

EASA REGULATORY IMPACT ASSESSMENT

***REQUIREMENTS FOR FIRE PROTECTION IN REMOTE/ISOLATED COMPARTMENTS
NOT PERMANENTLY OCCUPIED DURING FLIGHT***

OCTOBER 2009

Issue 2

AMENDMENT RECORD

ISSUE NUMBER	DATE	REMARKS
1	September 2009	Initial Issue
2	October 2009	Incorporation of Comments

CONTENTS

Abbreviations	4
1 Purpose and Intended Effect.....	5
1.1 Issue which the NPA is intended to address	5
1.2 Scale of the Issue	5
1.2.1 Special Areas on Very Large Transport Aeroplanes	5
1.2.2 Isolated Compartments in Aeroplanes with VIP Configurations.....	6
1.3 Brief Statement of the Objectives of the NPA	7
2 Options	8
2.1 The Options Identified.....	8
2.2 The Preferred Option Selected	10
3 Sectors Concerned.....	11
4 Impacts	11
4.1 All identified impacts	11
4.1.1 Safety	11
4.1.2 Economic.....	11
4.1.3 Environmental	11
4.1.4 Social	11
4.1.5 Other Aviation Requirements outside EASA scope	11
4.1.6 Foreign Comparable Regulatory Requirements	11
4.2 Equity and fairness issues identified	12
5 Summary and Final Assessment	13
5.1 Comparison of the positive and negative impacts for each option evaluated.....	13
5.2 A summary describing who would be affected by these impacts and analysing issues of equity and fairness.....	13
5.3 Final assessment and recommendation of a preferred option	13
6 References	14

ABBREVIATIONS

CAR	Canadian Aviation Regulations
CRI	Certification Review Item
CS	Certification Specifications
EASA	European Aviation Safety Agency
ETSO	European Technical Standard Order
FAA	Federal Aviation Administration (United States)
MPS	Minimum Performance Standards
NPA	Notice of Proposed Amendment
PBE	Protective Breathing Equipment
RIA	Regulatory Impact Assessment
SFAR	Special Federal Aviation Regulations
VIP	Very Important Person
VLTA	Very Large Transport Aeroplane

1 PURPOSE AND INTENDED EFFECT

1.1 ISSUE WHICH THE NPA IS INTENDED TO ADDRESS

The current requirements of CS-25 do not address fire protection in passenger or crew compartments that are not permanently occupied during flight other than lavatories. However, aircraft are often configured with compartments that are isolated physically from the main passenger cabin by doors, curtains or partitions. In other instances compartments are located in remote areas of the aircraft. Examples of such compartments include bedrooms, offices, praying rooms, recreational areas, and crew rest compartments. In the past, the fire protection standards required of isolated compartments have been addressed by Special Conditions. The intention of this proposed regulatory action is to amend CS-25 to accommodate the fire protection requirements appropriate to isolated and remotely located compartments with the intention of reducing the need for Special Conditions and standardising the required fire protection means.

1.2 SCALE OF THE ISSUE

The accident review carried out as part of a study commissioned by EASA (Reference 1) did not identify any accidents associated with in-flight fires in remote or isolated compartments that are not permanently occupied during flight. However, there are indications that the installation of such compartments is becoming more frequent, particularly in large transport aeroplanes and VIP configuration aeroplanes.

This Regulatory Impact Assessment addresses the threats associated with in-flight fires in isolated compartments. Other safety issues associated with these compartments, including emergency evacuation, communication and supplemental oxygen systems are currently addressed by Special Conditions. However, since fire in an unoccupied compartment can pose a significant threat to aircraft safety, by spreading into the passenger compartment or affecting critical aircraft systems, it is considered that this issue should be addressed by CS-25. In a Special Conditions document (Reference 2), the FAA considers a failure of the crew rest compartment fire protection system (i.e., smoke or fire detection and fire suppression systems) in combination with a crew rest area fire to be a catastrophic occurrence.

