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August 10, 2012

Federal Aviation Administration
800 Independence Avenue, SW
Washington, D.C. 20591

Attention: Ms. Margaret Gilligan, Associate Administrator for Aviation Safety

Subject: ARAC Recommendation, Materials Flammability Working Group

Reference: ARAC Tasking, Materials Flammability, Federal Register, August 27, 2010

Dear Peggy,

The Transport Airplane and Engine Issues Group and the Materials Flammability Harmonization Working Group are pleased to submit the attached report in response to the Reference tasking. The Working Group report was approved unanimously by Transport Airplane and Engine Issues Group at our July 25th, 2012 meeting.

TAEIG would like to make special note that considerable work remains prior to drafting new regulations and advisory material to address flammability requirements and related testing. Significant progress was made during the Materials Flammability Working Group's tenure; however, due to the complexity of the issues we recommend continued collaboration between the FAA and industry.

Sincerely yours,

Craig R. Bolt

C. R. Bolt
Assistant Chair, TAEIG

Copy: Mike Kaszycki – FAA-NWR
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ARAC TAEIG

Materials Flammability Working Group Report

July 9, 2012

Revision History

Revision	Description	Date
Original	Original	5/4/2012
Version 0.1	Team Leader release	5/6/2012
Version 0.2	Working Group release	5/11/2012
Version 0.3	For TAEIG status review	5/14/2012
Version 0.4	Cancelled	
Version 0.5	For TAEIG review with comments	5/21/2012
Version 0.6	Updates for WG review	5/31/2012
Version 0.7	Update for WG review	6/18/2012
Version 0.8	Final draft	7/2/2012
Version 1.0	Report Issued to TAEIG	7/9/2012

Table of Contents

1.0 Executive Summary

The FAA has proposed a new approach for flammability regulations. This new approach is an attempt to move from what has been a reactive set of regulations to a proactive safety framework. The FAA proposal is to completely rewrite and update the existing flammability regulations based on the fire threat. . It attempts to base the flammability performance for different parts of the aircraft upon realistic threats that could occur in-flight or in a post-crash environment.

The FAA recognized that this new approach could substantially affect industry and have a substantial regulatory impact both in the United States and internationally. The FAA sought broad input in evaluating the concept by proposing that an Aviation Rulemaking Advisory Committee (ARAC) Working Group be tasked with review of the proposed approach.

In August of 2010, a new ARAC working group was formed. The task for the new working group was: "**to consider the effectiveness of this new approach and recommend changes or improvements".** The main objectives of the revision and consolidation are to establish threat based flammability performance requirements that will

- **Provide simpler regulations.**
- **Simplify compliance demonstrations.**
- **Maintain or improve aircraft safety in fire related incidents.**

Along with this general review of the proposed method, the working group was to answer six specific questions. The specific questions:

1. **Is the threat based approach organized correctly?**
2. **Is App. F I (Bunsen burner) necessary for items covered with more stringent (Appendix F II-VII) tests?**
3. **Are there regions within the aircraft not covered that should be?**
4. **Can requirements be simplified while maintaining or improving safety?**
5. **How should non-metallic structure be handled? (e.g. Seats and airframe/fuselage)**
6. **What advisory material is needed to implement the new threat-based flammability safety structure?**

A working group was formed with over 20 members drawn from regulatory authorities, airframe manufacturers, equipment manufacturers, and operators. Members were drawn from the United States, as well as international representatives.

The results of the group's efforts produced consensus on the following assessments and recommendations:

a) The working group believed that the proposed threat-based organization for the flammability regulations was logical, practical and a more effective framework for regulation going forward than the current published regulations.
b) The group believed that the resulting regulation draft, along with appropriate advisory material, would ultimately be simpler and more easily understood and enforced
c) While the current flammability regulations may be reactive in nature, they have been extremely effective for our current fleet. The new structure should move the safety paradigm to avoiding incidents rather than reacting to them. Great care must be taken in moving from the old structure to the new structure to minimize the inevitable costs of change. Joint industry/FAA initiatives will help reduce the potential costs of the proposed change.
d) There are steps that can be initiated now that will substantially reduce compliance demonstration costs. If these programs are pursued as a part of the new regulatory change process, the net cost of change to a new regulatory structure will be reduced. These programs include developing a test hierarchy, listed approved materials, size and spacing criteria, acceptable industry or engineering tests, and analysis in lieu of testing.
e) The working group identified substantial additional work that must be done **before** this new regulatory structure can be proposed:
    - There must be additional work done to create and define tests for some of the portions of the aircraft not currently regulated. There must also be work done to refine and finalize some of the tests that cover existing areas of the aircraft.
    - The working group feels very strongly that advisory material must be developed and released concurrently with any revision of the regulations to avoid difficulties in implementation.
    - Industry efforts such as those provided by the Flammability Standardization Task Group (FSTG) will be needed in order to remove redundancy and/or eliminate unneeded testing, to create or refine current test methods, and to support creation of a data base of approved or “listed” materials which will not require additional testing.

- As with all regulatory changes, safety assessments and cost of compliance estimates are needed to assure cost/benefit is in alignment. The working group recommends a strategic application of requirements that maximizes the safety benefit while minimizing the compliance costs.
- We recommend that the TAEIG and the FAA consider a comprehensive 'systems' cargo task be developed, and a similar working team be formed.

The group's efforts produced the following answers to the six questions:

1. Is the threat based approach organized correctly?

   A threat based approach is a more rational and understandable policy than the current regulatory language. By defining the threat and expected performance, testing should be more traceable to the original intent over time, as aircraft materials and systems change. The new draft version of the regulation presented as a part of this report reflects what we think is the best organization. While the new draft regulatory language structure simplifies the regulations, we have not evaluated whether it simplifies compliance demonstration at the aircraft level. If we consider only the parts and constructions that are currently tested under the existing 25.853, the proposed regulation would result in a reduction in the number of tests to be performed.

2. Is App. F I (Bunsen burner) necessary for items covered with more stringent (Appendix F II-VII) tests?

   The group finds appropriate to eliminate the need to perform Bunsen burner testing on parts that are tested to a more stringent standard. However, Bunsen burner tests are still required in many areas where more stringent tests are not specified, as well as for aircraft with less than 20 passengers. The broader question of superseding test methods with other, more stringent test methods is addressed in our Hierarchy section contained within this draft language.

3. Are there regions within the aircraft not covered that should be?

   There are areas/materials/parts not covered that should be covered **based on consistency with the threat-based concept**. The working group has not reviewed accident and incident data to determine if the proposed changes would have affected outcomes in prior accidents and incidents. Where items are covered that were not previously covered, compliance effort and compliance cost to industry will be increased, at least initially.

4. Can requirements be simplified while maintaining or improving safety?

   Requirements CAN be simplified (and the working group thinks that our draft of the regulations is simpler and clearer). While the text of the threat-based regulation may be simplified, we have not evaluated the extent to which showing of compliance has been simplified. We have increased the number of items evaluated for flammability, but eliminated redundant testing required on each item. The net change in testing and compliance effort required for all items is unknown.

5. How should non-metallic structure be handled? (e.g. Seats and airframe/fuselage)

   Non-metallic fuselage was considered in the proposed language for burn through and non-accessible area testing. Non-metallic hidden seat structure, as well as flammable metallic structure, was considered with respect to the threat-based regulation language. While we have placed the testing requirements for magnesium seat structure logically within the draft regulation structure, there is not currently a test method for magnesium seat structure. Test methods must be developed or refined before proposed new regulations can be implemented. We decided that there is not currently sufficient information available to propose additional test requirements for non-metallic hidden seat structure. This area is recommended for further study.

6. What advisory material is needed to implement the new threat-based flammability safety structure?

   Along with the new threat-based regulation, the group recommends a comprehensive reconsideration of the existing Advisory Circulars (AC's) on flammability requirements. Whenever needed, new AC's will have to be developed to identify criteria for the showing of compliance with the new requirements. In addition to new or revised Advisory Circulars, a newly created Fire Test Methods Reference (FTMR) specifying test methods and apparatus should be issued. The FTMR will consist of relevant materials from the current Aircraft Materials Fire Test Handbook (Handbook), revised as appropriate, and of new chapters developed to describe the new test methods introduced by the new regulation. An updated Handbook should then be issued. This should all be done before or concurrent with issuing the new regulation.

2.0 ARAC Background

The Aviation Rulemaking Advisory Committee (A R A C) was formed in 1991 to provide information, assistance and advice to the FAA to support rulemaking. ARAC is made up of representatives from stakeholders in aviation. The FAA has sole responsibility to task ARAC with work to be done.

When ARAC is given a task by the FAA, they meet and decide whether or not the task is one they can accept. If the task is accepted, it is published in the Federal Register and ARAC forms a working group to develop the information and recommendations requested by the FAA.

The FAA proposed a new task, to form a Materials Flammability Working Group (MFWG). The task was published in August, 2010. The task is to review a proposed revision for flammability regulations and make recommendations.

3.0 Tasking

Adapted from the Federal Register Notice (found in Appendix 9.1):

The FAA has drafted an approach with the intent of simplifying compliance demonstrations, and maintaining or upgrading the level of safety for flammability throughout the airplane. The objective of the FAA's proposed approach is to completely revisit flammability requirements to provide a simpler regulation that maintains or provides a higher level of safety for transport category airplanes.

The working group was asked to:

- Consider the merits of the FAA's proposed approach for a threat-based structure for § 25.853 and Appendix F
- Make recommendations for improvement to the approach, including, classification of the various parts of Appendix F,
- Make recommendations for advisory material necessary for implementation.

The report should address the following questions for the proposed approach, including the rationale for the responses.

