



## 1. Applicability

All Aircraft.

## 2. Purpose

To provide guidance to owners, operators and maintenance organisations regarding flammability requirements for aircraft. All materials used in an aircraft cabin or cargo compartment must meet the applicable flammability requirements for that aircraft type. Such materials include, but are not limited to, interior panelling, floor coverings, seat cushions and upholstery, seat belts, curtains, decorative furnishings, padding, galley structure and furnishings, transparencies, stowage and baggage compartment structures, thermoformed parts, cargo liners, and insulation materials.

This Airworthiness Bulletin supersedes AAC 1-114.

## 3. Background

When repairing or replacing the interior material in an existing aircraft, you will need to understand, and show compliance with, the applicable material flammability requirements, amongst other things.

This bulletin is written to provide guidance on the requirements for different aircraft categories, to describe methods involved in showing compliance and to highlight some typical issues. The organisation carrying out the repair or refurbishment needs to ensure compliance with the appropriate standards for the aircraft being refurbished.

## 4. Information

### *What are the minimum flammability requirements for the aircraft?*

Minimum requirements for aircraft are firstly dependent on the airworthiness category of the aircraft. Secondly, standards are periodically revised due to inadequate service history or new technologies. Therefore, the minimum requirements are dependent on the aircraft category and the standard applicable at the time when the design was first certificated. Unless retroactive actions have been taken, the minimum standard is defined by the aircraft certification basis.

### *What is the aircraft certification basis?*

The aircraft certification basis defines the standard to which the aircraft is built and maintained. The certification basis will name an airworthiness standard at a particular amendment, or more likely, a range of amendments depending on the regulatory subject. Additionally, the certification basis may list Special Conditions or Equivalent Levels of Safety (ELOS) where the airworthiness standard does not adequately cover a feature of the aircraft.



A vast majority of aircraft are certificated to the following airworthiness standards and regulations:

- FAR – Federal Aviation Regulations – Federal Aviation Administration (FAA), USA
- JAR – Joint Aviation Regulations – Joint Aviation Authorities (JAA), Europe
- CS – Certification Standards – European Aviation Safety Agency (EASA)

Whilst these standards are mostly harmonised, not all flammability requirements are the same and harmonising of changes to standards have occurred at different dates.

### *How do I find the certification basis of an aircraft?*

The certification basis is defined in a document typically referred to as the Type Certificate Data Sheet (TCDS). This document is referenced by the Type Certificate (TC) for Australian certificated aircraft or in the Type Acceptance Certificate (TAC) for foreign certificated aircraft.

Link: <http://www.casa.gov.au/airworth/index.htm>

### *Are there any other requirements apart from the certification basis?*

Occasionally retroactive action is warranted to correct identified unsafe conditions in the flammability standard of the aircraft fleet. This is mostly applicable to transport category aircraft. This retroactive action can be aircraft type specific but for flammability issues tends to be more generalised and applicable by aircraft weight or passenger capacity. Retroactive actions are currently mandated by Airworthiness Directive with fleet encompassing applicability being covered by the AD/GENERAL/ series. Airworthiness Directives can be found on the CASA website.

Link: <http://www.casa.gov.au/airworth/airwd/index.htm>

### *How are flammability tests categorised?*

Some basic definitions are:

- Fireproof -- means the capacity to withstand the heat associated with fire at least as well as steel in dimensions appropriate for the purpose for which they are used.
- Fire resistant -- means the capacity to withstand the heat associated with fire at least as well as aluminium alloy in dimensions appropriate for the purpose for which they are used.
- Flame resistant -- means not susceptible to combustion to the point of propagating a flame, beyond safe limits, after the ignition source is removed.



- Flash resistant -- means not susceptible to burning violently when ignited.

These are general terms used to define tests. Some of these definitions allow for variations. For example, 'flame resistant' refers to safe limits. These limits vary depending on the material, or where and how a material is used, and this is reflected in the regulations. Some tests are quite specific.

### *So what are the minimum requirements for light aeroplanes?*

FAR 23, JAR 23 or CS 23 are standards for normal, utility and aerobatic category aircraft which seat a maximum of 9 passengers. Materials must be at least 'flame resistant', but aircraft certificated in more recent times will have more stringent standards for cargo compartments. FAR/JAR/CS 23.853 'Passenger and crew compartment interiors' and 23.855 'Cargo and baggage compartment fire protection' cover flammability requirements for materials.

However, for aircraft whose type design appeared in the 1960s or earlier are most likely to be certificated to CAR3. CAR 3.388 'Fire Protection' is the applicable regulation and requires 'flash resistance' except where smoking is allowed in which case certain materials require 'flame resistance'.

[FAA Advisory Circular AC 23-2A](#) describes the test procedures for showing compliance with 'flash resistance' and 'flame resistance'.

Other aircraft standards are British BCAR or the Australian ANO series.

Check the aircraft TCDS for the correct standard.