1.2.1 Special Areas on Very Large Transport Aeroplanes

There will inevitably be areas in Very Large Transport Aeroplanes (VLTA) that are unoccupied and unsupervised for long periods of time. Therefore, reliable fire protection systems providing timely notification will be required. This issue was discussed at the Very Large Transport Aeroplane (VLTA) Conference in 1998 (Reference 3) which resulted in the following conference recommendations:

“In view of fire protection aspects which may be compounded, altered or have unique benefit due to the size, shape and configuration of VLTA aircraft, there was general agreement that the following issues need to be studied during VLTA design development and certification:

4 - Smart systems for the crew to detect smoke and fire in hidden or unoccupied areas.

7 - Detection and suppression in large compartments used for carry-on baggage and electrical equipment.

6 - The amount and location of fire emergency and survival equipment for use by the crew.”

1.2.2 Isolated Compartments in Aeroplanes with VIP Configurations

Isolated compartments in aeroplanes with VIP configurations have been the subject of Special Conditions. Perhaps the most significant concern raised by isolated compartments is related to timely fire detection. Special Conditions have included the following fire protection requirements:

- *Each isolated compartment must incorporate a smoke detection system that meets the requirements of 25.858. A visual and audible indication of a smoke detection, that identifies in which compartment the smoke has been detected, must be provided to the flight crew or to the cabin crew.*

Whilst this requirement is appropriate to many isolated compartments it is inappropriate to those where smoking is allowed or cooking equipment is installed without additional measures being introduced to prevent nuisance warnings.

- *In addition to what is prescribed by 25.851, at least one hand fire extinguisher appropriate to the kinds of fires likely to occur and associated protective breathing equipment must be provided in close proximity of the doors that lead from each emergency exit area to each isolated compartment.*
- *It must be demonstrated that there is sufficient access in flight to enable a crew member to effectively reach any part of the isolated compartment with the content of a hand fire extinguisher.*

This requirement is applicable to small compartments and other means for fire suppression need to be considered in larger compartments such as crew rest areas.

- *It must be demonstrated that no hazardous quantities of smoke, flames or extinguishing agents will enter any compartment that could be occupied by the crew members or passengers.*
- *If a waste container is installed, it must meet the relevant requirements of 25.853[h].*
- *Smoking is not permitted in isolated compartments. Appropriate placards must be installed to indicate these restrictions.*

This requirement is applicable to compartments, such as crew rest areas, on passenger transport aircraft. However, it is probably inappropriate to ban smoking in all “isolated compartments” on all aircraft. On some VIP aircraft the “isolated compartment” could be occupied for the majority of the flight and the area assigned to be the main cabin (i.e. that compartment used for take-off and landing) unoccupied. In this instance, it would seem illogical to ban smoking in the compartment that is occupied for the majority of the time but allow it in the area that is least occupied. It would also seem inappropriate to prohibit smoking in an isolated compartment but allow the use of galley equipment which might be left unattended.

The FAA has issued SFAR No. 109 'Special Requirements for Private Use Transport Category Airplanes Regulatory Information (Reference 4), which contained fire protection requirements as follows:

12. Materials for Compartment Interiors. Compliance is required with the applicable provisions of Sec. 25.853, except that compliance with appendix F, parts IV and V, to part 25, need not be demonstrated if it can be shown by test or a combination of test and analysis that the maximum time for evacuation of all occupants does not exceed 45 seconds under the conditions specified in appendix J to part 25.

13. Fire Detection. For airplanes with a type certificated passenger capacity of 20 or more, there must be means that meet the requirements of Sec. 25.858(a) through (d) to signal the flightcrew in the event of a fire in any isolated room not occupiable for taxi, takeoff and landing, which can be closed off from the rest of the cabin by a door. The indication must identify the compartment where the fire is located. This does not apply to lavatories, which continue to be governed by Sec. 25.854.

15. Hand-Held Fire Extinguishers.

(a) For airplanes that were originally type certificated with more than 60 passengers, the number of hand-held fire extinguishers must be the greater of--

(1) That provided in accordance with the requirements of Sec. 25.851, or

(2) A number equal to the number of originally type certificated exit pairs, regardless of whether the exits are deactivated for the proposed configuration.

(b) Extinguishers must be evenly distributed throughout the cabin. These extinguishers are in addition to those required by paragraph 14 of this SFAR, unless it can be shown that the cooktop was installed in the immediate vicinity of the original exits.