1. Is the proposed threat-based approach for § 25.853 and Appendix F, parts II through VII organized correctly?

2. Is Appendix F, part I, necessary for items covered in parts II through VII?

3. Are there regions of the airplane not currently covered by flammability requirements that should be?

4. Can the flammability requirements be further simplified while maintaining or improving the existing level of safety?

5. How should non-metallic structure (*e.g.,* airframe and seats) be addressed?

6. What advisory material is needed to implement the new structure?

The working group restated and amplified the tasks internally to try to more fully frame our mission. They reviewed "the merits" of the proposed approach, looked at the

overall fit of the new approach, as well as the effects on different regions of the aircraft. In each of these, the working group tried to address the issue as to whether the threat-based regulations were simpler or more complex, as well as whether the compliance demonstration would be feasible and cost effective. In order to see if the proposed threat-based structure worked well, the MFWG attempted to draft a revised and consolidated threat-based § 25.853 and Appendix F, outline additional advisory material requirements, and reviewed effects on other part 25 sections related to flammability compliance.

OBJECTIVES:

- **Simplify compliance demonstrations.**
- **Provide simpler regulations.**
- **Maintain or improve safety for fire related incidents.**
- **Evaluate new approach and make recommendations.**
- **Outline follow on work that should be done before attempting implementation of revised regulations.**

Below are the six questions, with the working group interpretations:

1. Is the proposed threat-based approach for § 25.853 and Appendix F, parts II through VII organized correctly?

Can the working group re-draft § 25.853 and Appendix F into the new approach and reach a consensus?

2. Is Appendix F, part I, necessary for items covered in parts II through VII?

Appendix F part I covers the basic Bunsen burner tests that were originally the only requirements for flammability when regulations were first established. The MFWG looked at whether these requirements could be eliminated, now that much harsher threat based tests have been imposed. The group also expanded the question, to look at whether specific test methods could supersede or be substituted for other test methods.

3. Are there regions of the airplane not currently covered by flammability requirements that should be?

The group looked broadly at whether some regions were not addressed, as well as whether parts or assemblies within those regions were not adequately addressed by current regulations.

4. Can the flammability requirements be further simplified while maintaining or improving the existing level of safety?

The group reviewed the testing hierarchy as discussed in (2) above, as well as proposing the use of listed (approved) materials. As an objective, the proposed threat based regulation draft was to offer a complete and simplified regulation.

5. How should non-metallic structure (*e.g.,* airframe and seats) be addressed?

The group addressed this through (1) above, striving to integrate these items into the proposed threat-based structure. We further attempted to structure the language in an open ended manner, such that new materials, parts and assemblies would be covered.

6. What advisory material is needed to implement the new structure?

The working group attempted to develop outlines for additional Advisory Circulars, the Fire Test Handbook, and a new Fire Test Reference Manual needed to support the new threat-based regulation.

4.0 Working Group Members

NAME	COMPANY
Jim Davis	**AccuFleet**
Jean-François Petit	**Airbus**
Cheryl Hurst	**American Airlines**
Thomas Livengood	**BEAerospace**
Kendall Krieg	**Boeing**
Dan Slaton	**Boeing (alternate)**
Ian Lulham	**Bombardier**
Scott Campbell	**C&D Zodiac**
David E. Lucas	**Cessna Aircraft Company**
Jean Claude Lerminiaux	**Dassault**
Serge Le Neve	**DGA**
Enzo Canari	**EASA**
Francisco Landroni	**Embraer**
Becky Wulliman	**Evonik**
Jeff Gardlin	**FAA**
Dick Hill	**FAA**
Phuong Ta	**Goodrich**
Ed Nixon	**Gulfstream**
Ralph R. Buoniconti	**SABIC Innovative Plastics**
Mike Miler	**Schneller**
Claude Lewis	**Transport Canada**
Robert Trimble	**Weber**

5.0 Meeting Schedule

DATE	LOCATION
November 2, 2010	DFW Airport (first meeting)
January 5, 2011	Clearwater
March 3, 2011 (with IAMFTWG)	Savannah
May 4, 2011	Seattle
June 1, 2011	Fort Worth
June 20, 2011 (with IAMFTWG)	Bremen
July 13, 2011	Ottawa
August 16, 2011	Huntington Beach
September 13, 2011	Montreal
October 17, 2011 (with IAMFTWG)	Atlantic City
January, 2012	Fort Lauderdale
April 2, 2012	Washington D.C.

The group met at sites in both North America and Europe. There were also numerous online conferences, conference calls, and two different websites upon which the group shared and exchanged ideas.

6.0 Working Group Recommendations

The flammability regulations governing transport type aircraft have primarily been developed on a reactive basis. As accidents and incidents have occurred, their causes have been investigated, and regulations have been put in place to avoid a recurrence of the prior failure, and to mitigate post accident hazards. The current regulations are a patchwork of changes that have evolved over time when new issues have arisen. Flammability requirements have become increasingly complicated, sometimes conflicting, and occasionally incomplete or obsolete for dealing with current aircraft. The FAA and the aviation industry have been struggling with the increasing cost and complexity of demonstrating compliance with the current flammability regulations.

To address this issue, the FAA has proposed a new approach for flammability regulations. This new approach is an attempt to move from a reactive set of regulations to a proactive safety framework. The FAA proposal is to completely rewrite and update the existing flammability regulations. These regulations are currently found in different paragraphs of 14 CFR part 25. The new structure consolidates flammability regulations in § 25.853 and the associated appendix F. This effort applies only to flammability requirements within the typically pressurized portion of the aircraft; the separate requirements for specialized areas (e.g. wing tanks, engines, etc.) are not contemplated in this proposed revision. The new FAA approach to fire safety regulation is threat-based. It attempts to base the flammability performance for different parts of the aircraft upon realistic threats that could occur in-flight or in a post-crash environment.

The proposal is to design a coherent structure for flammability regulations. The result should be an organized framework into which the current flammability requirements can be placed. This structure should also accommodate future materials and systems, providing a logical place for any new requirements, and a clear statement of what performance will be expected in each area of the aircraft. This organized basis for regulating the flammability of aircraft components is designed to avoid future incidents and accidents, and effectively mitigate the hazards of a post crash fire. The new approach orients the regulations to proactively avoid or mitigate the effects of future in-flight incidents and accidents, rather than reactively adding regulations after incidents and accidents have occurred.

The proposed approach is a new design philosophy which divides the threat based safety requirements into two operational regimes: in-flight and post-crash. The in-flight

regime includes all normal operational phases for the aircraft, including taxi, takeoff, cruise and landing. The objective is to ensure that fire threats do not present a direct hazard to the occupants and allow the safe flight, landing and potential evacuation of the aircraft. The post crash regime assumes a post-incident environment where at least some of the occupants have survived. The objective is to sustain survivable conditions long enough to evacuate the aircraft.

For the in-flight regime, the working group considered different zones where common safety requirements are found. In order to differentiate these zones, the group identified and reviewed five different parameters. The parameters are:

1. Nature and likelihood of ignition source.
2. Likelihood of detection.
3. Ability to mitigate.
4. Proximity to occupants.
5. Proximity to flight critical systems.

Proximity to occupants has multiple dimensions. Within the cabin, occupants are part of both the detection and mitigation systems, but are also one of the potential ignition sources, as well as subject to direct danger from fires.

For the in-flight regime, the group then divided the aircraft into the appropriate zones:

1. Accessible areas within the cabin. The TSA controls materials carried on by the occupants. Due to the post crash fire requirements, the materials inside the cabin are highly fire resistant. The nature and likelihood of ignition sources is small. The occupants are part of both the detection and mitigation systems. The fact that occupants could be directly harmed sets a high standard for safety in this region. The ability to harm flight critical systems is small, with the exception of the flight deck (access to which is highly restricted in flight).
2. Areas that are non-accessible. There are a large number of potential ignition sources and the size of the ignition source varies from a smoke/overheat event to something larger (the FAA Technical Center is suggesting approximately basketball in size).[1] Detection systems are limited to smoke detection within HVAC systems or sensory (smell and observation). Mitigation measures are passive, with the ability to intervene limited or nonexistent.[2] While proximity to occupants is not great, proximity to flight critical systems is extensive.
3. Waste containment receptacles. The likelihood of an ignition source is high due to illegal smoking and the disposal of flaming or near flaming materials on the commercial aircraft (or legal smoking if permitted). Likelihood of detection is good within these areas, as galleys, crew rests and lavatories have smoke detectors. Ability to mitigate is mixed. Waste containers are often at the interface

between accessible and non-accessible areas and could allow spread of fires into the non-accessible areas. Containers are designed and tested to contain fires based on current regulations. Lavatories also have eutectic actuated fire extinguishers.

4. Cargo compartments. The likelihood of ignition sources is high and the size of the fire can be large due to the less controlled nature of cargo. Likelihood of detection is good due to detection systems. Ability to mitigate varies depending on the classification of the cargo compartment and the fire suppression systems. With respect to a fire threat, there is minimal proximity to occupants, but higher proximity to flight critical systems, though aircraft design considerations enforce extensive critical system separation.

In the post crash regime, the threat is a large fuel-fed pool fire. The objective is to provide adequate evacuation time. This requires:

1. Protection for escape equipment. This brings in the testing currently done to support TSO for evacuation slides. By setting a threat based standard for this type of equipment, expectations are set for any future evacuation aids.
2. Limiting flame penetration into the cabin. For aircraft with 20 or more passengers, protection will be provided which keeps the pool fire outside the cabin for a period of time. This protection is proposed regardless of the method used to provide it, so that methods other than insulation will be held to a consistent performance level.
3. Limiting flame spread within the cabin due to the involvement of cabin materials. The large exposed interior panels and seating systems must not become heavily involved in the fire until evacuation has been achieved.

6.1 Development Approach

In order to determine whether the new threat-based structure will be effective for writing regulations and in reducing or eliminating a fire threat, the group attempted to consolidate and draft new 25.853 and appendix F language and related test requirements for the aircraft. This effort allowed the working group to address all six specific questions, and provided insight into the broader objective of ensuring and promoting safety.

It was expected that this effort would produce one of three different results:

- CASE 1: The group was successful in drafting proposed threat-based regulations using the new approach. We could then: A) answer the questions about the new

approach positively, and B) provide a good initial draft of the revised threat-based regulations for use by the FAA.

