Fire Code Issues Impacting Air Mobility

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Rev. 4/10/2020

The ‘Codes’ Regulating EVTOL Sites

- The overwhelming majority of states, cities, and local governments adopt one of two major building codes to regulate construction:
  - International Code Council’s ‘International Building Code’ (IBC)
  - National Fire Protection Assoc. NFPA 5000 ‘Building Safety Code’
- Fire and operational safety requirements are largely contained within two model fire code documents:
  - International Code Council’s ‘International Fire Code’ (IFC)
  - National Fire Protection Assoc. NFPA 1 ‘Fire Code’
- Depending on the adoption process (state or local) various editions of these codes are currently adopted
- At the present time these codes do not specifically address EVTOL operations on buildings or open ground

The Great Question Facing Emerging Tech

- If the model building and/or fire codes do not address the physical or operational aspects of an emerging technology is that technology allowed?

- Depending on the jurisdiction, adopted codes, and code official personalities the answer could be:
  - A. Absolutely Not
  - B. Maybe, but probably not (I'll listen but don't get your hopes up)
  - C. Come back when it's part of the model or adopted codes

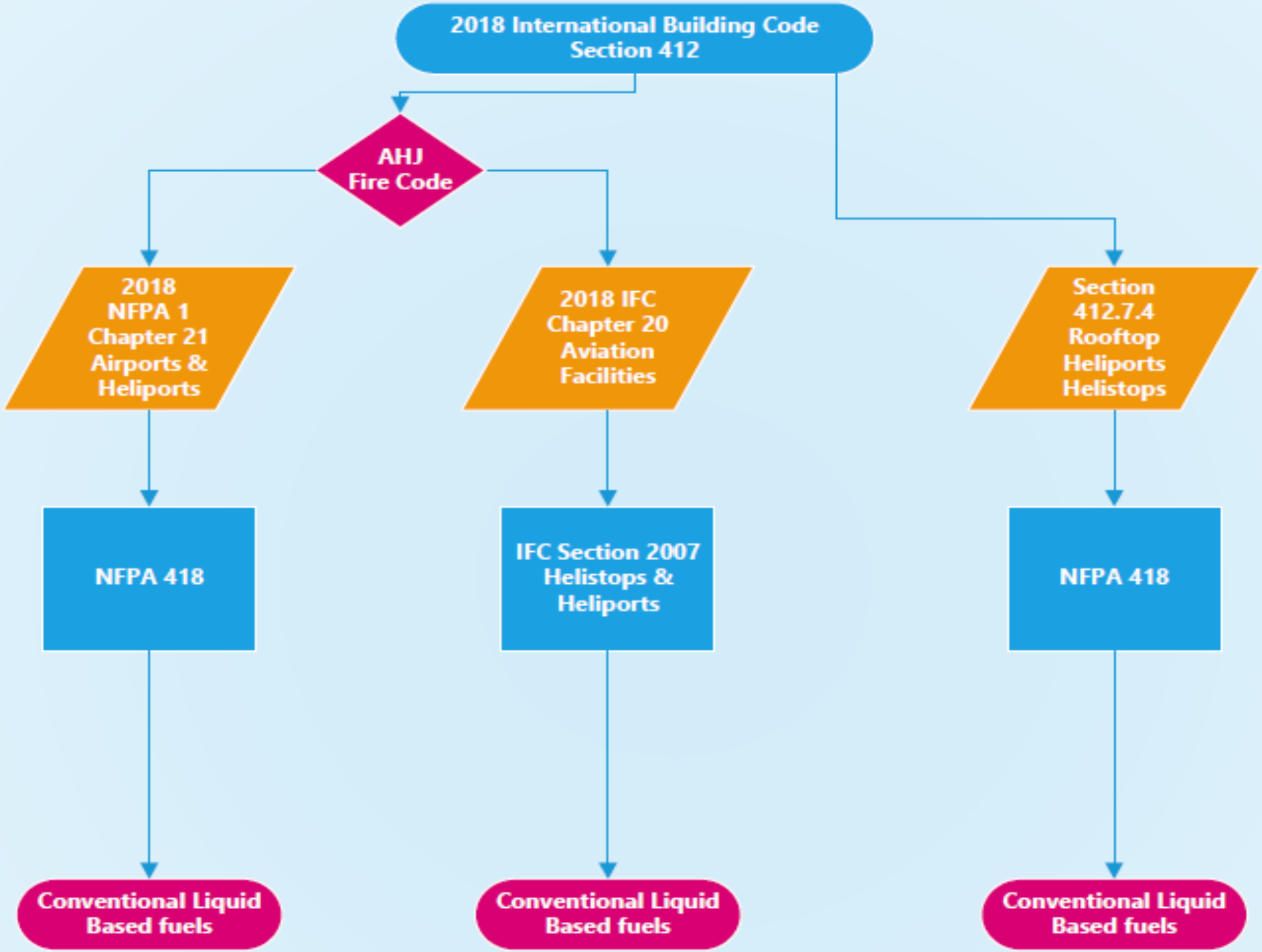
- Some may suggest that all you need is a few good installations to convince other jurisdictions to follow along
  - In the process of reaching that milestone all you (don't) need is one mishap or fire event to derail future efforts.

