A threat-based approach to part 25 flammability regulations

Federal Aviation Administration

October 26, 2010

Sixth Triennial International Fire and Cabin Safety Research Conference

Jeff Gardlin, FAA Transport Standards Staff

Current Transport Airplane Flammability Requirements

- **Basic requirements contained in §§25.853, 25.855, 25.856 and 25.1713**
- **Test methods and detailed requirements contained in Appendix F**
- **Supported by Advisory Circulars and Aircraft Materials Fire Test Handbook**

Current Flammability Requirements

- **Apply to all interior materials, except:**
- **Small parts… that would not contribute *significantly to the propagation of a fire…***
- **Certain locations in the airplane, unless a specified type of part**
- **The interior portion of exterior surfaces**

Historical Evolution

- **Requirement for evaluating flammability of materials dates to 1940's**
  - First only if smoking was allowed
  - Then irrespective of smoking
- **Initially did refer to 'threat' i.e., ignition by a cigarette or matches**
- **Later requirements (into the 70's) simply based on material, or use, but not driven by threat per se**

Research Focus

- In 1958, FAA established the National Aviation Facilities Experimental Center
- One of its research programs investigated the threats posed by fires and ways to characterize them
- This program initially focused on materials and post-crash fire threats
- As the program matured, the focus on the threat(s) became more prominent

Threat-based research/regulation

- **Research focus on two basic fire threats: in-flight and post-crash**
- **Characterization of those threats in a way that lends itself to standards**
- **Regulatory action based on the research, and safety benefit assessments specific to each action**

Threat Characterization for Standards

Current State

- **Appendix F has grown and evolved over 40-plus years**
- **Each successive revision has focused more specifically on a particular safety issue**
  - Beginning with radiant heat standard for escape slides
  - Continuing through radiant panel for inaccessible areas
- **Many materials/parts are subject to multiple requirements**
  - Because of different usage (carpet on a floor and a sidewall)
  - Because more than one requirement applies (both Bunsen burner and Heat Release apply to affected parts)

Current State cont.

- Appendix F has 7 parts
- Only part I establishes requirements based on type of material (as opposed to usage)
- Current approach, whether by usage or material, is to list applicable parts explicitly
- All requirements permit ‘other approved equivalent method’

Main Factors in Establishing Flammability Requirement

- **Nature of threat: principally**
  - Post Crash, or
  - In flight
- **Potential contribution of the item: principally**
  - Propagation, and/or
  - Intensity, and/or
  - Penetration
- **Relative ability to mitigate: principally**
  - Accessible, or
  - Inaccessible

Threat Hierarchy

- **Accessible, or exposed materials subject to both in-flight and post crash threats**
- **Post crash is more intense threat**
- **In general, parts meeting post crash requirements are acceptable against in-flight threats**
- **In-flight threats most significant for materials in inaccessible regions, which are generally not subject to the post crash requirements**