Crew Rest Compartments

The fire protection provisions for isolated areas in aeroplanes for private use discussed above are generally similar to the fire protection provisions for crew rest compartments. Some of the Special Conditions for crew rest compartments also mention additional provisions for the use of built-in fire extinguishing systems and fire protection for stowage compartments. The texts of the Special Conditions have been considered in the formulation of the proposed regulatory change to CS-25 addressed in this RIA.

1.3 BRIEF STATEMENT OF THE OBJECTIVES OF THE NPA

The purpose of the NPA is to amend CS-25 to include requirements for fire protection in compartments that are not permanently occupied during flight and are isolated from the main passenger cabin. The requirements would ensure that the fire protection measures for these compartments are standardised and would also reduce time and costs for the certification of such compartments.

The proposed amendment consists of the requirements for flammability of compartment material, fire/smoke detection systems, fire extinguishing systems or firefighting equipment (and its associated provisions), and means to exclude smoke or extinguishing agents from entering other occupiable compartments.

2 OPTIONS

2.1 THE OPTIONS IDENTIFIED

Two regulatory options for Agency action are considered in this Regulatory Impact Assessment:

Option 1 – Do Nothing

The “Do Nothing” option means no amendments to CS-25 in relation to fire protection in compartments not permanently occupied during flight that are isolated or located in remote areas will be made. Installation of such compartments will continue to be addressed by means of Special Conditions.

Option 2 – Rulemaking Action

This option means new requirements and associated guidance material will be added to CS-25 to incorporate the provisions of Special Conditions related to fire protection in compartments not permanently occupied during flight that are isolated or located in remote areas. The proposed requirements are as follows:

CS 25.xxx Fire protection in isolated compartments (see AMC 25.xxx)

An isolated compartment is one which is not permanently occupied during flight and which is separated from other areas of the cabin. Isolated compartments must comply with the following:

- (a) There must be at least one ashtray on the inside and outside of any entrance to the compartment.*
- (b) Each disposal receptacle for towels, paper, or waste, located within the compartment must be equipped with a built-in fire extinguisher. The extinguisher must be designed to discharge automatically into each disposal receptacle upon occurrence of a fire in that receptacle.*
- (c) The interiors need not meet the test requirements of parts IV and V of appendix F, provided such compartments are isolated from the main passenger cabin by doors or equivalent means that would normally be closed during an emergency landing condition and the compartment is not occupied for take-off and landing,*
- (d) Enclosed stowage compartments within an isolated compartment must be at least fire resistant.*
- (e) There is readily available safety equipment appropriate to the size of the compartment and the likely nature of the fire threat.*
- (f) In compartments that do not contain equipment that is a potential fire source and where smoking is not permitted:*
 - (1) There must be appropriate placards, inside and outside each entrance to the compartment, and in each section of the compartment created by the installation of a curtain, in accord with 25.791(a).*
 - (2) A smoke or fire detection system (or systems) meeting CS 25.858(b), (c), and (d) must be provided that monitors each occupiable area within the*

compartment, including those areas partitioned by curtains. Each system (or systems) must provide:

- (i.) Within one minute after the start of a fire, a visual warning in the cockpit, or a visual or audible indication in the passenger cabin that would be readily detected by persons in the cabin, taking into consideration their positioning throughout the cabin during various phases of flight, and*
 - (ii.) An aural warning in the compartment that would be certain to wake a sleeping occupant.*
- b. A means to fight and suppress a fire in the compartment must be provided. This means can either be a built-in extinguishing system or a manual hand fire extinguisher as specified in sub-paragraph (e) of this paragraph.*
- (i.) If a built-in fire extinguishing system is used it must have adequate capacity to suppress any fire occurring in the compartment, considering the fire threat, volume of the compartment, the ventilation rate and the minimum performance standards (MPS) that have been established for the agent being used. In addition it must be shown that a fire will be contained within a controlled volume meeting the requirements of Appendix F, Part III. There must be a means provided to exclude hazardous quantities of smoke or extinguishing agent originating in the compartment from entering any other occupiable compartment.*
 - (ii.) If manual hand held extinguishers are used it must be demonstrated that any fire within the compartment can be controlled without entering the compartment or the access provisions must allow crewmembers equipped for fire fighting to have unrestricted access to the compartment. There must be at least one readily accessible hand fire extinguisher available for use.*
- (g) Compartments that contain equipment that is a potential fire source or where smoking is permitted must contain a smoke or fire detection system in accord with 25.xxx(f)(2), however such systems may be temporarily disabled by crewmembers, or by any other means found acceptable to the Agency, provided:*
- (1) It is demonstrated that any fire or smoke within the compartment can be:*
 - (i.) Detected by cabin crew or passengers in the cabin within the time that allows for effective fire fighting action, taking into consideration the positioning of those persons throughout the cabin during various phases of flight.*
 - (ii.) Controlled without entering the compartment or the access provisions must allow crewmembers equipped for fire fighting to have unrestricted access to the compartment.*
 - (2) Signs, which notify when smoking is prohibited, are installed in compartments where smoking is permitted in accord with 25.791(a)*