Current Regulation of Liquid Fuel Helistops

- Both model building codes immediately reference to NFPA 418 Standard for Heliports for rooftop installations
  - The NFPA 418 standard is also referenced in Appendix D of FAA Advisory Circular 150/5390-2C via Section 317(b)

- The International Fire Code provides requirements focused on fire safety but it does not reference NFPA 418

- The IFC defers to the International Building Code for egress but otherwise writes its own fire safety requirements
  - While ‘similar in approach’ the IFC is not the same as NFPA 418
  - Jurisdictionally the IFC may supercede NFPA 418 but in other cases the code officials may defer to NFPA 418


2018 International Building Code
Section 412
AHJ
Fire Code
2018
NFPA 1
Chapter 21
Airports &
Heliports
2018 IFC
Chapter 20
Aviation
Facilities
Section
412.7.4
Rooftop
Heliports
Helistops
NFPA 418
IFC Section 2007
Helistops &
Heliports
NFPA 418
Conventional Liquid
Based fuels
Conventional Liquid
Based fuels
Conventional Liquid
Based fuels

IFC Rooftop Helistop & Heliport Summary

- Clear Area Surrounding Touchdown Area (anti-collision measure)
- Liquid Fuel Spill Containment
- Standpipe System at Roof Level
- Foam Protection
  - Required by IFC w/o Exception
  - NFPA 418 requires but provides some alternatives and exception
- Portable Fire Extinguishers

- While clearly all part of a comprehensive fire safety and protection scheme these requirements only focus on the risk and hazards posed by liquid fuel aircraft and spills

- EVTOL aircraft and rooftop operations will require a comprehensive evaluation of fire risks and hazards

Specific Areas for Attention - Containment

- At present all codes require some form of liquid containment as a means to protect the building below from spills, leaks, or other loss of fuel containment along with equipment to foam (blanket) the surface and suppress
  - Clearly a liquid hazard protection measure
- Follow up support for firefighting hose streams is accomplished via the building standpipe being extended to the roof level
  - This measure would be part of both liquid and EVTOL sites
- EVTOL locations would need to focus on the power cell and it’s external hazards during fire or runaway events instead of liquid containment

Specific Areas for Attention – Portable FE's

- Current extinguisher requirements prefer B:C rated dry chemical agents for their liquid firefighting capability and to protect aluminum parts and aircraft systems
- The changing dynamic of materials used in all aircraft means that plastics and synthetics are overtaking metals and alloys
- When burning plastics (flowing solids) are involved in fire there needs to be a Class A capable extinguishing agent
- Aircraft in general also present the challenge of an obstacle fire and require specific fire extinguishers
  - NFPA 10-2018 Section 5.5

Additional Considerations to Explore

- Remote power disconnect from a point below the roof
- Roof level video feed available to emergency responders
  - At premise or via wireless method to dispatch and responders
- Integration of building fire alarm to roof alarm devices
  - Voice based EVACS more versatile that general alarm as it allows for directed instruction to occupants
- Coordinated emergency response plan with local agency
- Roof access elevator sized to accommodate EMS stretcher ***OR*** equivalent patient transport in existing bldgs
  - 'Fire' codes have begun to address medical and rescue needs

Future Code Pathways

- New EVTOL at new construction or existing building
  - Future EVTOL fire & life safety requirements
  - Little benefit from also applying current liquid based protection
- EVTOL at existing liquid based helistop / heliport
  - Existing protection for liquid hazards (compliant or adequate?)
  - Adding future EVTOL fire & life safety requirements
- Can EVTOL have more than one energy source ?
  - Varying energy sources could necessitate different requirements to target the specific hazard
  - What if multiple energy sources are anticipated?
    - Protection must match all hazards which are anticipated
- Could liquid fuel and energy based requirements possibly conflict or counter-effect each other ?

What Will be Needed

- EVTOL operations will need to be recognized for their uniqueness from liquid fuel aircraft operations
- In the absence of historical or fire loss data to understand the EVTOL ‘fire problem’ there will need to be risk/hazard analysis performed
  - Provide reliable assessment of problems which will need code attention
- Practical fire testing of aircraft shell & frame to evaluate best practices for extinguishment
  - What exotic alloys or combustible metals are present in aircraft
- Practical fire testing of energy cells to determine duration and energy release if extinguishment not possible

Thank You for Listening and Considering These Points

Call or Email with Questions

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