

Where:	AAR MRO Services, an aircraft maintenance, repair and overhaul (MRO) facility at Chicago Rockford International Airport in Illinois
What:	Ten X3301 optical flame detectors in each of two extremely large (119,000 sq. ft.) MRO hangar bays
Why:	Provide fire protection for high-value aircraft assets, as well as workers and the hangar structure
Application challenges:	Huge physical area, field-of-view obstacles such as equipment and aircraft, EMI interference and "friendly fire" that can cause costly false alarms
Primary choice factors:	Industry-leading field of view, detection range and speed of detection; resistance to false alarm sources



In AAR's immense MRO hangar bays, fire protection for today's aircraft depends on Det-Tronics flame detectors

AAR MRO Services supports airline operators with everything from maintenance inspections and equipment upgrades to airframe painting and heavy maintenance for all major aircraft in service. The largest MRO operator of its type in the Americas, AAR recently opened the company's largest facility, located at the Chicago Rockford International Airport.



Here, each of two 10-story hangar bays can accommodate hundreds of "small" aircraft, two Boeing 787s or even an Airbus A380, the largest commercial aircraft in production today. Also in each of the two bays are 10 Det-Tronics optical flame detectors that function as the critical sensors for the AAR hangar's fire protection system.

Russel Daubert, AAR Rockford's Facility Manager, and Chris Wolf, Director of Maintenance, have overseen the 24-hour operations at the MRO hangar since it opened in late 2016. AAR serves multiple airline customers, and like any MRO facility, Wolf says their goal is to "get lines that are current, which means an airline operator will continually bring in one plane after another to keep their fleet operating safely." Daubert adds, "The biggest portion of our work is airframe overhauls

and heavy maintenance inspections, and depending on the aircraft, we can have up to 225 aircraft in each hangar at one time plus 50 to 60 crew." Aircraft spend anywhere from three days to two months in AAR's hangars.

Fire protection in MRO hangars must be able to handle the challenges associated with servicing aircraft. According to Wolf, aircraft bring inherent fire hazards to MRO facilities. "These aircraft come in with 70,000 to 80,000 pounds of fuel," Wolf says. "Add the oxygen tanks on board for passenger and crew safety, plus the possible sparks from electrical equipment or other sources, and you have all the ingredients needed for fire." Maintenance also involves painting aircraft in the hangars, which can result in the circulation of highly flammable paint plumes under and around wings and fuselage.

Meeting standards for aircraft hangar protection

Fire protection standards specific to aircraft hangars are spelled out in the National Fire Protection Association's NFPA® 409 Standard on Aircraft Hangars. This document classifies hangars by size and construction type; conventionally constructed fire hangars with fire areas of 40,000 sq. ft. or less are classified in Groups I, II and III. Hangars in these groups usually require both sprinklers and foam for fire protection.

AAR's Rockford facility is unique both for its immense size and for its construction method, a fabric tension membrane over steel trusses. The 2-inch thick insulated material meets NFPA 701 and ASTM E-84 standards for flame retardancy, fire safety advantages that led the NFPA to decide hangars covered in this fabric would fall in a Group IV classification. Group IV hangars can have an unlimited fire area and need only a low- or high-expansion foam suppression system.

Fire detection done right

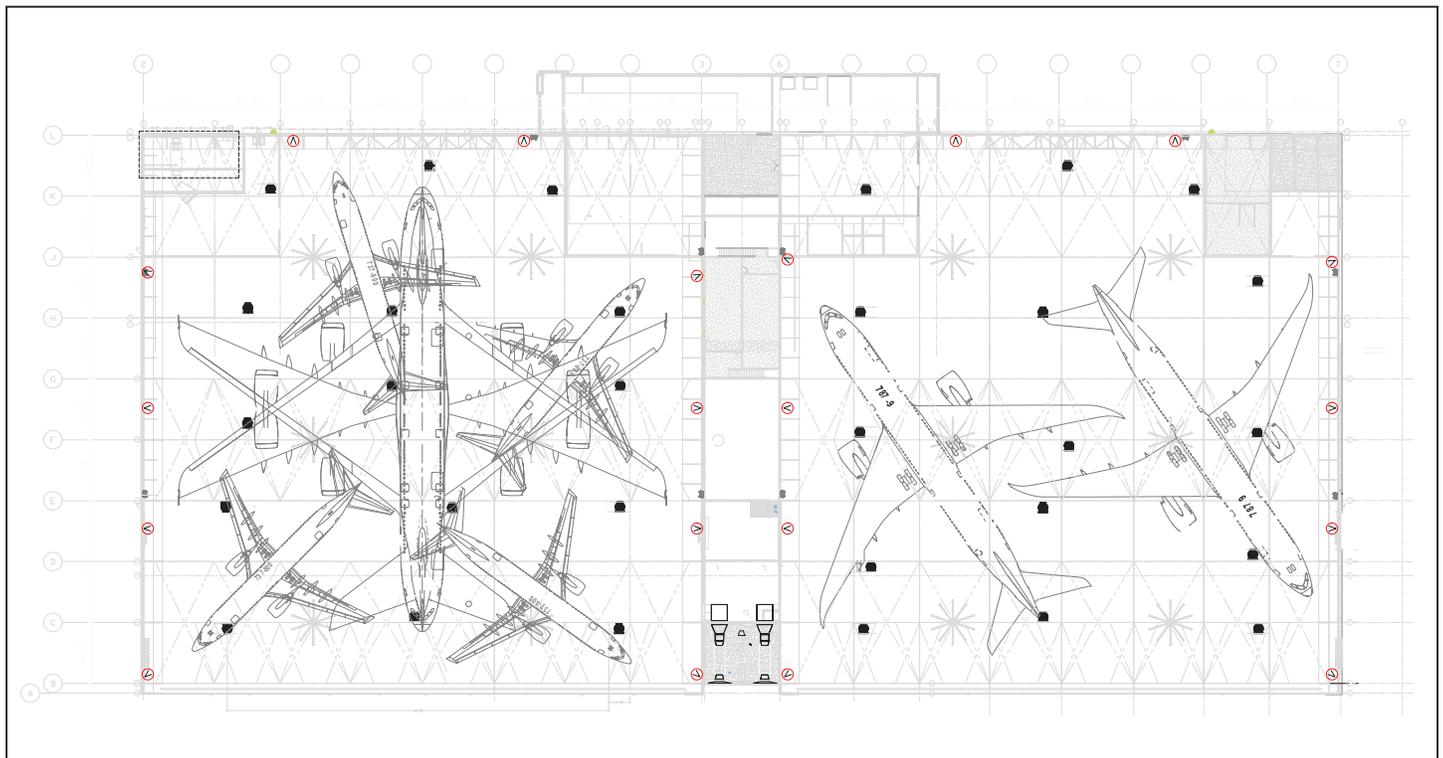
One of the goals of MRO service providers is to provide fast turns of the planes entrusted to them by airline operators. To support this objective, a hangar fire detection system must have two very important capabilities: 1) quickly detect the presence of flames; and 2) reject false alarms (generated by welding, engine