- CASE 2: The group could not reach consensus on the entire rewrite, but made substantial progress on parts of the revision. Based upon the actual progress made, we should be able to answer the questions raised by the tasking. We should provide good draft language where the group had consensus on how the regulations should read. We should also provide indication of which areas will be more difficult to get consensus, and provide draft language on some different draft versions that we developed while trying to reach consensus.
- CASE 3: No progress and no consensus on how the regulations should be rewritten. This would lead the group to answer negatively as to the new approach, and highlight the reasons for lack of progress.

The working group effort resulted in the Case 2 outcome. The group's attempt to draft the regulations using the new approach illuminates where agreement can be found. In those areas where finding consensus will be more difficult, we developed positions with the widest support, and alternate wording. The drafting effort highlighted areas where additional development and research must be done as a follow on effort by others. Included in these efforts are the substantial advisory materials that must accompany a revision of this magnitude.

The draft provides a potential framework into which amendments could be made in current regulations over time, moving towards the objective of a better organized regulation. The group also found where changes could be made under the existing regulations to provide simplification.

The sample regulatory language proposed contains some language that will likely be more appropriate for preamble or advisory material, but is combined here for simplicity and with the understanding that the proposal requires additional efforts (test method development, advisory circulars) before it can be implemented. However, since a draft NPRM is not part of this recommendation, the proposed rule language includes more of the relevant discussion and rationale than is typical.

Wherever possible, we have included additional commentary by the group members. It is presented as a numbered, linked note. The note reference number is in red.

6.2 Recommendations Applicable to Multiple Areas

The group's commentary, recommendations and discussion follow in sections 6.3 and 6.4, organized by flight regime and zone within the aircraft. There were some recommendations that applied more broadly to many different areas. These topics are discussed in this section.

6.2.1 Cost / Benefit Challenge

While the current flammability regulations may be reactive in nature, they have been extremely effective for our current fleet. We currently have the safest aviation system in the world. All known flammability issues have been addressed or are being evaluated for regulation. While this has **not** resulted in a cohesive and organized structure for regulations, it **has** resulted in regulations that address the known and critical safety issues. Industry has developed systems, compliance guidelines, and Methods of Compliance (MOC's), as well as the internal structures and procedures required to meet the current regulations. Due to the effectiveness of the current system, the "low hanging fruit" for safety has already been captured. The new structure should move the safety paradigm to avoiding incidents rather than reacting to them. Great care must be taken in moving from the old structure to the new structure to minimize the inevitable costs of change. The new approach includes language which covers regions of the aircraft not covered by current regulations. This is a substantial expansion of regulations, and potentially a substantial initial increase in the effort required for compliance. To mitigate the potentially costly compliance activities of expanded regulation, the group recommends strategic application of those requirements that maximize the safety benefit while minimizing the compliance costs. Joint industry/FAA initiatives will help reduce the potential costs of the proposed change.

While a revised regulation could improve clarity and provide better direction for those seeking guidance on the performance required by aircraft, much of the safety benefit may come from avoiding future failures. While the safety benefits may come in the future, costs of changing compliance methods will arrive immediately. The group has identified a number of areas where testing could be reduced or simplified. We recommend that these areas be given a priority if proposed rulemaking goes forward.

This will allow some immediate reductions in costs and testing to balance the costs of changing to a better (clearer) regulation.

6.2.2 Hierarchy

In order to reduce unnecessary testing, we agreed that whenever possible, only one type of flammability test would be performed on a part. We created a "hierarchy" section for the proposed regulation in a new Appendix F, part III. In many cases, when several tests are possible, one is clearly the most severe. In other cases, we deemed a test to be "severe enough". We do not think, and did not prove, that where we specify one test in lieu of another, that it could be proven that passing one test meant it would always pass the other test. We instead recognized that in setting performance standards, where the "acceptable" line is drawn is somewhat arbitrary. As such, we set a hierarchy based upon our experience and knowledge. While we are confident with the hierarchy we have proposed, there is potential for FAA and industry testing to support or modify various substitutions.

Flammability testing as used in this section have three different performance measures:

1. Barrier performance; resistance to flame penetration.
2. Flame spread containment
3. Total combustion or fuel provided to an ignition source.

There is potential for additional hierarchy substitutions in the non-accessible areas. Hidden areas have the back side of sidewalls (Heat Release), composite fuselage (Oil Burner) and cargo liners (Oil Burner). These are very severe tests, but do not measure flame spread, which is the criteria for radiant panel tests in the hidden areas. The substitution of these tests should be studied to determine if it is feasible.

6.2.3 Listed Materials

There are many materials with a long history of good performance, and a body of test data showing consistent performance. In particular, in the hidden areas, where substantial expansion of requirements is contemplated, there are proven materials with good performance. The group recommends developing listed approved materials in order to reduce unnecessary testing. This effort should be a joint FAA and industry effort. It should be set up as an on-going process, so that materials can be added as they demonstrate a history of acceptable performance. There should also be a mechanism for removing listed materials that have unexpectedly demonstrated poor performance.

6.2.4 Industry Tests

There are many accepted non-aviation tests which could be used in lieu of aviation tests. We recommend further study in determination of which tests are acceptable.

6.2.5 Engineering Analysis

Advances in analysis and modeling are rapidly allowing the determination of system performance by analysis rather than actual testing. We recommend that proposed language be open to this, rather than being limited to physical testing.

6.2.6 Focus on Material Tests

In systems which act as barriers or containers, construction details and features may need to be tested to assure that the safety purpose is met. For those tests that concern the overall flammability of materials used in the aircraft, we recommend that the rules be structured to permit material tests for a specimen representative of the typical part. As an example, we are concerned with the overall flammability of large panels in the cabin, to assure that they do not become rapidly engaged in a cabin fire. A panel may have many edge, corner, joint and radius features. Nonetheless, the overall flammability should be assessed with a single test of a specimen representing a typical portion of the panel. We recommend that the rule language be oriented towards representative material tests, not a test of every unique feature of a part.

6.2.7 Size and Spacing

A recurring issue is determination of the point at which a part becomes large enough that we are concerned with its flammability properties. A related issue is spacing, or “tiling” of small parts, which then may collectively act as a large part. We had extensive discussions on these topics in both the Accessible and Non-Accessible areas, with similar concerns. Size also needs to be rationalized with the criteria for acceptance (e.g. if a six inch burn length is acceptable for a part, should we even test a part with a five inch maximum dimension?). The tiling issue is especially difficult when trying to encompass small, adjacent parts on different aircraft systems. Consistent standards may not be practicable between systems until it is built into 3-D modeling and CAD-CAM systems. There are also many accepted size and spacing practices in the industry. We recommend for further study the determination and rationalization of size and spacing dimensions.

6.2.8 Comprehensive Advisory Materials

The group strongly recommend advisory materials be developed prior to rulemaking activity, so that when a new rule is ready, there is comprehensive advisory material support. The concept of regulations which state intent for performance, with details found in advisory materials like the Handbook was appealing. We proposed the

addition of another document, a “Fire Test Methods Reference” (FTMR), with all technical details of test apparatus. There was no consensus on whether this was an unnecessary additional layer of documents, or a required repository for information. There was strong, universal support for production of the “Certification Flow Diagrams”, examples of which were produced for the Cargo and Non-Accessible Areas. We recommend a FTWG task group with FAA and industry representatives study and recommend the advisory structure that best serves the purpose.

6.2.9 Rogue Failure Procedures

Some test methods have accommodation for “Rogue Failures”. These are unexpected failures which are not thought to be indicative of the materials’ actual performance. There are options in some methods to recover from these failures. The group agreed that this topic should be considered for ALL methods, not just some.

It has been voiced by Industry to the FAA that there needs to be a method to deal with rogue failures in the various flammability test methods that can be consistently applied to the regulations. This immediately brought up the issue of the definition of a rogue failure, i.e., establishing that the failure was indeed not representative. In an attempt to get around the requirement for this definition, the FAA proposed the following:

“For each material tested, a minimum of 3 samples must be tested. Should a sample fail, additional samples may be tested. At least 80% of all samples tested must pass. “

Although this works around the requirement to define “rogue”, it opens up the requirement that if one of three samples exceeds the requirement of the test, then at least two more samples must be tested to approve the material. For items such as veneered surfaces, this can lead to either long recovery times after a marginal failure of a sample (for example a single sample in a vertical burn test at 15.1 sec.) or the need to produce extra samples up front at great expense.

An alternate proposal would be to maintain the current pass/fail requirements for each test method (average, no failure, 2/3 pass as appropriate), and offer the above 80% pass approach as an option:

“For each material tested, a minimum of 3 samples must be tested. For a test series to pass, one of the following conditions must be met:

1) *The results must meet the applicable criteria of the specific test.*
2) *80% of the individual test specimens must meet the prescribed pass/fail criteria of the specific test”*

It is agreed that this topic needs to be addressed by the FAA and included in future regulations. However, at this time further study needs to be conducted. It is recommended that the Fire Test Working Group take on the challenge of this task.

Issues that have been brought up by members of the committee are as follows:

A review of each test method needs to be conducted for the statistical variation of the testing. This information should be included in the development of an acceptable means of addressing rogue failures for each test method. Ideally there would be one method to address these failures across all test methods, however, that may not be possible.

If the current pass/fail criteria for each test is abandoned for a pure percentage of samples that pass, then the pass/fail criteria needs to be evaluated. It is assumed that the current criteria have been developed based on how the samples are evaluated (averaged, 2/3 pass, no burn through, etc.)

6.3 Recommendations by Area – In-Flight

Discussion on the requirements for in-flight fire safety produced the greatest variances in proposed wording. This was not surprising, as it encompassed the greatest proposed expansion of regulatory language: coverage of all items in the non-accessible areas. Recommendations for each area follow.

6.3.1 Accessible areas

Materials in the accessible areas are typically subject to the much more severe test requirements of the post-crash environment.