Several motivators for new rulemaking

- **Enhanced safety**
- **Standardization**
- **Simplification**

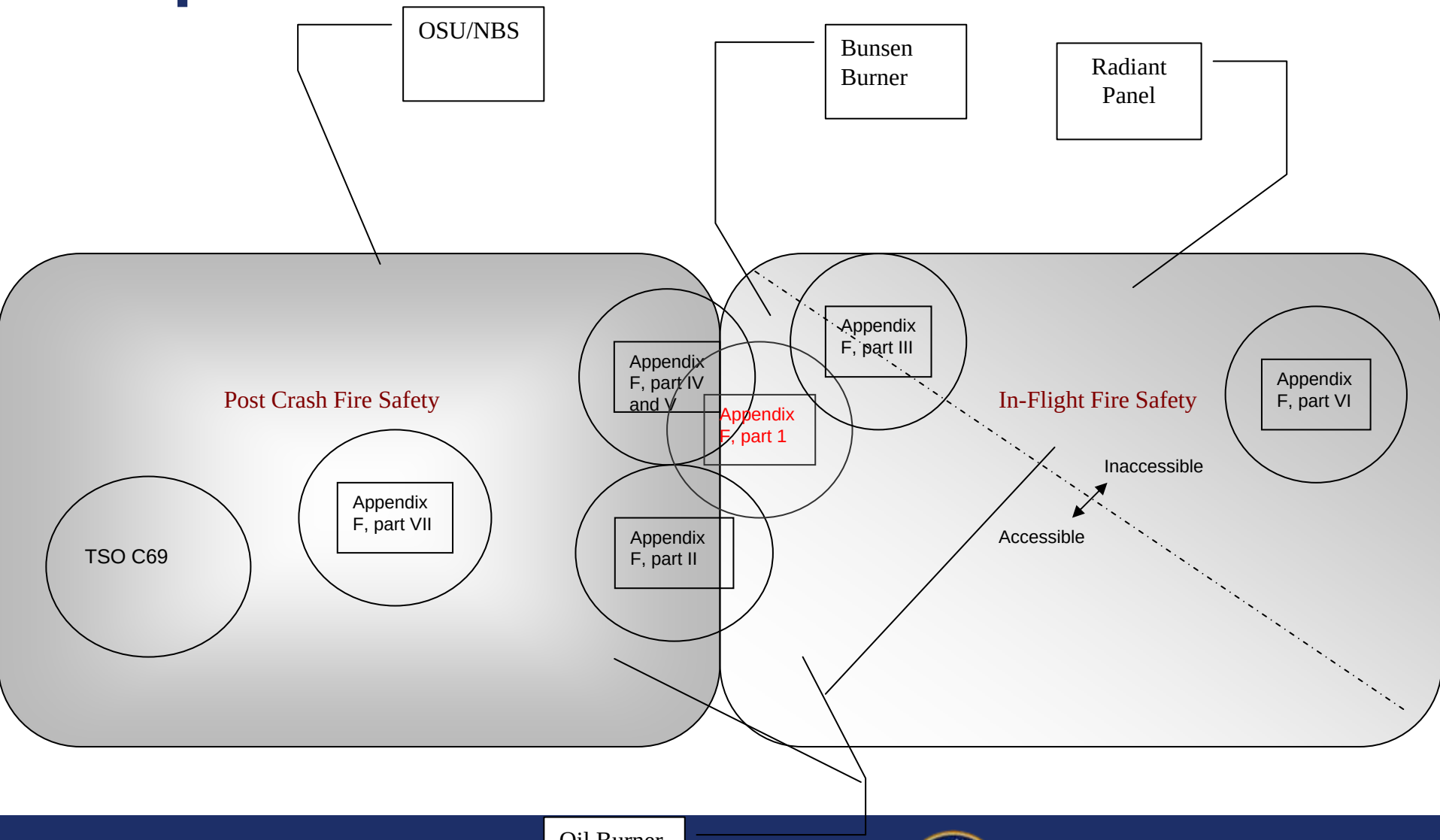
Existing Test methods and their applicability

- **Bunsen burner: post-crash, in-flight, accessible and inaccessible materials—six possible tests/criteria**
- **Oil Burner (seats, cargo liners, insulation): used both for post-crash and in-flight threat representation, accessible and inaccessible materials—three test methods**

Existing Test methods and their applicability

- **OSU/NBS Chambers: Post-crash, in-flight accessible materials—two test methods**
- **Radiant Panel: in-flight, inaccessible materials (currently just insulation)—single test method at present**
- **Radiant furnace test for escape slides (only captured in TSO C69)—single test method**
- **Fire containment for receptacles—not captured in a rule per se**

Representation of Current State



Current state has

- **Lots of overlap**
- **Lots of test methods**
- **Challenges to determine applicable requirements**

Example of Simplified Structure

- **Appendix F, Part I :**
  - In-flight fire protection requirements
- **Appendix F, Part II:**
  - Post crash fire protection requirements

Future Appendix F, part I

- **IA Radiant Panel Requirements for Inaccessible areas**
- **IB Oil burner—cargo liner Requirements for cargo compartments**
- **IC Fire containment tests for all disposal receptacles**
- **ID Bunsen burner General Requirements**
  Resistance to ignition;

Future Appendix F, part II

- IIA OSU/NBS—Large surface area parts
- IIB Oil burner—Cushions
- IIC Oil burner—Insulation in the lower half
- IID Radiant furnace—Escape slides

Current Appendix F, Part I would become…

- **Things not covered elsewhere that could contribute to the propagation of a fire**
- **Possibly only 1 test method (for airplanes with >19 pax)**
- **Simplified method to qualify common things, such as adhesive used to bond two parts together (a ‘fabricated part’ is covered by one of the other tests)**

Some Issues to Consider

- **Airplanes with less than 20 passengers**
  - Some standards currently don't apply
  - Would one test method be sufficient in that case?
- **Small parts: concept based on size might not be most appropriate**
- **Implementation: simplified rule might be attractive, but could also include some enhancements to safety, i.e., certain elements more onerous than currently**

Status

- **FAA beginning the rulemaking process**
- **ARAC tasking published in August**
- **First Working Group meeting is scheduled**
- **FAA will provide a proposal to ARAC, rather than request a proposal starting from scratch**