start-ups, etc.) that could unnecessarily initiate suppression systems, interrupt operations and potentially lead to significant aircraft damage. The solution for hundreds of hangars in the past 10 years – from military bases to commercial hangars and MRO facilities – has been to deploy optical flame detectors from Det-Tronics.

When it was time to specify the fire protection system for the mammoth hangar bays, the project manager for the Chicago Rockford hangar expansion looked to local fire protection contractor, Absolute Fire Protection, Inc., to handle the fire protection system. In turn, John Danis of Absolute called in 3S Incorporated, a Harrison, Ohio firm that specializes in industrial and special hazard systems, to design the detection and foam suppression part of the fire protection system.

Because of the size and scope of the Rockford hangar, 3S and Absolute, along with other design and building partners, worked for nearly three years to take the project from initial planning to construction. During that time, a construction engineer had calculated it would take no less than 84 detectors per hangar bay to monitor the facilities for fire. Aaron Hinkle, sales engineer at 3S, disagreed. "I realized that was far more than necessary, if we just picked the right product for the job," he says.

Figure: This plan lays out the flame detector coverage using just 10 X3301 optical detectors per hangar bay, which afford visibility to all of the points noted in red on the hangar floor.





Capable of housing an A380 in each bay, AAR's Rockford MRO hangars are one of only two locations in the U.S. that can service the largest plane in production today.

Hinkle had worked with the Det-Tronics X3301 Multispectrum Infrared (IR) flame detectors on previous hangar projects, and he knew the units possessed the optical power, field-of-view capacity and speed to do what was required. In consultation with Det-Tronics applications engineers, Hinkle came to the conclusion that, "Because of the X3301's performance attributes, each 119,000-square-foot hangar could be covered with just 10 detectors from Det-Tronics."

"Using just ten detectors per bay greatly simplified the work," Hinkle explains. "All the alarms contractor had to do was install four detectors on each side wall and two on the back wall." The front wall is the giant door that opens up to allow the craft to enter and exit." (See Figure.) There were considerable cost savings in equipment and related hardware, as well as labor savings due both to the small number of units to be installed and the fact that the X3301 detectors could be placed at a much easier-to-reach height of just 8 to 10 feet off the floor rather than near the top of the 10-story hangar bays.

About Det-Tronics

Det-Tronics is the global leader in fire and gas safety systems, providing premium flame and gas detection and hazard-mitigation systems for high-risk processes and industrial operations.

The company designs, builds, tests and commissions a complete line of SIL 2 Capable, globally certified flame, gas and smoke safety products, including the X3301 Multispectrum Infrared Flame Detector and the Eagle Quantum Premier® (EQP) Fire and Gas Safety Controller.

To maximize false alarm rejection, X3301 flame detectors are programmed to run in Det-Tronics® Hangar Mode™, an option that incorporates a delay mechanism. The mechanism extends the processing time to react to fires, letting the detector distinguish between an actual fire and an event like a short-duration auxiliary power unit startup. The operation mode has no effect on detection ranges or field of view, but can prevent an innocent action (such as a crew firing up gas heaters to stay warm) from resulting in an unwanted foam dump.

An impressive demonstration

To date, AAR's foam suppression system has gone off only once, and that was intentional. To certify that the new system was working properly, Absolute, 3S and other suppliers commissioned the overall protection system by simulating an actual fire suppression event. They recorded it on video, and it's a stunning sight.

Daubert, facility manager for the AAR hangars, was delighted when he saw the video. "Within seconds of being triggered, foam erupts from dispensers in the ceiling. In no time, it has put a layer on every inch of the hangar's floor. Within 3-and-a-half minutes, the foam has stacked up to a 10-foot depth, smothering any possible fire."

"I had never seen a system of that magnitude before," Daubert continues. "Seeing just how fast we could stop a fire from spreading and put it out was pretty impressive." Thanks to the Det-Tronics detectors and the system's other components, it's obvious our hangar is well protected from the dangers of fire."

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Corporate Office

6901 West 110th Street
Minneapolis, MN 55438 USA

www.det-tronics.com

Phone: 952.946.6491

Toll-free: 800.765.3473

Fax: 952.829.8750

det-tronics@det-tronics.com