6.3.2 Non-accessible areas

The draft regulation contains the baseline language originally developed during the first phases of our WG activities. During subsequent meetings the group's in-depth discussions diverged significantly, and we have concluded now at the cross-roads of the "7 options", with no majority consensus. This area has substantial work ahead by the FAA and industry to determine the best way forward. Critical to supporting higher standards in the non-accessible area will be issues addressed by Hierarchy, Listed Materials, and Size and Spacing research.

We recommend continued industry support of the currently active FTWG's Task Groups (i.e. - Ducting Material Test; Wiring Flammability Test; Radiant Panel for Insulation Test; Composite In-Flight Flammability Test). It is recommended that these FTWG-TGs expand their focus to include the issues highlighted in this report, such as the test method improvement, optional alternative tests, and the need for detailed AC guidance material.

A flow diagram for the original language is contained in the following chart:

Non-Accessible Decision Flow.pdf

The different proposed alternatives, along with discussion, are contained in the following spreadsheets.

Non-accessible Area Requirement Options

Non-Accessible Areas, Rev D,E,F,H--

Chart of Options for non-accessible Areas:

Non-accessible Area Requirement Options

6.3.3 Waste containment

Waste containment test procedures were brought from current best practices as used in certification. One of the most significant areas for review was the makeup of the "simulated trash" used in testing. Current in-fleet refuse is dramatically different from the "simulated trash" used historically in this test. Along with an update of the proposed "simulated trash" samples, a procedure for regular review is needed.

6.3.4 Cargo Compartments

The cargo compartment is a 'system' involving burn-through resistant materials (containment), detection, suppression, thermal isolation and smoke management to ensure a cargo fire of moderate to large size is suppressed and managed during the flight to protect passengers, supernumeraries, flight crew and aircraft. The 'system' includes compensating features that define the overall capabilities based on Class of compartment as defined in 14 CFR 25.857. The liner materials and features are important aspects of the system. The 2 GPH oil burner test for sidewalls and ceilings plus 45 degree Bunsen burner penetration resistance test for floors or lower liners have been shown to effectively evaluate the penetration resistance to maintain the overall liner system integrity in the event of in-service cargo fires. (Note: Neither the Oil Burner test nor the Bunsen burner test represent an actual cargo fire threat. They are an effective means to evaluate liner fire resistance.)

There are multiple open issues and opportunities involving the materials testing and 'system' aspects of the Cargo compartments:

Current cargo materials testing open industry issues (included in this tasking):

1. Since the inception of the original requirements for oil burner testing, a significant amount of testing (materials, joints, and features) has 'evolved'. The tests have migrated away from the original intent to ensure basic material and design feature performance into numerous point design and specific tests. The original intent was envisioned as a few performance tests; it has evolved into hundreds of point design tests. This has become onerous to the regulatory/certification process and industry.
2. Additionally, 12 second and horizontal Bunsen burner flammability tests (for parts and materials within the compartment) were retained after the adoption of the oil burner test, elimination of Class D compartments and upgrade of Class B compartments. These tests are viewed as duplicative and/or unnecessary for maintaining safety.

Other current cargo 'system' open and evolving industry issues (not included in this tasking):

1. Recent events and evolving transportation requirements (i.e. battery transportation, powered devices and other potentially hazardous materials) are driving potential new requirements for material handling and/or design features of cargo systems.
2. Full/large scale thermal testing and analysis of systems and non-metallic structure prompting issue papers and special conditions for new generation aircraft.

3. Newly released 14 CFR 25.795 update for design for security impacting cargo systems.
4. Lessons learned from large scale cargo conversions and modifications.
5. Potential replacement and hybrid suppression systems.
6. Incorporation of new Class 'F' to replace Combi current Class 'B'
7. Other(s) as deemed appropriate to be included in common industry and regulatory challenges for cargo systems

ARAC Materials Flammability Working Group Scope and Further Recommendations:

1. The scope of this tasking effort for cargo is (as defined in the charter) limited to material testing required by 14 CFR 25.853, and 25.855 plus as specified in Appendix F. The proposal is to move all material testing as currently defined in 25.855 (c and d) to 25.853. All 'system' aspects would be retained in 14 CFR 25.855.
2. As follow-up to this action and in order to comprehensively cover the balance of items listed in "Other current cargo 'system' open and evolving industry issues" listed above, this working group recommends the TAEIG consider a comprehensive 'systems' cargo ARAC tasking or other similar working group be formed.

   Additional specific recommendations for material testing may result from this activity. It's recommended that output from this activity be coordinated with the materials flammability working group.

Recommendations and rationales from the MFWG Cargo testing review :

1. No change to the oil burner test performance parameter requirements specified in Appendix F for cargo ceiling and sidewall liners in Class C and Class B/F (when applicable).

   Rationale: The oil burner does not replicate a specific, actual full scale cargo fire; it is meant to represent a realistic threat of sufficient size that it would challenge the liners and cargo systems, but should be able to be dealt with successfully. The oil burner test has historically proven to be a robust test for cargo liners as applied to ceilings and sidewalls.

2. No change to the 45 degree Bunsen burner test performance parameters for floor (or equivalent) for all compartment Classes. No change to the 45 degree Bunsen burner test performance parameters for liners of Class E compartments that are not required to protect critical or essential systems.

Hierarchical acceptability of sidewall or ceiling oil burner resistant passing results is considered acceptable as substitute for 45 degree Bunsen burner test.

Rationale: While the 45 degree Bunsen burner does not represent a specific cargo fire full scale threat, the 45 Degree test has historically been proven in-service to be an adequate test for cargo floors/liners (when applicable) with exception as noted in item 4) in this recommendation.

The 45 degree penetration test is a direct impingement test. There is no specific oil burner test for floors as there is for sidewalls and ceilings. The oil burner test with direct impingement testing (sidewall or ceiling) is considered a higher standard than the 45 degree test and therefore the results are acceptable.

3. Include oil burner resistant liner requirements to protect critical systems that can be impacted by cargo fire in Class E or Class B/F compartments.

   Various regulatory guidance/policy and industry design practice has been used over time to provide additional thermal protection of safe flight and landing systems of Class E and other compartments. The working group recommends this as a safety enhancement.

4. Include Oil Burner resistant materials for sidewall to cargo floor/liner interface transition to prevent fires from migrating from under floor space when no cargo floor is present (this is unique to certain manufacturer designs).

   Rationale: AD's (90-25-08) were required in the 1990's for aircraft with an 'open' cargo floor design to eliminate fire migration behind 'sloping' sidewalls. The tasking statement included the requirement to eliminate AD's by incorporating requirement into the rule.

5. Appendix F recommend to be updated to include the 2 GPH cargo 'sonic' burner (in development by the FAA-TC sponsored working group) as the prime test method while retaining the current (as originally defined, but commercially no longer available) 'Park' and other burners as optional.

   Rationale: Based on the insulation work, the Sonic Burner design from specific components has shown to be more repeatable (and long term available) than commercial-of-the-shelf burners. This decision is based on an assumption that the FTWG produces an acceptable burner that is harmonized for performance across industry; this is still work-in-progress at the time of this report.

6. Eliminate redundant Bunsen burner tests currently specified for components within the cargo compartment and/or part of the liner system.

   Rationale: Various components specified within the cargo compartment and part of the liners, and floors require 12 second or Horizontal Bunsen burner testing. The liners, detection and suppression system (including Class E decompression) are designed to accommodate carriage of materials far exceeding the fire threat contribution of aircraft components. Additional testing of these materials is considered to contribute very little to flight safety and therefore can be eliminated.

7. Recommend formation of AC cargo team through the FTWG to create AC materials for cargo testing. Relocate advisory information from the current Fire Test Handbook into the new AC relating to Methods of Compliance, standardized testing for common joints and in-service repair of liners.

   Rationale: The working group recognizes the significant amount of testing (materials, joints, features) that has 'evolved' since the inception of the cargo liner oil burner requirement. The original intent of the Industry is proposing that guidance materials (acceptable design practices and Methods of Compliance (MOC's)) will be provided as part of this activity to significantly reduce testing while maintaining safety.

We have provided a draft AC and test decision flow charts for cargo as a recommendation for consideration to greatly simplify and streamline cargo oil burner testing. The draft AC and Cargo decision chart are found below:

Cargo AC Proposal Rev 13 Rev 3_21_12

Cargo Decision Flow.pdf

6.4 Recommendations by Area - Post Crash

6.4.1 Escape Slides Fire Protection

In this area we discussed no new issues, just consolidation of current TSO procedures into regulations. This area might be broadened in the future into an escape equipment section, if other equipment is used for evacuation.

6.4.2 Magnesium Alloy Seat Frames

Test standards do not currently exist for magnesium seat structures, and should be developed by the FAA.

6.4.3 Large Exposed Interior Panels Bunsen Burner (less than 20 Passengers)

This test is brought forward with no issues. The 60 second test is retained for aircraft with less than 20 passengers.

6.4.4 Cushions

The proposed language allows use of Heat Release (HR) testing for thinly padded parts, to potentially ease the confusion or burden of testing for new types of seats where the line between structure and cushion supporting the occupant is blurred. Because test detail is pushed down to the FTMR, the methods for lightweight seats are not explicitly addressed in the proposed language. Lightweight seats are encompassed by the structure written, but not explicitly mentioned.

6.4.5 Fuselage fire penetration resistance (20 or more Passengers)

The intent of the working group effort with respect to Flame Penetration Resistance is to move all material testing as currently defined in 25.856(b) to 25.853. The proposal is to update the intent of the proposed 25.853 to capture any alternate means of compliance for flame penetration resistance such as new fuselage material /manufacturing technologies that have the ability to delay fire entry into the occupied compartments of the aircraft during a post crash fire event. The critical element to address is an

equivalent time period of five minutes before flame penetration into the cabin. Based upon full scale testing using insulation for penetration protection, the aluminum skin provided one minute, the insulation four additional minutes. New systems of protection might allocate penetration resistance between various systems. The net penetration resistance must add up to five or more minutes

Recommendations:

1) The current AC 25.856-2A for Flame Penetration Resistance of Thermal/Acoustic Insulation Materials would still be applicable; however an amendment would be required to incorporate any new guidance material required for Composite Fuselage Flame Penetration Resistance. e.g. may need additional information to define acceptable placement and mounting of the graphite composite skin onto the existing specimen holder frame

2) Appendix F to be updated to include the 6 GPH “Sonic” burner as the prime test method while retaining the current “Park DPL3400 model” and other burners as optional.