### *What are the minimum requirements for transport category aeroplanes?*

FAR 25, JAR 25 or CS 25 are standards for transport category aircraft. Materials must meet vertical or horizontal Bunsen burner tests as specified in Appendix F of the applicable standard. FAR/JAR/CS 25.853 'Compartment interiors' and 25.855 'Cargo and baggage compartment' cover flammability requirements for materials.

However for new aircraft types since 1984, there has been a steady increase in the number tests required for various components found in the aircraft cabin which significantly improves the flammability of cabin materials. These address specific tests for critical areas of the cabin and are in addition to the general "Bunsen burner test" for most cabin materials. There are additional tests for seat cushions, ceiling and wall panels, cargo compartment liners, and insulation materials. This increase in the number of tests will continue with new standards for electrical wiring and air conditioning ducts likely in the future.



Additional to these new flammability standards for new aircraft designs, the same requirements were made retroactive for some existing aircraft, mainly based on passenger capacity. The outcome of this action is many flammability requirements for older transport category designs are no longer entirely defined by their certification basis but also defined by airworthiness directives. The specific tests include:

- Oil burner tests for seat cushions ([AD/GENERAL/63](#));
- Radiant heat release and smoke criteria for interior ceiling and side-wall panels ([AD/GENERAL/68](#));
- Burnthrough criteria for cargo compartment liners ([AD/GENERAL/70](#)), and
- Flame propagation and flame penetration of thermal acoustic materials ([AD/GENERAL/84](#)).

The details of these tests are covered by FAR/JAR/CS 25.853, FAR/JAR/CS 25 Appendix F and [FAA Report DOT/FAA/CT-85/15 "Aircraft Material Fire Test Handbook"](#).

### *What about commuter category aeroplanes?*

FAR/JAR/CS 23.853(d) addresses the additional requirements for the cabin materials in commuter category aircraft. These require basically the same vertical and horizontal Bunsen burner tests as required for Part 25 Transport category aircraft; however, these aircraft are not affected by the additional nor retroactive action mentioned above. FAR/JAR/CS 23.853(d) and the accompanying Appendix F provide the required test methods. The [FAA Aircraft Material Fire Test Handbook](#) also provides information.

### *What about helicopters?*

FAR/JAR/CS 27.853 and 27.855 address flammability requirements for cabin and cargo compartments, respectively, for normal category helicopters. Likewise FAR/JAR/CS 29.853 and 29.855 address requirements for cabin and cargo compartments for transport category helicopters. These are currently the same or similar to their respective fixed wing counterparts. However, the normal category helicopter standard has only matched the fixed wing standard for new designs since 1999. Before that time, the standard aligned with the CAR3 standard for normal category aeroplanes.

Again, refer to the helicopter TCDS to determine the applicable flammability standards.



*Now I have worked out the test requirements, how do I ensure these requirements are met for the replacement material?*

Cabin material in aircraft must meet the applicable flammability standard. There are three ways to ensure this:

1. Carry out all component replacements or repairs in accordance with approved material and data (e.g. aircraft manufacturer's parts and instructions, STC, APMA, etc.),
2. Obtain material which has been tested to the appropriate standard from an approved supplier, or
3. Obtain commercial material and organise samples to be tested for their flammability.

Option 1 is the preferred and easiest because the supplier of that component will show compliance. If you use manufacturer approved data you do not need to worry about the rest of this bulletin.

*I'm not using the manufacturer's parts. I want to make my own using materials from a 3<sup>rd</sup> party aviation material supplier. How do I show it meets the minimum applicable flammability standard?*

An aviation materials supplier should supply batch test certificates for the materials. Ensure that these certificates cover your required flammability standard adequately. These certificates must reflect an aviation authority certification (CASA Form 1 [917], EASA Form 1, FAA Form 8130-3, etc.) and must not be non-aviation based commercial 'certs'. This Airworthiness Bulletin does not address aspects of the certification apart from flammability.

*The material I want use is from a commercial supplier that doesn't supply 'aircraft grade' material. How do I show it meets the minimum applicable flammability standard?*

You must subject your materials to the tests required by the airworthiness regulations applicable to the aircraft certification basis and any Airworthiness Directives. Apart from the certification testing, any material acquired subsequently will also have to ensure compliance with these standards.

*Can I perform the flammability test?*

Usually no. CASA has approved facilities that have met various quality requirements. These facilities have a Certificate of Approval for the purposes of performing and certifying for flammability tests. Alternatively, CASA considers tests carried out by a NATA approved laboratory acceptable for the tests defined in the organisation's NATA accreditation. Look for accreditation to FAR23.853 or FAR25.853 testing.



However, you can elect to have CASA witness the required tests if you want to perform them yourself. You will need to comply with test methods that are defined by the certification basis for the aircraft to which the parts will be fitted. CASA would additionally recommend the advisory materials regarding procedures contained in [FAA Advisory Circular AC 23-2A](#), or [FAA Aircraft Materials Fire Test Handbook](#), as appropriate.

Link: [www.nata.com.au](http://www.nata.com.au)

*Can I use Fire Retardants to improve the flammability performance of my chosen material?*

Yes. If fire retardant chemicals are used to provide the required flammability properties of the material, the long term performance must be taken into consideration to ensure the material in service continues to meet the certification standard.