AMC 25.xxx General

A compartment is considered isolated if it is separated such that passengers or crew located outside may not be immediately aware of a fire starting within the compartment. Isolation can be created by features such as doors, partitions or curtains and can also be created by being located remotely from the main passenger cabin. Compartments that are not occupied during taxi, take-off or landing are considered to be not permanently occupied during flight.

The advisory material is to be developed to provide guidance on compliance with CS 25.xxx for aircraft of varying sizes, operational roles and isolated compartment configurations. In particular guidance is to be provided on:

- The types of isolated compartments addressed by the requirements based on occupancy and separation.
- The required compliance demonstration means to be used to determine the adequacy of fire or smoke detection by cabin crew or passengers if a smoke or fire detection system is not installed.
- The potential fire sources that need to be considered in the isolated compartment and the associated safeguards that need to be implemented.
- What constitutes “effective fire fighting action”
- The required safety equipment and its location taking into consideration the likely number and location of crewmembers.
- What constitutes “unrestricted access” to an isolated compartment
- Acceptable means of de-activating fire/smoke detection systems

2.2 THE PREFERRED OPTION SELECTED

After due consideration the Agency believes that **Option 2 – Rulemaking Action** to amend CS-25 to specify fire protection measures for compartments not permanently occupied during flight that are isolated or located in remote areas is to be preferred.

3 SECTORS CONCERNED

The proposed regulatory change is to CS-25 and hence the aircraft affected will be those for which the application for a type certificate or supplemental type certificate is made after the regulatory change considered in this RIA. There is unlikely to be any additional cost borne by aircraft manufacturers, aircraft converters or aircraft operators for compliance with the proposed regulatory change since the subject is currently being addressed by Special Conditions. There will be a marginal cost to EASA for the rulemaking activities. However, there is a potential benefit in terms of time and cost saving for all sectors concerned from a simplified cabin certification process.

4 IMPACTS

4.1 ALL IDENTIFIED IMPACTS

4.1.1 Safety

Generally, there will be no difference in the level of safety that would be achieved by Option 1 and Option 2. However, a rulemaking action would ensure that the fire protection measures for these compartments are standardised.

4.1.2 Economic

Option 1 – Do Nothing

The certification of compartments not permanently occupied during flight that are isolated or located in remote areas will continue to be addressed by Special Conditions which incurs additional costs and time.

Option 2 – Rulemaking Action

Rulemaking action will result in a reduction in certification costs and time due to the simplified certification process.

4.1.3 Environmental

There is no difference between the environmental impact of Option 1 and Option 2. The use of hand-held fire extinguishers or built-in fire extinguishers required by both options should take into consideration the phasing out of Halon 1211/1301 and the availability of their environmentally-friendly replacement extinguishing agents.

4.1.4 Social

No social impacts have been identified.

4.1.5 Other Aviation Requirements outside EASA scope

No aviation requirements outside the scope of EASA which may be affected by the contents of the NPA have been identified.

4.1.6 Foreign Comparable Regulatory Requirements

ICAO Annex 8 does not conflict with the content or overall objectives of this proposed regulatory change.