3) Formation of a Fire Penetration Resistance AC Team to create AC guidance material for new technology composite fuselage and other means of compliance.

4) Update of new Fire Test Method Reference to cover existing thermal/Acoustic insulation as well as new technology composite fuselage and other means of compliance. Some information that can be considered is below:

Information to be included in the new FTMR or updated Fire Test Handbook (DOT /FAA/AR-00/12 dated xxxxxx Chapter XX)

Definitions,

Apparatus,

Test Specimens,

Preparation of Apparatus,

Calibration,

Test procedure,

Report,

Requirements:

The test burner shall be a Next Gen (Sonic) Burner or a modified gun-type Park Model DPL 3400 or equivalent, with a 6.0 gal/hr fuel flow rate, providing an average flame temperature of 1900 ^{0}F.

(a) Thermal acoustic insulation flame penetration protection requirements are as follows:

(1) Each of the two insulation blanket test specimens must not allow fire or flame penetration in less than 4 minutes.

(2) Each of the two insulation blanket test specimens must not allow more than 2.0 Btu/ft2 -sec (2.27 W/cm2) on the cold side of the insulation specimens at a point 12 inches (30.5 cm) from the face of the test rig.

(b) Composite fuselage structure flame penetration protection requirements are as follows :

(1) Each composite fuselage structure test specimens must not allow fire or flame penetration in less than 5 minutes.

6.4.6 Large Exposed Interior Panels Heat Release (20 and more PAX)

HR testing is required for large exposed panels in aircraft with 20 or more passengers. It can be used in place of Oil Burner testing for thinly padded panels (often found as part of new style seating). The reliability and repeatability of this test continue to be an issue. It is important for the FTWG to continue to improve and standardize this test. This test is also one where focus on a materials test, as opposed to a features/construction test should be pursued.

6.4.7 SMOKE TESTING

One of the most difficult discussions in the post-crash area was on the potential to remove the requirement for NBS smoke testing. We should develop listed materials for acceptance without further NBS smoke testing. While the group did not reach consensus on removal of this requirement, there was agreement on a path forward as described in this smoke whitepaper:

NBS Smoke Test
White Paper Revision

6.4.8 Non-metallic Composite Structure in Passenger Seats

Background:

As part of the ARAC working group initiative, in-flight and post crash pool fire scenarios were reviewed for both existing as well as future areas within the aircraft. As part of this review, consideration for defining requirements to seats constructed using non-metallic structure was considered.

The main factor which drove this discussion and the need to consider extending more severe flammability requirements on non-metallic seat structure (currently requires only 12 second vertical burn) was a presentations on the actual full scale cabin fire test results provided by the FAA Technical Center. Although the testing was focused on evaluating the magnesium seat structure, it was observed that seat backs collapsed during the test.

References: FAA Special Conditions , Full Scale Test Results and SAE ARP-6199 Recommended Guidelines.

Current FAA Requirements:

All components on seats shall meet basic Bunsen burner requirements of 25.853(a). Only the exposed large non-metallic, non-traditional panels of the seat installed within the cabin interior must meet the Special Condition HR/ SD requirements.

Future Test Requirements under Consideration:

All non-metallic seat structure (principal materials only) within the construction must meet a cabin interior requirement more stringent ensures than today that durability of improved during a post- seats backs scenario. crash fire include the HR Options could per 14 CFR requirements other tests. 25.853(d) or

14 CFR 25.853 compliant cushion assemblies

Seat Composite

Discussion:

During initial cabin interiors discussions regarding the post-crash fire scenario, the working group developed the following proposal: (the item highlighted in bold indicates the initial proposal to perform heat release on composite seat structure but has since been removed.)

Aircraft with 20 or more passengers have additional requirements to assure time for evacuation:

- *The aircraft must be resistant to fire impingement on the lower half of the aircraft. The lower half of the aircraft must meet the requirements of Appendix F, Part II.A.*
- *Large exposed interior surfaces (excluding curtains) inside the cabin more than 12" above the floor must meet the requirements of Appendix F, Part II.B.).*
- *All cushions on or part of seating accommodations greater than ½ inch thick within the accessible areas must meet the requirements of Appendix F, Part II.C. All cushions on or part of seating accommodations less than or equal to ½ inch thick within the accessible areas must meet the requirements of Appendix F Part II.B or C.*
- *Seat structure made from flammable metallic alloys such as magnesium alloys (greater than X% mg) as detailed and allowed per appendix F, must meet the requirements of Appendix F, Part II.E.* ***~~Large non-metallic primary seat structure above the seat pan must meet the requirements of Appendix F Part II.B.~~***

All evidence available to determine whether to add or remove the highlighted language was primarily limited to the results obtained from the full scale cabin testing of magnesium seat structure. Improving heat release performance of materials used in large exposed panels has been shown to extend the time to flashover in a post-crash fire scenario, thus the team suggested this test requirement for non-exposed seat structure.

After additional discussions and further review of the full scale test results, test article design, construction and test objective, it was found that the specific material definition for the non-metallic seat back structure was undocumented. (The main test objective was to evaluate certain other metallic material (magnesium) improvements). Discrepancies with the seat cushions were also noted.

No full scale evaluation nor consideration for seats constructed with heat release compliant materials meeting the current FAA special conditions (following the MOC developed by the Industry, EASA and the FAA leading to the recent industry accepted guidance now published in ARP-6199) was available prior to publishing this report.

Conclusion:

Based on the limited full scale cabin test observations presented by the FAA Tech Center during the magnesium seat test program, there is concern that the seats constructed of non-metallic seat structure could pose additional risk when considering a

post crash pool fire threat. However, the necessary research needed to determine if new regulatory requirements are needed has not been done. Without further research there are technical questions that remain unanswered to adequately determine the appropriate test requirement. It is unclear whether the new Seat Special Condition requirements on large exposed seat panels will provide the necessary cabin safety or even whether heat release is the proper test for non-exposed non-metallic seat structure. At this time, the working group cannot recommend adding a new test requirement.

Additionally, some members of the working group recommend that in lieu of imposing additional heat release requirements, additional "oil burner type" test methods be developed for complete seats with definitive pass/fail criterion.

This recommendation would be more beneficial to the seat designers and modifiers when considering new threat based regulatory requirements. This recommendation is supported by the significant amount of time and resources expended using today's FAA special conditions

For reference, here are all the presentations on the magnesium test program that also included info on the poor performing seat cushions.

Reference:
FAATC status presentations provided at the Materials Working Group meetings:
1. June 2008:
http://www.fire.tc.faa.gov/pdf/materials/June08Meeting/marker-0608-Magnesium4.pdf
2. October 2008:
http://www.fire.tc.faa.gov/pdf/materials/Oct08Meeting/Marker-1008-MagAlloyTesting.pdf
3. March 2009:
* Overall Presentation:
http://www.fire.tc.faa.gov/pdf/materials/March09Meeting/marker-0309-Magnesium.pdf
* Seat Cushion Testing:
http://www.fire.tc.faa.gov/pdf/materials/March09Meeting/marker-0309-LabScaleTestCushions.pdf
4. June 2009:
http://www.fire.tc.faa.gov/pdf/materials/June09Meeting/marker-0609-MagnesiumAlloyFullScaleTesting.pdf

6.5 Engineering Analysis

Advances in analysis and modeling are rapidly allowing the determination of system performance by analysis rather than actual testing. We recommend that proposed language be open to this method, rather than being limited to physical testing.

6.6 Test Hierarchy

In order to reduce unnecessary testing, we agreed that whenever possible, only one type of flammability test would be performed on a part. We created a "hierarchy" section for the proposed regulation in a new Appendix F, part III. In many cases, when several tests are possible, one is clearly the most severe. In other cases, we deemed a test to be "severe enough". We do not think, and did not prove, that where we specify one test in lieu of another, that it could be proven that passing one test meant it would always pass the other test. We instead recognized that in setting performance standards, where the "acceptable" line is drawn is somewhat arbitrary. As such, we set a hierarchy based upon our experience and knowledge. While we are confident with the hierarchy we have proposed, there is potential for FAA and industry testing to support or modify various substitutions.

Flammability testing as used in this section has three different performance measures:

1. Barrier performance; resistance to flame penetration.
2. Flame spread containment
3. Total combustion or fuel provided to an ignition source.