Fire retardant performance deteriorates with wear and, particularly, cleaning. Therefore, the service life of material treated with the fire retardant must be established and appropriate maintenance instructions provided to ensure continuing airworthiness of the cabin interior.

An aircraft which has been refurbished with material treated with fire retardant may no longer meet the flammability requirements after time in service. If a service life or instructions for reapplication of the retardant have not been established, then the effectiveness of the retardant should be treated with suspicion.

*Do I have to test every component in my modification?*

As steel is considered to be fireproof and aluminium to be fire resistant, unfinished metal parts can already be assumed to meet the flame resistance and flash resistance tests. Parts containing magnesium or magnesium alloys do require testing.

*Some of my components are very small. Do I have to test them?*

In general, all non-steel and non-aluminium components need to be tested. However, the flammability standards listed above contain the following statement: - "Except for small parts (such as knobs, handles, rollers, fasteners, clips, grommets, rub strips, pulleys, and small electrical parts) that would not contribute significantly to the propagation of a fire.....". This statement acknowledges that small components don't add a great deal to the overall fuel available to a fire and therefore don't warrant the effort involved in testing. Often, the small part material cannot be obtained in a form that can be tested.



The definition of a “small part” is subjective but as a generalisation can be considered to be any part where the greatest dimension is no longer than 50mm. Multiple items in close proximity do not qualify for this exception. Also, this definition does not apply to rub strips, small placards and the like that are long and thin. These are subject to individual assessment.

*We are performing a cabin refresh which involves covering the existing wall surfaces with a laminate. We know the existing material meets the flammability requirements. Can we test just the laminate and the adhesive?*

In general, no. A sample of the original material, the adhesive, and the new laminate should be subject to the required flammability tests assembled in a representative manner. Amongst other issues, research has shown that the increase in heat release from the addition of a new surface finish or laminate is variable and dependant on the underlying substrate material, thus showing an indirect relationship between the flammability of individual materials and the laminated assembly.

However, families of materials with similar construction methods but varying thickness may only require testing of the critical configurations. The FAA is also developing methods to qualify adhesives independently.

*Are there any cabin items that are exempt from undergoing a flammability test?*

There are certain items of an operational nature that are not required to undergo a flammability test. Blankets, pillows, headrest protective covers, and carry-on items that are not part of the aircraft type design are not required to meet the flammability certification standard. However, incidents have occurred with fires starting and propagating in airline comfort blankets. The [FAA Aircraft Materials Fire Test Handbook](#) contains a specifically designed flammability test for blankets that is recommended.

*We are installing Role Equipment. What flammability requirements does it need to meet?*

Role equipment is additional equipment fitted to the aircraft to carry out a dedicated function and is usually not fitted by the aircraft manufacturer. Some examples of aircraft use requiring role equipment are Search and Rescue, Medivac, Surveillance and Geographical Surveying. If the role equipment is attached to the aircraft in anyway, be it mechanically or electrically, the equipment must be assessed against the requirements of the aircraft certification basis and CASA’s



other airworthiness requirements. Therefore, just as the equipment's mechanical fastening must be assessed against structural requirements, and any electrical connection to the aircraft assessed for hazardous interaction, the flammability of the item must also be assessed. In general, the 2X.853 flammability requirements will need to be met. Non-aviation based commercial environmental standards may be deemed acceptable. Contact CASA for assistance.

*Is there any information useful on the internet?*

The following websites have useful information and were correct at the time of publication:

The FAA regulations and Advisory Circulars - <http://rgl.faa.gov>

FAA AC23-2A - Flammability Tests [Light aircraft] - <http://rgl.faa.gov>

FAA AC25-17 - Transport Airplane Cabin Interiors Crashworthiness Handbook - <http://rgl.faa.gov>

DOT/FAA/AR-00/12 FAA Aircraft Materials Fire Test Handbook - [www.fire.tc.faa.gov/handbook.stm](http://www.fire.tc.faa.gov/handbook.stm)

EASA regulations - [http://www.easa.europa.eu/ws\\_prod/g/rg\\_certspecs.php](http://www.easa.europa.eu/ws_prod/g/rg_certspecs.php)

JAA regulations - [www.jaa.nl/publications/publications.html](http://www.jaa.nl/publications/publications.html)

CASA Type Certificates - <http://www.casa.gov.au/airworth/index.htm>

FAA TCDS - <http://rgl.faa.gov>

EASA TCDS - [http://www.easa.europa.eu/home/c\\_tc\\_aircraft.html](http://www.easa.europa.eu/home/c_tc_aircraft.html)

## 5. Enquiries

Enquiries with regard to the content of this Airworthiness Bulletin should be made via the direct link e-mail address:

[AirworthinessBulletin@casa.gov.au](mailto:AirworthinessBulletin@casa.gov.au)

Or in writing, to:

Airworthiness Engineering Branch  
Civil Aviation Safety Authority  
GPO Box 2005, Canberra, ACT, 2601