Aircraft Hangar Fire Protection
Introduction

Agenda

› Who am I and why am I talking?
› Challenges of Aircraft Hangars
› Types of Hangars
› Fire Protection Strategies
› Open discussion and questions
Introduction

Who Am I?

› Fire Protection Engineer – C&S Companies
› Adjunct Professor – Fire Protection Technology
› Firefighter/ EMT – 19 years in fire service
› Past President – SFPE NY Empire Chapter
› Certified Fire Protection Specialist – NFPA
› OSHA Authorized Outreach Trainer
› M.S. – Safety, Security & Emergency Management
› B.S. – Fire & Safety Engineering Technology
Overview of Aircraft Hangars
Aircraft Hangars

Overview
Aircraft Hangars
Overview
Classification of Aircraft Hangars
Aircraft Hangars

Classification

› NFPA 409 Standard on Aircraft Hangars
  › Group I
  › Group II
  › Group III
  › Group IV

› UFC 4-211-01 Aircraft Maintenance Hangars
  › Air Force
  › Army
  › Navy/ Marine
Aircraft Hangars
NFPA 409 Group I

› Aircraft access door height over 28’
› Single fire area in excess of 40,000 ft²
› Aircraft with tail height over 28’
Aircraft Hangars
NFPA 409 Group II

- Aircraft access door height of 28’ or less
- Single fire area not larger than 40,000 ft\(^2\)

Table 4.1.2 Fire Areas for Group II Aircraft Hangars

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Single Fire Area (Inclusive)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m(^2)</td>
</tr>
<tr>
<td>Type I (443) and (332)</td>
<td>2,787–3,716</td>
</tr>
<tr>
<td>Type II (222)</td>
<td>1,858–3,716</td>
</tr>
<tr>
<td>Type II (111), Type III (211), and Type IV (2HH)</td>
<td>1,394–3,716</td>
</tr>
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<tr>
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<tr>
<td>Type V (111)</td>
<td>743–3,716</td>
</tr>
<tr>
<td>Type V (000)</td>
<td>465–3,716</td>
</tr>
</tbody>
</table>
Aircraft Hangars
NFPA 409 Group III

- Aircraft access door height of 28’ or less

Table 4.1.3 Maximum Fire Areas for Group III Aircraft Hangars

<table>
<thead>
<tr>
<th>Type of Construction</th>
<th>Maximum Single Fire Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m²</td>
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<tr>
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Aircraft Hangars
NFPA 409 Group IV

› Membrane-covered rigid, steel frame structure
Aircraft Hangars
UFC 4-211-01

› All military hangars are classified as NFPA 409 Group I
› Specific design requirements for individual branches
Aircraft Hangars

UFC 4-211-01

- Air Force

- Army
  - Army Standard for the Aircraft Maintenance Hangar (HGR) Complex

- Navy/ Marines
  - ITG 2003-01 – Aircraft Maintenance Facility Design
  - F35 or C Supplement
Fire Protection Strategies

Overview

› Provide a reasonable degree of protection from fire for life and property... based on sound engineering principles, test data, and field experience.

› Protect Life
› Protect Aircraft
› Protect Building
Fire Protection Strategies

Decision Tree

1. **CLASSIFY HANGAR**
2. **DETERMINE PRIMARY SYSTEM**
   - **TYPE**, **DISCHARGE TIME**, and **APPLICATION RATE**
   - **CALCULATE PRIMARY FOAM QUANTITY**
   - **CALCULATE TOTAL FOAM QUANTITY**
   - **DETERMINE MONITOR SYSTEM DISCHARGE TIME & APPLICATION RATE**
   - **CALCULATE MONITOR SYSTEM FOAM QUANTITY**
3. **DETERMINE MONITOR LOCATION AND AREA OF COVERAGE**
4. **REVIEW PROTECTION OPTIONS**
5. **DETERMINE HAND HOSE LINE REQUIREMENTS**
6. **DETERMINE MONITOR SYSTEM**
7. **AREA OF COVERAGE**
8. **COMPLETE BILL OF MATERIALS**
Fire Protection Strategies
NFPA 409

› Primary Foam-Water Sprinkler Systems
  › May require supplemental oscillating monitors

› Foam monitor systems

› High Expansion Foam System

› Supplemental Requirements for all above:
  › Foam-Water Hand Hose Line Systems
Fire Protection Strategies
Unified Facilities Criteria

› All military hangars are classified as a Group I application in reference to NFPA 409 however they follow a specific design application.

› **Airforce/ Airguard** – High Expansion systems with foam inductor proportioning and an atmospheric poly tank for foam storage.

› **Army** – High expansion system with main and reserve foam pump proportioning and atmospheric poly tank for foam storage.

› **Navy/ Marine (NAVFAC)** – AFFF foam systems with foam inductor proportioning, trench nozzle discharge device and atmospheric poly tank for foam storage.

› All hangars require a dead man switch to stop foam
Case Studies
Case Study #1
Group II Hangars

› Private Aviation Facility
  › Design & Construction of new hangar
  › Design/ Building contract
  › FP Contractor brought in late – no FPE involved
  › Big ticket item missed early (No Foam!)
  › Owner consulted with multiple FPEs
    › All had similar conversations (consistency is good)
  › Business plan changed (no maintenance)
Case Study #2
Two Group II Hangars

› Private Aviation Facilities
  › Expansion of existing (operational) hangar (+6,000 SQ FT)
  › Insufficient fire suppression system
  › Adjacent (operational) hangar with similar issues
  › Water supply concerns (pressure and volume)
  › Owner challenges
  › Scope change – owner education
    › Convert to wet-pipe/ hi-ex foam (both hangars)
    › Update fire alarm/ detection
    › 3 Fire pumps & new building
Case Study #3
Two Group II Hangars

› Stewart IAP
  › Competing stakeholder interest
    › Army hangars
    › Air base,
    › NYS Police
  › NY/ NJ Port Authority
  › Convert existing water deluge to wet-pipe & high expansion foam
  › Design-Build contract/ Restricted budget
  › Known water supply deficiencies
  › New Contractors
Case Study #4
Two Group I Hangars

- Plattsburgh IAP
  - Two 26,000+ SQ FT nose docks
    - Complete renovation (we’ve done this before)
    - Modification to operational hangar
  - Wet-pipe sprinklers, hi-ex foam, hose reels, alarm, and detection
  - Tight construction schedules & budgets
  - Scope change via addendum
    - Wet-pipe sprinklers, alarm & detection
    - Extend existing pre-action, alarm & detection
Case Study #5
Group I Hangar

- Confidential Aviation Hangar
  - New hangar design
  - Three bays – one fire area
  - Wet-pipe sprinkler, hi-ex foam, hose reels, pumps, alarm & detection
  - AHJ initiated design change late
    - AFFF deluge sprinklers
      - 6 zones
      - 5 operate with design fire
    - Water supply impact (7,800 +/- gpm)
  - Contractor relationships
Case Study #6
Group I Hangar

› Melbourne MRO
  › Design & Construction new hangar
  › Design/ build contract
  › Experienced construction & design team (new partnership)
  › 30% design for proposal
  › Multiple approaches
  › Issues with bidding process (TBD)
Closing

Presentation Take Away:
1. Determine Water Supply Early
2. Communicate Expectations to Stakeholder
3. Performance vs Prescriptive

▪ Questions
▪ Open Discussion
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