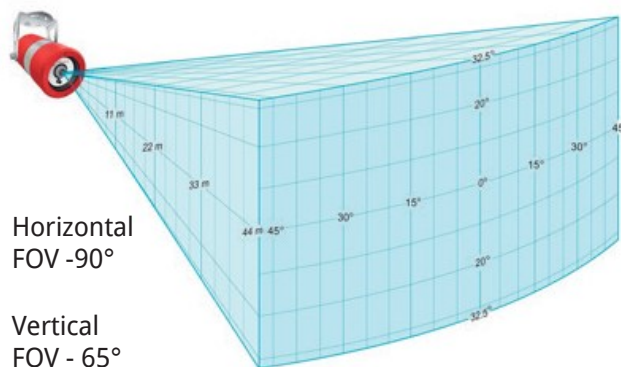
Flame Sensitivity

Fuel	Fire Size	Distance
Methane Jet Fire	0.9m (3ft) plume	30m (100 feet)
Ethanol	0.1m ² (1sqft) pan	25m (85 feet)
n-Heptane: Pan Fire	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: in direct sunlight	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: in modulated sunlight	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: modulated black body	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: Arc welding	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: 1000watt lamp	0.1m ² (1sqft) pan	44m (144 feet)
Gasoline Fire	0.1m ² (1sqft) pan	44m (144 feet)
JP4	0.36m ² (3.8sqft)	61m (200 feet)
Ethylene Glycol	0.1m ² (1sqft) pan	15m (50 feet)
Diesel	0.1m ² (1sqft) pan	40m (130 feet)
Crude Oil (heavy fuel oil) Pan Fire	0.25m ² (2.7sqft)	40m (130 feet)
Silane fire	0.61m (2ft) plume	13m (42ft)

Enclosure

Dimensions: 100 Diameter x 200 Length Overall (mm)
 Material: LM25 (Red epoxy), 316L stainless steel
 Entries: 1 – M25, ¾"NPT (Variants on Request)
 Weight: 2.5kg (LM25) or 6kg (316L)

Field of View



Horizontal
FOV -90°

Vertical
FOV - 65°

Outputs

Relay contacts - alarm and fault
 Current source 4-20mA
 RS485, HART
 Live colour video – PAL and NTSC

Certification

ATEX : II 2 G Ex db IIC T4 (FM07ATEX0033)
 Factory Mutual : 3260 (3029978)
 IEC 61508 : SIL 2 (MP 080203 C001)
 IECEx FME 07.0002
 Class 1 DIV 1 GROUPS B,C,D,T4
 Class 1 Zone 1 AEx/Ex d IIC T4
 EN54-10 (VdS)