There is potential for additional hierarchy substitutions in the non-accessible areas. Hidden areas have the back side of sidewalls (Heat Release), composite fuselage (Oil Burner) and cargo liners (Oil Burner). These are very severe tests, but do not measure flame spread, which is the criteria for radiant panel tests in the hidden areas. The substitution of these tests should be studied to determine if it is feasible.
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6.7 ADDITIONAL WORK

- The proposed hierarchy section should be reviewed and edited for completeness. After all reasonable substitutions have been proposed, a review of test data should be done to determine reasonableness of substitutions. For any tests where there is inadequate data to support substitution, a test program should be designed and undertaken by industry, managed by the FAA and the FTWG.
- Listed, approved materials would reduce the amount of testing. The group proposes that industry members of the FTWG develop a list of materials with consistent performance for which further testing is not required. This list should be provided to the FAA for review and inclusion in a listed materials system. The system should have clearly defined procedures for the addition of new materials if shown through testing and experience to be acceptable. There should also be

- It is proposed that a range of simple industry flammability tests (UL94V0, ASTM) should be acceptable in lieu of aviation Bunsen burner tests for some small parts. We propose that Industry members of FTWG develop a list of acceptable tests for FAA inclusion in a proposed new regulation.
- Size and spacing criteria are and will be found throughout flammability regulations. Along with a rationalization of the criteria in different areas, testing should be performed to determine at what point size or "tiling" become important. The concept that a larger part may be used without additional testing if industry test data is available should also be validated. A joint FAA / FTWG effort should study and recommend meaningful size and spacing limits. Additionally, the potential for showing compliance through 3D design systems should be investigated. If the flammability characteristics of materials are included in the part description, as part of the three-dimensional computer design, spacing and flammability concerns could be addressed automatically, without additional cost or effort. A group familiar with aircraft design systems should review their potential for showing compliance.
- The group strongly recommend advisory materials be developed prior to rulemaking activity, so that when a new rule is ready, there is comprehensive advisory material support. The concept of regulations which state intent for performance, with details found in advisory materials like the Handbook was appealing. We proposed the addition of another document, a "Fire Test Methods Reference", with all technical details of test apparatus. There was no consensus on whether this was an unnecessary additional layer of documents, or a required repository for information. There was strong, universal support for production of the "Certification Flow Diagrams", examples of which were produced for the Cargo and Non-accessible Areas. We recommend a FTWG task group with FAA and industry representatives study and recommend the advisory structure that best serves the purpose.
- Some test methods have accommodation for "Rogue Failures". There are options in some methods to recover from these failures. The group agreed that this topic should be considered for ALL methods, not just some. It is recommended that the Fire Test Working Group take on the challenge of this task.
- A determination of the appropriate content for the waste containment test should be made with current typical materials. A procedure to update test contents as common materials change should be developed.
- We recommend that the TAEIG and the FAA consider a comprehensive 'systems' cargo task be developed, and a similar working team be formed.
- We recommend formation of Cargo AC Team through the FTWG to create AC materials for cargo testing.

- We recommend formation of a Flame Penetration Resistance AC Team at the FTWG to create AC guidance material for new technology composite fuselage and other means of compliance.
- Develop listed materials for acceptance without further smoke testing. Further tasking could be given to a group similar to the industry Flammability Standardization Task Group.
- Test standards do not currently exist for magnesium seat structures, and should be developed by the FAA
- Test standards do not currently exist for composite fuselage when used for burn through resistance, and should be developed by the FAA.
- Test standards have not been finalized for radiant panel test for many components found in hidden areas. Final development of radiant panel tests, or development and inclusion of other tests (e.g. Meeker burner) should be done by the FAA.

7.0 Draft of 25.853

Section 25.853

As specified in this section and the associated Appendix F, all aircraft parts, components and assemblies within and including the fuselage must provide protection from the foreseeable fire threats. The foreseeable fire threats are in-flight fire threats, as well as the post-crash fire threat. The following in-flight fire requirements are intended to show that aircraft parts, components and assemblies subjected to in-flight fire threats shall not present a direct hazard to the occupants, and shall allow the continued safe flight and landing of the aircraft. The following post-crash fire requirements are intended to show that aircraft parts, components and assemblies subjected to the post crash fire threat shall maintain survivable cabin conditions for a period of time adequate to facilitate evacuation. Methods for showing compliance with these requirements are specified in this section, and the associated Appendix F. [3]

(a) **In-Flight Requirements**: The foreseeable in-flight fire threat depends on the area/zone of the aircraft, the nature of the ignition source, the likelihood of detection, accessibility to the area/zone, and the fire suppression and extinguishing capability.

i. In accessible areas, the foreseeable threat is a small flame, electric arc or spark. Accessible aircraft parts, components and assemblies must meet the requirements of Appendix F, I. (a) [Bunsen Burner]

ii. In areas non-accessible, the threat is a moderate fire, electric arc or spark[4]. Aircraft parts, components and assemblies in non- accessible areas must meet the requirements of Appendix F.I. (b) [radiant panel]

iii. For a waste receptacle, the threat is a moderate trash fire. Each receptacle designed to be used for the disposal of flammable waste material must

a) be fully enclosed

b) constructed of lining materials that meet a 45 degree Bunsen burner test

c) must contain fires likely to occur in it under normal use.

The capability of the receptacle to contain those fires under all probable conditions of wear, misalignment, and ventilation expected in service must be demonstrated to comply with the requirements of Appendix F, Part I. (c). [waste containment]

iv. Cargo and baggage compartments, as defined in §25.857, must meet the requirements defined in Appendix F.I.(d). [cargo]

(b) **Post-Crash Requirements:** The foreseeable post crash threat is a large fuel pool fire. An additional resulting threat to evacuation is fire intrusion into the cabin.

i. The threat to escape slides is radiant heat from the fire. Escape slides must meet the requirements of Appendix F, Part II. (a) [escape slide test]

ii. A threat from fire intrusion into the cabin is ignition of magnesium alloys used in seat structures. Seat structure made from magnesium alloys must meet the requirements of Appendix F, Part II. (b) [5] [magnesium seat]

iii. A threat from fire intrusion into the cabin is ignition of large exposed interior surfaces. Large exposed interior surfaces inside the cabin must meet the requirements of Appendix F, Part II.(c) [60 second vertical BB]

iv. A threat from fire intrusion into the cabin is ignition of seat or berth cushions. All cushions on or part of seating or berth accommodations which support the occupant must meet the requirements of Appendix F, Part II. (d). [cushion oil burner] This supersedes the requirement in 25.853 (b) iii. [60 second vertical Bunsen burner]

v. Aircraft with 20 or more passengers have additional requirements to assure time for evacuation:

1. The lower half of the fuselage shall provide flame penetration protection to the aircraft occupants from a post crash fire. The flame penetration protection is not required where not practicable, such as windows, door frames, wing box, antennae, outflow valves and other essential systems.

A. When the flame penetration protection means is the thermal/acoustic insulation, then thermal acoustic insulation materials (including the means of fastening the materials to the fuselage) when installed in the lower half of the airplane fuselage as a part of the penetration protection must meet the flame penetration resistance test requirements of Appendix F.II. (e) [OB burn through].

B. When the flame penetration protection is provided by composite fuselage structure or any other means, then this alternative must provide a post-crash survivability equivalent to that provided by a aluminum fuselage / insulation configuration which meets the requirements of Appendix F II. (e) to this part or other approved equivalent test requirements.

2. Large exposed interior surfaces inside the cabin not addressed by 25.853 (b) (iv) [cushion oil burner] must meet the requirements of Appendix F, Part II. (f). [OSU]. This supersedes the requirement in 25.853 (b) (iii). [60 second vertical Bunsen burner]

(c**) Other methods of compliance:** The test methods described in Appendix F may be replaced by other approved equivalent methods, or by engineering analysis. [6] The testing requirement is also satisfied by performing any test which supersedes the required test as defined in Appendix F. III.

7.1 Draft of Appendix F

Appendix F

This Appendix specifies methods for showing compliance with 25.853. When the method includes testing, a test article (test coupon) must be fabricated. The test method specifies the requirements for the test article. The test article will typically be fabricated specifically for the test, and will represent a model of the production part materials and construction, but will often not be identical to the production part in thickness, construction, color or other characteristics. It may be possible to fabricate a test article from the actual aircraft part; this is acceptable, but is not required.

Definitions. [7]

Part I: Requirements for in-flight fire threats

(a) **Resistance to small ignition sources in accessible areas.** [8]

(1) Except as provided in (2), components, parts and assemblies located in accessible areas shall meet the test requirements specified in the FAA Fire Test Methods Reference, original revision, Chapter xx, "Vertical Bunsen Burner Testing For Interiors, 12 Second or greater duration".

(2) Exceptions and alternatives:

(i) Class 1 items: components, parts and assemblies of volume not exceeding ½(X) cu. in. or surface area not exceeding ½(Y) sq. in. (e.g. knobs, plastic tie-wraps, clamps, standoffs, rub strips, abrasion shields, gaspers, etc.) with spacing such that it will not propagate a fire (shown by engineering analysis) are exempt from testing.

(ii) Class 2 items: components, parts and assemblies made from materials that have been shown by engineering data to not propagate a flame vertically are exempt from further testing providing they meet the size restriction of a volume not exceeding (X) cu. in. or surface area not exceeding (Y) sq. in .

(iii) Class 3 items: components, parts and assemblies that have been shown by an analysis to be acceptable to the administrator in regard to fire propagation:

A. that are of a size, construction and/or location to not be a risk to propagate a fire, or

B. for parts that are essential for the safety of the aircraft/occupants or for the functionality of the aircraft that cannot reasonably be constructed of a less flammable material without compromising their integrity and functionality

(b) **Non-acessible areas, resistance to a moderate fire:** [9]

(1) Except as provided in (2), the following components, parts and assemblies located in non-accessible areas shall meet the test requirements specified in the FAA Fire Test Methods Reference, original revision, Chapter XX, "radiant panel test".

(i) Ducts shall be tested using radiant panel test A.
(ii) Composite fuselage structure shall be tested with radiant panel test B.
(iii) Thermal/Acoustic Insulation shall be tested with radiant panel test C.
(iv) Insulation on electrical cable and wiring shall be tested with radiant panel test D.
(v) All other large components, parts and assemblies shall be tested to an appropriate radiant panel test method (TBD).

(2) Exceptions and alternatives:

Parts which are considered small may be exempt due to their small size and amount because they would not contribute significantly to the propagation of a fire. Consideration must be given when more than one small part is located in the same proximity with the same or other small parts *when installed on the same* system *component, part or assembly*. When such quantity and spacing conditions exist the above small parts exemption would not apply.

i. Class 1 items: components, parts and assemblies constructed of materials with unknown fire properties, shall not exceed a volume of ½(X) cu. in. or alternatively an exposed surface area not exceeding ½(Y) sq. in. Quantity and spacing must be considered.

ii. Class 2 items: Components, parts and assemblies constructed of materials that have been shown by engineering

data to be self-extinguishing when exposed to a small flame are exempt from further testing provided they meet the size restrictions of a volume of (X) cu. in. or an exposed surface area exceeding (Y) sq. in. The resistance to a small flame shall be established by meeting the test requirements specified in the FAA Fire Test Methods Reference, original revision, Chapter XX, "vertical Bunsen burner" or other test method acceptable to the administrator.

