



RESEARCH FOUNDATION

RESEARCH FOR THE NFPA MISSION

PROJECT SUMMARY

Performance Criteria for Aircraft Hangar Fire Protection Systems

Last Updated: 1 October 2020

Background: NFPA 409, Standard on Aircraft Hangars, currently requires various fire protection options using firefighting foam systems. The existing requirements for foam fire protection systems currently in NFPA 409 (e.g., low expansion, high expansion) are largely based on large-scale fire tests (~900 sq. ft. pool fire tests) conducted by FM Global in the 1970's, however it is a challenge to replicate these large scale pool fire tests today. Currently, there is no avenue for evaluating alternative fire protection methods for possible inclusion in NFPA 409. While systems such as water mist, compressed air foam, clean agents and other solutions have been proposed, the path to understand their effectiveness in protecting an aircraft hangar is unclear. Therefore, it is necessary to develop an alternative evaluation method that can be used to assess the performance of other technologies on the assumed aircraft hangar fire scenario (a large jet fuel pool fire).

Research Goal: The overall goal of this research program is to establish an evaluation method that can be used to assess the performance of fire protection systems for aircraft hangar facilities.

The specific goal of this project is to determine the baseline performance criteria of existing fire protection systems in aircraft hangar facilities. The objectives include:

- Review and clarify the technical basis of the performance criteria of fire protection systems currently permitted in NFPA 409;
- Conduct a risk assessment of aircraft hangar facilities and evaluate the applicability of alternate fire protection technologies;
- Develop a research plan to further investigate the effectiveness of fire protection solutions in aircraft hangars.

Project Tasks: This project will involve the following tasks:

Task 1: Literature review

Task 1.1: Aircraft Hangar Fire Incident Review. Review, collect and summarize information and statistics on fire incidents in aircraft hangars. This should include collecting the following information, where available: number of hangar fires, size of hangar fires, cause of fire, means of controlling the fire, financial loss from the fire, number of fuels spills in the hangar, size of fuel spill, cause of fuel spill, consequence of the fuel spill, spill containment mechanism, information on unwanted system activations (e.g. number, reason, impact on the operation and the environment, cost of clean-up, cost to damaged equipment or materials in the hangar, and business interruption from unwanted activation.

Task 1.2: Aircraft Hangar Fire Protection Methods.

- Identify and summarize the existing fire protection methods (i.e., foam), as specified in the Standards (e.g., NFPA 409) for aircraft hangars. Clarify the level of protection required by NFPA 409 and other applicable standards for aircraft hangar fire protection.

- Establish a baseline understanding of the existing NFPA 409 foam requirements (what is the protection goal, how was this confirmed via the initial 1970's fire testing, etc.).
- Identify, explain and review the alternative fire protection methods (e.g., water mist, compressed air foam, clean agent, etc.) and performance criteria that have been proposed or installed in aircraft hangars or proposed to protect other similar hazards (e.g. flammable or combustible liquid pool fires).
- Review prior studies including but not limited to peer reviewed articles, conference proceedings, and research reports on fire testing that has been conducted on any type of aircraft hangar fire protection systems.

Task 2: Assessment of Fire Protection Performance Criteria

- Identify the fire scenarios in aircraft hangars (e.g., jet fuel pool fire) and conduct a fire risk assessment. This shall include consideration of the factors influencing the fire scenarios in aircraft hangars.
- Evaluate the applicability of various fire protection methods, and their corresponding performance criteria, identified in Task 1 on the fire scenarios expected in aircraft hangars.
- Conduct a gap analysis to identify any existing knowledge gaps.

Task 3: Future Research Plan

- Develop a research plan to further investigate the effectiveness of fire protection solutions in aircraft hangars. This is intended to include the baseline information to develop a manageable and repeatable test method in the future by which the performance of fire protection systems can be evaluated. This test method should establish performance criteria that can be consistently applied to all fire protection methods used to protect an aircraft hangar.

Task 4. Final Report

- Prepare a draft final report including the findings from above tasks and review it with the panel.
- Submit a final report after incorporating the necessary revisions based on the panel feedback.

Schedule and Implementation: This eight-month research program will be conducted under the auspices of the Research Foundation in accordance with Foundation Policies and will be guided by a Project Technical Panel who will provide input to the project, recommend contractor selection, review periodic reports of progress and research results, and review the final project report.

About the Fire Protection Research Foundation

The [Fire Protection Research Foundation](#) plans, manages, and communicates research on a broad range of fire safety issues in collaboration with scientists and laboratories around the world. The Foundation is an affiliate of NFPA.



About the National Fire Protection Association (NFPA)

Founded in 1896, NFPA is a global, nonprofit organization devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards. The association delivers information and knowledge through more than 300 consensus codes and standards, research, training, education, outreach and advocacy; and by partnering with others who share an interest in furthering the NFPA mission. [All NFPA codes and standards can be viewed online for free.](#) NFPA's [membership](#) totals more than 65,000 individuals around the world.