The FAA has issued SFAR No. 109 which is applicable to Private Use Transport Category Airplanes. The SFAR contains the following requirement:

“For airplanes with a type certificated passenger capacity of 20 or more, there must be means that meet the requirements of Sec. 25.858(a) through (d) to signal the flightcrew in the event of a fire in any isolated room not occupiable for taxi, takeoff and landing, which can be closed off from the rest of the cabin by a door. The indication must identify the compartment where the fire is located. This does not apply to lavatories, which continue to be governed by Sec. 25.854.”

For aircraft with a type certificated passenger capacity of 20 or more the SFAR is similar to the proposed regulatory change addressed by this RIA. However, there are some significant differences:

1. The EASA proposed regulatory change, addressed in this RIA, requires that isolated compartments that contain equipment that are a potential fire source, for instance a cooktop installation, or where smoking is permitted, are provided with smoke or fire detection systems. However, these systems may be temporarily disabled by crewmembers, or by any other means found acceptable to the Agency. EASA has accepted deactivation of smoke detection systems for short periods in such compartments in previous certifications, provided certain safeguards are implemented.
2. The SFAR requires that the smoke or fire detection system indication is provided to the flight crew whereas the EASA proposed regulatory change allows the warning to be provided in the cockpit or in the cabin. This policy is intended to reduce the number of nuisance warnings that might otherwise result in distractions to the flight crew in instances where adequate levels of safety might be achieved by other means.

There are no other rulemaking activities being carried out by the FAA or Transport Canada that are pertinent to this subject. The introduction of new rules in CS-25 will result in differences with FAR 25/CAR 525.

4.2 EQUITY AND FAIRNESS ISSUES IDENTIFIED

There are no issues of equity and fairness associated with any of the options considered in this Regulatory Impact Assessment.

5 SUMMARY AND FINAL ASSESSMENT

5.1 COMPARISON OF THE POSITIVE AND NEGATIVE IMPACTS FOR EACH OPTION EVALUATED

Option 1 – Do Nothing

Whilst certification using Special Conditions has provided the intended level of safety, such process incurs increased costs and time to EASA and manufacturers/converters. The optimum way forward is to capture the safety intent contained within the Special Conditions into CS-25.

Option 2 – Rulemaking Action

Taking into consideration that there is an increasing demand for the installation of private rooms/offices in aeroplanes, special areas in large transport aeroplanes and crew rest compartments, incorporating fire protection requirements currently stipulated in Special Conditions into CS-25 would standardise the required fire protection and reduce certification costs and time. This option would, however, introduce differences with FAR 25/CAR 525.

5.2 A SUMMARY DESCRIBING WHO WOULD BE AFFECTED BY THESE IMPACTS AND ANALYSING ISSUES OF EQUITY AND FAIRNESS

In terms of safety impacts, aircraft crew and passengers will not be affected by either option since there is no change in the level of safety currently provided by the fire protection requirements stipulated in the Special Conditions.

In terms of economic impacts, EASA, manufacturers/converters, and ultimately operators would benefit from the reduction of time and costs associated with the certification process if Option 2 is selected.

5.3 FINAL ASSESSMENT AND RECOMMENDATION OF A PREFERRED OPTION

After due consideration the Agency believes that Option 2 is to be preferred.

Whilst certification using Special Conditions has provided the intended level of safety, such process incurs increased costs and time to EASA and manufacturers/converters. Reflecting the safety intent contained within the Special Conditions into CS-25 would ensure that the intended level of safety is achieved and certification costs and time can be reduced.

Rulemaking as described under Option 2 above is therefore considered to be justified.

6 REFERENCES

1. RGW Cherry & Associates (2009) *Study on CS-25 Cabin Safety Requirements*, prepared for the European Aviation Safety Agency. United Kingdom Author.
2. Federal Aviation Administration, Final Special Condition No. 25-216-SC Boeing Model 777-200 Series Airplanes; Overhead Crew Rest Compartment. United States of America Author.
3. Proceedings of the Very Large Transport Aeroplane Conference, Noordwijkerhout, The Netherlands, 13-16 October 1998.
4. Federal Aviation Administration, SFAR No. 109, Special Requirements for Private Use Transport Category Airplanes Regulatory Information. United States of America Author.