(iii) Class 3 items: Components, parts and assemblies are not required to meet the flammability requirements of this section when shown by an analysis that is acceptable to the administrator that:

A. The items are of construction or location to not be a risk to propagate a fire, or
B. The items that are essential for the safety of the aircraft, or its occupants or the functionality of the aircraft *and* cannot reasonably be constructed of a less flammable material without compromising their integrity and functionality.

(c) **Fire penetration and containment for waste compartments** : [10]

(1) Waste stowage wall ceiling and floor must be tested to 45 deg Bunsen burner flame penetration test in accordance with Chapter x of the Fire Test Reference dated mm/dd/yyyy.
(2) In addition the waste stowage receptacle shall be tested for fire containment in accordance with Chapter x Fire Test Method Reference dated mm/dd/yyyy. The capability of the receptacle to contain fires likely to occur in it under normal use must be demonstrated under all probable conditions of wear, misalignment, and ventilation expected in service.

(d) **Cargo**: [11]

(1) Except as provided in section (2), materials (that represent parts, components or assemblies) forming a cargo compartment shall be tested as specified below:

(i) <u>Class C or equivalent</u>

Ceiling and sidewall liner panels of each cargo or baggage compartment classified as C or equivalent, including any design features such as joints, lamp assemblies, etc., that may alter the continuity of the liner, shall be

tested per the FAA Fire Test Methods Reference , original revision, Chapter xx, “Cargo liner testing”.

Cargo floor panels (including materials serving the purpose of a liner at or below cargo floor level) shall be tested per the FAA Fire Test Methods Reference , original revision, Chapter xx, “45 degree Bunsen burner”.

(ii) Classes B and E

Class B, and E cargo liners (ceilings, sidewalls and floors) shall be tested per the FAA Fire Test Methods Reference , original revision, Chapter xx, “45 degree Bunsen burner”.

Areas of the liners including design features used to protect critical/essential systems of Class B or E compartment required to maintain safe flight and landing of the airplane per the FAA Fire Test Methods Reference , original revision, Chapter xx, “Cargo liner testing”.

(iii) Class F

Unless there are other means of containing the fire and protecting critical systems and structure, a Class F compartment must have a liner tested per the FAA Fire Test Methods Reference , original revision, Chapter xx, “Cargo liner testing”.

(2) Exceptions alternatives and specific requirements:

i. Components (examples: cargo restraint, cargo conveyance, moisture control, floor panels not part of liner and other similar miscellaneous components) within the confines of a cargo compartment require no flammability testing.

ii. Components, parts and assemblies that have been shown by an analysis to be acceptable to the administrator in regard to fire penetration for parts that are essential for the safety of the aircraft/occupants or for the functionality of the aircraft that cannot reasonably be constructed of a less flammable material without compromising their integrity and functionality. (Examples include cargo door surrounds, system ventilation penetration, emergency decompression vents,).

iii. Materials serving as an air or fire stop between a Class C cargo volume and other areas must meet the requirements (cargo oil burner resistance test) or be shown to maintain safe flight and landing for aircraft and occupants.

Part II: Requirements for Post-Crash Threats:

(a) **Slide heat resistance** [12]

(1) Except as provided in section 2, inflation escape slide materials and constructions of inflation slide materials altered by marking, lettering, or affixed overlay materials shall meet requirements specified in the FAA Fire Test Methods Reference, original revision Chapter XX, “Slide Heat Resistance Testing”.

(2) Exceptions and Alternatives:

Components, parts and assemblies that have been shown by an analysis to be acceptable to the administrator in regard to post crash performance:

A. that are of a size, construction and/or location to not affect evacuation

B. for parts that are essential for the safety of the aircraft/occupants or for the functionality of the aircraft, that cannot reasonably be constructed of a less flammable material without compromising their integrity and functionality

(b) **Seat magnesium component flame resistance** [13]

(1) Magnesium seat components shall meet the test requirements specified in the FAA Fire Test Methods Reference, original revision, Chapter xx, “Magnesium Seat Component Test”

(c) **Large exposed panel 60 second vertical BB flame resistance** [14]

(1) Except as provided in section (2), large components, parts and assemblies with exposed surface areas shall meet the test requirements specified in the FAA Fire Test Methods Reference, original revision, Chapter xx, “Large Panel 60 second vertical BB Testing For Interiors”

(2) Exceptions and alternatives:

(i) Large exposed interior surfaces inside the cabin less than xx”[12” ?] above the floor are exempt from testing

(ii) Interiors of compartments such as pilot compartments, galleys, lavatories, crew rest quarters, cabinets and stowage

compartments are exempt from testing, provided the interiors of such compartments are isolated from the main passenger cabin by doors or equivalent means that are closed during TTL.

(iii) Lighting lenses and windows are exempt from testing.

(iv) Transparent panels needed to enhance cabin safety are exempt from testing.

(v) Curtains of galleys and class dividers are exempt from testing.

(vi) Class 1 items: components, parts and assemblies with exposed surface area not exceeding xx sq. in. [144 ?](e.g. placards, etc.) are exempt from testing.

(vii) Class 2 items: components, parts and assemblies with surface area not exceeding xx sq. in. [24 ?]fastened onto the exposed face of a compliant panel are exempt from testing.

(viii) Class 3 items: components, parts and assemblies that have been shown by an analysis to be acceptable to the administrator in regard to post crash performance:

A. that are of a size, construction and/or location to not affect evacuation

B. for parts that are essential for the safety of the aircraft/occupants or for the functionality of the aircraft that cannot reasonably be constructed of a less flammable material without compromising their integrity and functionality.

(d) **Cushion flame resistance** [15]

(1) Except as provided in section (2), all cushions on or part of seating or berth accommodations which support the occupant shall meet the test requirements specified in the FAA Fire Test Methods Reference, original revision, Chapter XX, “Cushion Oil Burner Testing for Interiors”

(2) Exceptions and alternatives:

(i) Cushions on or part of seating accommodations less than or equal to ½ inch thick within the accessible areas may meet the requirements of Appendix F Part II.(b)1 [OSU] .

(ii) Thin padding used on armrests is exempt.

(iii) Components, parts and assemblies that have been shown by an analysis to be acceptable to the administrator in regard to post crash performance:

A. that are of a size, construction and/or location to not affect evacuation

B. for parts that are essential for the safety of the aircraft/occupants or for the functionality of the aircraft, that cannot reasonably be constructed of a less flammable material without compromising their integrity and functionality

(e) **Fuselage Flame Penetration Protection for the Occupants** [16]

The test method used to demonstrate compliance shall be as described in the FAA Fire Test Methods Reference, original revision, Chapter XX , to evaluate the Flame Penetration Protection when exposed to a high intensity open flame.

(f) **Large Exposed panel flame resistance [OSU]** [17]

(1) Except as provided in section (2), large components, parts and assemblies with exposed surface areas shall meet the test requirements specified in the FAA Fire Test Methods Reference, original revision, Chapter XX, “Large Panel Testing For Interiors”[OSU]

(2) Exceptions and alternatives:

(i) Large exposed interior surfaces inside the cabin less than xx [12” ?] above the floor are exempt from testing.

(ii) Interiors of compartments such as pilot compartments, galleys, lavatories, crewrest quarters, cabinets and stowage compartments are exempt from testing, provided the interiors of such compartments are isolated from the main passenger cabin by doors or equivalent means that are be closed during TTL.

(iii) Lighting lenses and windows are exempt from testing.

(iv) Transparent panels needed to enhance cabin safety are exempt from testing.

(v) Curtains of galleys and class dividers are exempt from testing.

(vi) Class 1 items: components, parts and assemblies with exposed surface area not exceeding xx sq. in. [144?] (e.g. placards, etc.) are exempt from testing.

(vii) Class 2 items: : components, parts and assemblies with surface area not exceeding xx sq. in. [24?] attached onto the exposed face of a compliant panel are exempt from testing.

(viii) Class 3 items: components, parts and assemblies that have been shown by an analysis to be acceptable to the administrator in regard to post crash performance:

A. that are of a size, construction and/or location to not affect evacuation

B. for parts that are essential for the safety of the aircraft/occupants or for the functionality of the aircraft, that cannot reasonably be constructed of a less flammable material without compromising their integrity and functionality.

Part III: Hierarchy of tests[18]

When a component, part or assembly has been tested for flammability, the test performed may be adequate to eliminate the need for additional flammability testing. Satisfactory performance on the following tests can be accepted in lieu of additional testing:

1. Radiant panel test is acceptable in place of Bunsen burner.
2. Heat release test is acceptable in place of Bunsen burner .
3. Seat oil burner test is acceptable in place of Bunsen burner.
4. Burn through for rigid composite panels is acceptable in place of cargo liner test.
5. Burn through for rigid composite panels is acceptable in place of 45 degree Bunsen burner test
6. Cargo liner test is acceptable in place of 45 degree Bunsen burner test.
7. Heat release test is acceptable in place of seat oil burner.
8. Heat release is acceptable in place of radiant panel for the back side of interior panels.
9. Cargo liner is acceptable in place of radiant panel for the back side of cargo liners.

10. UL94V0, ASTM xxx, other industry tests (list) are acceptable in place of 12 second vertical Bunsen burner test.
11. 60 second Bunsen burner test is acceptable in place of 12 second test.

7.2 GROUP STATUS ON DRAFT BY SECTION

In our attempt to flesh out the concept of the proposed new regulatory language, our objective was to develop:

- 25.853 and Appendix F language.
- Outline of changes to the Handbook
- Outline of material in “Test Reference”
- Outline of Material in AC’s for each area.
- A decision tree / flow chart for compliance.
- A listing of how things would change, from existing regulations to proposed regulations.
- A descriptive rationale of why we proposed changes.

The success and consensus for each area drafted with the new approach is outlined in the following “stoplight chart”.


New Stoplight chart.xlsx

8.0 Member Comments and Discussion on Draft Language

[1] The FAA and industry has implemented operational enhancements through the program EAPAS to reduce ignition sources and the impacts of contamination. The systems in the inaccessible areas are designed for functionality robustness. The FAA has recently implemented improvements for insulation. OEM's provide additional material flammability resistance robustness.

[2] Mitigation has been enhanced recently by the FAA through operational procedures and checklists. System separation requirements ensure critical operational robustness in the event of a fire.

[3] Comments on opening language. We have tried to provide intent at the highest levels so that as new materials and systems are developed, it will be clear what sort of performance they must have. Industry has concerns over being asked to show compliance to over-broad statements. Advisory material concurrent with any new regulations will be critical in proposing regulatory changes.

[4] This intermediate sized fire, modeled by the "block of foam" test, is one which should challenge the materials and systems in the hidden areas, but not directly cause critical systems to fail, so long as the threat does not spread or grow.

[5] Only seats are addressed because a test method is currently being developed only for seats. This section could be made more broad for use of magnesium on other places on aircraft. The intent statement at the beginning of 25.853, and in the opening of the post-crash requirements provides high level guidance on what performance is expected.

[6] The meaning of "engineering analysis" is not well defined. What we mean by "engineering analysis" needs to be specified. Our intent is to allow accepted analysis, modeling and simulation in place of physical testing. The language and criteria appropriate for this must be determined before new regulation is proposed.

[7] Definitions. The group found that a common set of definitions was critical to agreement and understanding. We were advised that there are negative aspects to including definitions within regulatory language. The correct place for definitions must be determined, and the definitions carefully crafted, before new regulations are proposed. Following are some of the definitions we used:

Accessible: Accessible areas are the areas of the aircraft contained within the cabin linings where in-flight fires:

- may be visible or detected by passengers or crew, and
- may be reached without the use of tools and extinguished by the crew .

Accessible areas are occupiable by passengers and crew, or immediately adjacent to areas that are occupiable. Compartments that have separately defined flammability requirements are excluded (examples: Class B and Class F cargo compartments, waste containers, etc.).

Exposed – Any surface visible within the cabin during taxi, takeoff and landing

Interiors- Anything within the cabin lining, see figure tbd.

Non-accessible: A non-accessible area is any area not addressed by the definition of accessible, and is defined as any area where in-flight fires may not be visible or detected, and cannot be reached and extinguished by the crew. This zone is located between the fuselage skin and the passenger cabin “living space”, such as the area behind sidewall panels, ceiling panels, and below cabin floor, and monument surfaces that are exposed/opened to the areas defined above. Compartments that have separately defined flammability requirements are excluded (examples: cargo compartments; fire zones; waste containers).

Note: “Exposed” needs to have broader application to all areas of the airplane and should be in context of “surface area of the part that is contacted by (or directly affected by) the actual fire threat”. Another word with definition limited to “visible during TTL” should be selected.

Clarification is needed to define “fuselage skin” relative to the non-accessible areas. It is recommended that when an aircraft is pressurized, the pressurized compartment provides the boundary and this clarification should be captured in this definition. Need to develop clear definitions and AC guidance on how to handle fuselage areas such as wing-body fairings, empennage areas, APU area (areas not part of pressurized cabin).

Lower deck and over head crew rest compartments are accessible but not within cabin linings.

The definition should address the “remote” areas (crew-rests, lower galleys, EEbays, flight deck, steps to a crew rest, backside of galleys and lavs that are not inboard of the liners, etc…) to ensure consistent application of the requirements. Language should also cover spaces between panel walls, or galley inserts . We need AC guidance definition, and illustrations defining areas that are within the linings but not considered exposed during TTL. Other examples of remote areas include elevators, overhead stowage, crew rests, lower lobe galleys, etc... Also need to develop AC guidance on areas within lining area but not in the traditional non-accessible areas. e.g. under a sink or behind a galley/closet that is not accessible but within the linings.

[8] Comments for accessible areas. There should not be analysis publication required for class 1 parts, simply AR determination. Conceptually, the “exceptions and alternatives” in both “In-Flight Accessible” and “In-Flight Non-Accessible” should be aligned/standardized. Dimensions might be different, but rationale should be same. The dimensions for exempt parts support a consensus position that parts of truly unknown flammability must be quite small. Parts with manufacturer/engineering tests can be much larger without additional FAA compliant testing.

[9] This is the initial draft of language for this section. As discussions continued, we arrived at several different versions and no consensus. This is reviewed in detail in 6.3.2.

The dimensions for exempt parts support a consensus position that parts of truly unknown flammability must be quite small. Parts with manufacturer/engineering tests can be much larger without additional FAA compliant testing.

[10] Concern: what is 2012 trash, compared to 1965 trash? Need mechanism to update based upon current conditions.

[11] Cargo Comments. “Class C” type liner for this application (i.e.- “Class F”) is new requirement. We realize this section is intended to support proposed FAA/EASA baggage/cargo compartment definitions in 25.857, but is pre-emptive in this ARAC rule until the pending 25.857 rule change occurs.

The components within the compartment are exempted because they are far less flammable than the uncontrolled material in the compartment

12 This might be broadened into an excape equipment section, to also cover rafts, PBE, cockpit ladders, etc.

13 Test for magnesium seat components does not exist, and must be developed.

14 Global comments on large panel 60 second vertical testing.

The exemption for panels near the floor should be aligned with typical seat pan or seat cushion height.

The size and spacing criteria should be developed consistent with test pass/fail criteria and with other size/spacing rules. Advisory material should make clear whether sizes apply to individual parts, assemblies, etc.

Advisory material should make clear the definition of “attached” – mechanical, tape, glue, etc.

Evaluation should be made as to whether this should extend to the Flight Deck, or whether the training, occupancy and egress options make this unnecessary.

15 Global comments on cushion protection. “Supporting the occupant” is a key element of this requirement and should be emphasized in the definition of the seat cushions requiring Oil Burner. It is noted that specifically stating “supporting the occupant” must be maintained; absence of this phrase might be interpreted that §25.853(b)(3) (60-second VBB) does not apply to the remaining padded surfaces and would impose oil burner and/or OSU on aircraft with ≤ 19 passengers for those areas of seats not supporting the occupant that are currently defined as “padding”.

[16] Global comments on Flame Penetration Resistance

The proposed regulation expands flame penetration resistance from an insulation requirement to an occupant protection requirement. Evaluation should be made as to whether this should extend to the Flight Deck, or whether the training, occupancy and egress options make this unnecessary.

Extensive advisory material is required. As new systems may be made up of elements from fuselage, fuselage coatings, insulation, cargo panels, floor panels, sidewall panels, etc., guidance on what must be tested, and what is exempted from testing will be critical.

17 Global comments on large panel OSU testing

The exemption for panels near the floor should be aligned with typical seat pan or seat cushion height.

The size and spacing criteria should be developed consistent with test pass/fail criteria and with other size/spacing rules. Advisory material should make clear whether sizes apply to individual parts, assemblies, etc.

Advisory material should make clear the definition of “attached” – mechanical, tape, glue, etc.

Evaluation should be made as to whether this should extend to the Flight Deck, or whether the training, occupancy and egress options make this unnecessary.

[18] Global comments on Hierarchy section.

The concern about allowing the oil burner test as a substitute for the Bunsen burner test for seating primarily has to do with concern about damage to fire blocking layers over conventional foams. Many in the group felt that this was a continued airworthiness issue properly dealt with by the aircraft operator. There was additional concern that without the use of a Bunsen burner test, it would not be possible to substitute or replace dress covers. This concern was generally judged to be a business concern for the operator.

We tried to draw a general equivalency between OSU tests and seat oil burner tests for thinly padded parts. Where pads are used for delethalization or decoration on large panels, the group agreed that the heat release test provided an adequate margin of safety for the part instead of an oil burner test. The reverse was not supported by the FAA, as the HR test was instituted after the OB test, and is seen as a more severe standard. The FAA advice was to propose OB test over HR test on a case by case basis.

The new regulation proposal is that all large panels in hidden areas must restrict flame spread as measured by the RP test. Both sidewall panels and cargo liner panels have severe tests to their front faces. Their rear faces are exposed in the hidden areas. While the group though it likely that the face test would suffice, this is an area we feel testing should be done to prove performance. This is also an area where listed approved materials could greatly reduce testing burden.

9.0 Appendices

9.1 Tasking notice

FR TAEIG MFWG tasking notice.pdf

U.S. Department
of Transportation
**Federal Aviation
Administration**

September 10, 2012

Mr. Craig R. Bolt
Assistant Chair, Aviation Rulemaking
Advisory Committee
Pratt & Whitney
400 Main Street, Mail Stop 162-14
East Hartford, CT 06108

Dear Mr. Bolt:

This is in reply to your August 10, 2012 letter. Your letter transmitted to the Federal Aviation Administration (FAA) the Aviation Rulemaking Advisory Committee's (ARAC) recommendations regarding the FAA's approach to update, reorganize and improve the level of safety of requirements for flammability of materials. I understand that members of the Materials Flammability Working Group (MFWG) reached consensus and the report was approved unanimously by the Transport Airplane and Engine Issues Group (TAEIG).

I wish to thank the ARAC, particularly the members associated with TAEIG and its MFWG that provided resources to develop the report and recommendation. The report will be placed on the ARAC website at:
http://www.faa.gov/regulations_policies/rulemaking/committees/documents/.

We consider your submittal of the MFWG report as completion of tasking from our August 27, 2010 tasking statement (75 FR 52807). We will keep the committee apprised of the agency's efforts on this recommendation through the FAA report at future ARAC meetings.

Sincerely,

Lirio Liu
Acting Director, Office of Rulemaking